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

Title: Changes Related to LCO 3.5.6, In-containment Refueling Water Storage Tank (IRWST) – Operating

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, Rev. 3, Relocate Surveillance Frequencies to Licensee Control - RITSTF Initiative 5b
TSTF-523, Rev. 2, Generic Letter 2008-01, Managing Gas Accumulation

STS NUREGs Affected:

TSTF-425, Rev. 3: NUREG-1430, 1431, 1432, 1433, 1434
TSTF-523, Rev. 2: NUREG-1430, 1431, 1432, 1433, 1434

NRC Approval Date:

TSTF-425, Rev. 3: 06-Jul-09
TSTF-523, Rev. 2: 23-Dec-13

TSTF Classification:

TSTF-425, Rev. 3: Technical Change
TSTF-523, Rev. 2: 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:

None

RCOL COL Item Number and Title:

None

RCOL PTS Change Number and Title:

VEGP LAR DOC A077:	TS 3.5.6 Condition F revision
VEGP LAR DOC A078:	Borated water volume designation revision
VEGP LAR DOC A079:	IRWST SR Frequency revision
VEGP LAR DOC L01:	Added SR for valve actuation
VEGP LAR DOC L17:	Revisions to Actions and SRs associated with Noncondensible gases

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(1) applicable to operating reactor designs, but not to the AP1000 design; (2) already incorporated in the GTS; or (3) superseded by another change.

VEGP LAR DOC A078 revises the third entry statement for Condition D of TS 3.5.6 by changing the IRWST borated water volume from a percent range of < 100% and > 97% to a specific range of ≤ 73,100 cu. ft. and > 70,907 cu. ft.. A proposed additional change corrects "cu. ft." to "cu ft".

TSTF-425 is deferred for future consideration.

TSTF-523, Rev. 1 is not applicable to the GTS. The issues of gas accumulation have been addressed by GTS Rev.19.

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)

Condition D and SR 3.5.6.2 are revised to delete the periods from “cu. ft.”

APOG Recommended Changes to Improve the Bases

Throughout the Bases, references to Sections and Chapters of the FSAR do not include the “FSAR” modifier. Since these Section and Chapter references are to an external document, it is appropriate to include the acronym “FSAR” to modify “Section” and “Chapter” in references to the FSAR throughout the Bases. (DOC A003)

In the “Applicable Safety Analyses” section of the Bases in the first paragraph, the first use of the acronym “PRHR” is corrected by adding the full phrase “Passive Residual Heat Removal”.

In the “Applicable Safety Analyses” section of the Bases, third paragraph, the fifth sentence is revised as follows:

> Injection from the IRWST provides core cooling until the tank empties and **the containment is flooded up to a level sufficient to provide recirculation flow through the gravity injection lines back into the RCS**~~gravity recirculation from the containment starts~~.

In the “Applicability” section of the Bases, first paragraph, second sentence, the function naming for “low head safety injection” is revised to “low pressure safety injection”.

An editorial change is made to the “Actions” section of the Bases, under heading “A.1”. The change clarifies and corrects the first use of the acronym “ECCS” by using the full phrase “emergency core cooling system” and deleting “system” after “ECCS”.

An editorial change is made to the “Actions” section of the Bases, under heading “D.1”. The change corrects the first use of the acronym “PRA” by using the full phrase “probabilistic risk assessment” and clarifies the assumed number of failed boron injection sources (CMTs and Accumulators).

In the “Surveillance Requirements” section of the Bases, under heading “SR 3.5.6.8” a reference to the stated ASME OM Code is added and the stated section is revised to be more specific.

In the “Reference” section of the Bases the ASME OM Code reference is added.

In the “Surveillance Requirements” section of the Bases, under heading “SR 3.5.6.9” the discussion is revised for consistency with the TS requirement(s) being discussed in the TS Bases.

V. Applicability

Affected Generic Technical Specifications and Bases:

Section 3.5.6, In-containment Refueling Water Storage Tank (IRWST) – Operating

Changes to the Generic Technical Specifications and Bases:

Condition B of TS 3.5.6 is revised from "One IRWST injection line inoperable due to presence of noncondensible gases in one high point vent." to "One IRWST injection flow path with noncondensible gas volume in one squib valve outlet line pipe stub not within limit." The Required Action B.1 is revised from "Vent noncondensible gases." to "Restore noncondensible gas volume in squib valve outlet line pipe stub to within limit." The associated "Actions" section of the Bases is also revised. (DOC L17)

Condition C of TS 3.5.6 is revised from "One IRWST injection line inoperable due to presence of noncondensible gases in both high point vents." to "One IRWST injection flow path with noncondensible gas volume in both squib valve outlet line pipe stubs not within limit." The Required Action C.1 is revised from "Vent noncondensible gases from one high point vent." to "Restore noncondensible gas volume in one squib valve outlet line pipe stub to within limit." The associated "Actions" section of the Bases is also revised. (DOC L17)

The third entry statement for Condition D of TS 3.5.6 is revised by replacing the specified volume percent with cubic feet. (DOC A078)

Condition D and SR 3.5.6.2 are revised to correct "cu. ft." to "cu ft". (NRC staff proposed change)

The first entry statement for Condition F of TS 3.5.6 is revised by specifying the applicable Conditions. (DOC A077)

SR 3.5.6.4 second Frequency is revised by changing the "...solution volume increase of 15,000 gal" to "...solution volume increase of ≥ 15,000 gal". (DOC A079)

A new SR 3.5.6.9 is added to "Verify continuity of the circuit from the Protection Logic Cabinets to each IRWST injection and containment recirculation squib valve on an actual or simulated actuation signal." The SR includes a surveillance column Note stating, "Squib actuation may be excluded." (DOC L01)

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

In the "Applicable Safety Analyses" Section of the Bases in the first paragraph, the phrase "Passive Residual Heat Removal" is added before "PRHR". (APOG Comment)

In the "Applicable Safety Analyses" section of the Bases, third paragraph, the fifth sentence is revised for consistency. (APOG Comment)

In the "Applicability" section of the Bases, first paragraph, second sentence, the function naming for "low head safety injection" is revised to "low pressure safety injection". (APOG Comment)

In the “Actions” section of the Bases, under heading “A.1” the last sentence is revised by changing “ECCS system” to “emergency core cooling system (ECCS)”. (APOG Comment)

In the “Actions” section of the Bases, under heading “D.1” the fourth sentence is revised by changing “PRA” to “probabilistic risk assessment (PRA)” and clarifying the assumed number of failed boron injection sources (CMTs and Accumulators). (APOG Comment)

In the “Surveillance Requirements” section of the Bases, under heading “SR 3.5.6.8” a reference to the stated ASME OM Code is added and the stated section is revised to be more specific. (APOG Comment)

In the “Reference” section of the Bases, the ASME OM Code reference is added. (APOG Comment)

In the “Surveillance Requirements” section of the Bases, under heading “SR 3.5.6.9” the discussion is revised for consistency with the TS requirement(s) being discussed in the TS Bases. (APOG Comment)

VI. Traveler Information

Description of TSTF changes:

None

Rationale for TSTF changes:

None

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

VEGP LAR DOC A077 revises Condition F of TS 3.5.6 by specifying the Conditions that are applicable to the first entry statement.

VEGP LAR DOC A078 revises the third entry statement for Condition D of TS 3.5.6 by changing the IRWST borated water volume from a percent range of < 100% and > 97% to a specific range of ≤ 73,100 cu. ft. and > 70,907 cu. ft.

VEGP LAR DOC A079 revises the second Frequency of SR 3.5.6.4 from "Once within 6 hours after each solution volume increase of 15,000 gal" to "Once within 6 hours after each solution volume increase of ≥ 15,000 gal"

VEGP LAR DOC L01 adds new SR 3.5.6.9 to "Verify continuity of the circuit from the Protection Logic Cabinets to each IRWST injection and containment recirculation squib valve on an actual or simulated actuation signal." with a Note stating "Squib actuation may be excluded." and Frequency of 24 months.

VEGP LAR DOC L17 changes the TS 3.5.6 Condition B entry statement from "One IRWST injection line inoperable due to presence of noncondensible gases in both high point vents." to "One IRWST injection flow path with noncondensible gas volume in both squib valve outlet line pipe stubs not within limit." Condition C entry statement is changed from "One IRWST injection line inoperable due to presence of noncondensible gases in both high point vents." to "One IRWST injection flow path with noncondensible gas volume in both squib valve outlet line pipe stubs not within limit." Required Action B.1 and C.1 are revised to reflect the change to the revised Condition B and C statements.

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

VEGP LAR DOC A077 changes to the first entry statement for Condition F of TS 3.5.6 provide clarification by specifying the applicable Conditions.

VEGP LAR DOC A078 changes to the third entry statement for Condition D of TS 3.5.6 provides clarity by changing the IRWST borated water volume in units of cubic feet, which align with SR 3.5.6.2.

VEGP LAR DOC A079 revises the second Frequency of SR 3.5.6.4 from "Once within 6 hours after each solution volume increase of 15,000 gal" to "Once within 6 hours after each solution volume increase of ≥ 15,000 gal" to clarify that the requirement is also applicable to a solution volume increase of greater than 15,000 gallons.

VEGP LAR DOC L01 addition of new SR 3.5.6.9 to TS 3.5.6 is due to deletion of SR 3.3.2.8. The equivalent requirement is included in the new SR for TS 3.5.6 with the same 24 month Frequency as the deleted SR 3.3.2.8.

VEGP LAR DOC L17 changes align Condition B and C entry statements and Required Action B.1 and C.1 with the intent of the LCO as described in the Bases.

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

Condition D and SR 3.5.6.2 are revised to correct "cu. ft." to "cu ft".

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

The first reference to the acronym "PRHR" is corrected by adding "Passive Residual Heat Removal" before "PRHR" in the "Applicable Safety Analyses" section of the Bases, in the first paragraph. (APOG Comment)

In the "Applicable Safety Analyses" section of the Bases, third paragraph, the fifth sentence is revised to "Injection from the IRWST provides core cooling until the tank empties and **the containment is flooded up to a level sufficient to provide recirculation flow through the gravity injection lines back into the RCS**~~gravity recirculation from the containment starts~~." (APOG Comment)

In the "Applicability" section of the Bases, first paragraph, second sentence, the function naming for "low head safety injection" is revised to "low pressure safety injection". (APOG Comment)

The phrase "ECCS system" is clarified and corrected to "emergency core cooling system (ECCS)" in the "Actions" section of the Bases, under heading "A.1". (APOG Comment)

The acronym "PRA" is corrected to include the phrase "probabilistic risk assessment" before "(PRA)" and the assumed number of failed boron injection sources (CMTs and Accumulators) is clarified in the "Actions" section of the Bases, under heading "D.1". (APOG Comment)

A reference to the stated ASME OM Code is added and the stated ASME OM Code section is revised to be more specific in the "Surveillance Requirements" section of the Bases, under heading "SR 3.5.6.8". (APOG Comment)

The ASME OM Code is added to the "References" section of the Bases. (APOG Comment)

In the "Surveillance Requirements" section of the Bases, under heading "SR 3.5.6.9" the discussion is revised by adding the sentence "The OPERABILITY of the squib valves is checked by performing a continuity check of the circuit form the Protection Logic Cabinets to the squib valve." (APOG Comment)

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

Changing “cu. ft.” to “cu ft” is an editorial correction. The change is in accordance with section 3.3.4.d of writer's guide TST-GG-05-01.

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

The change from “PRHR” to “Passive Residual Heat Removal (PRHR)” is an editorial correction in conformance with TSTF-GG-05-01, section 3.2.2.a. These non-technical changes provide improved clarity, consistency, and operator usability.

In the “Applicable Safety Analyses” section of the Bases, third paragraph, the fifth sentence is revised for consistency with AP1000 DCD 6.3.2.1.3.

In the “Applicability” section of the Bases, first paragraph, the second sentence is revised for consistency with naming convention in the AP1000 DCD.

The change from “ECCS system” to “emergency core cooling system (ECCS)” is an editorial clarification and the correction is in conformance with TSTF-GG-05-01, section 3.2.2.a.

The change from “PRA” to “probabilistic risk assessment (PRA)” is an editorial correction in conformance with TSTF-GG-05-01, section 3.2.2.a and the change to the discussion of the assumed number of failed boron injection sources (CMTs and Accumulators) is an editorial clarification.

Adding the reference to the stated ASME OM Code is an editorial improvement to more completely reference the stated ASME OM Code and add the Code as a Reference consistent with other TS Bases Specifications. The “paragraph 4.6” reference for squib valve testing is more specifically “paragraph ISTC 4.6,” which is the applicable paragraph from ASME OM Code 1995, 1996 addenda, Subsection ISTC.

The ASME OM Code is added to the “References” section of the Bases since a reference to the stated ASME OM Code is added to the “Surveillance Requirements” section of the Bases, under heading “SR 3.5.6.8”.

The changes to SR 3.5.6.9 Bases are editorial change that provide consistency with the TS requirement(s) being discussed in the TS Bases.

VII. GTST Safety Evaluation

Technical Analysis:

VEGP LAR DOC L01: GTS 3.3.2, “Engineered Safety Feature Actuation System (ESFAS) Instrumentation,” SR 3.3.2.7 (“Perform ACTUATION DEVICE TEST”) and SR 3.3.2.8 (“Perform ACTUATION DEVICE TEST for squib valves”) are deleted from GTS 3.3.2 and Table 3.3.2-1, Function 26.a, ESF Actuation Subsystem. The equivalent requirement (using phrasing generally consistent with NUREG-1431) is included in individual Specifications for the actuated devices with the same 24 month Frequency as the deleted SRs. The new SR added to TS 3.5.6 is due to deletion of SR 3.3.2.8. The equivalent requirement is included in the new SR for TS 3.5.6 and the same 24 month Frequency as the deleted SR 3.3.2.8. The bases for deleted SR 3.3.2.8 discusses performance of an actuation device test demonstrates that the actuated device responds to a simulated actuation signal. As such, Surveillances associated with the testing of the actuated equipment should be addressed in the actuated equipment Specifications, where failures of the surveillance would lead to entering the Actions for the inoperable actuated equipment. The change is less restrictive, but results in closer alignment with NUREG Standard TS presentation of actuated device testing.

VEGP LAR DOC L17: As stated in the associated Bases for the GTS 3.5.6 Actions, the presence of some noncondensible gases does not mean that the CMT is immediately inoperable, but that gases are collecting and should be vented. In addition, the associated LCO Bases for TS 3.5.6 state that a relatively small gas volume was incorporated into the design for alerting operators to provide sufficient time to initiate venting operations before the gas volume would be expected to increase to a sufficient volume that might potentially challenge the OPERABILITY of natural circulation flow. The language of GTS 3.5.6, Condition B and C is not consistent with the intent of the LCO, as described in the Bases. Therefore, the Condition is revised for consistency with the LCO as described in the associated Bases.

GTS 3.5.6, Required Action B.1 and C.1 are revised to replace a specific method of restoration with a more general action to restore the parameter, in this case noncondensible gas volume, to within its limit. This change is made for consistency with the revised entry conditions associated with the Required Action. Only the specific method is deleted from the action. The associated Bases, both GTS and revised, describe an appropriate method for restoration. The revised Action continues to provide assurance that operation with a noncondensible gas volume that can affect the associated flow path is allowed for only a limited period of time. These changes are designated as less restrictive because the specific method of restoration is deleted and replaced with a more general requirement to restore within the limit.

Other Changes: 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 3.5.6 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 5/23/2014.

APOG Comments (Ref. 7) and Resolutions:

1. (Internal #2) Approved TSTF-523 is not dispositioned in the material provided to support the GTSTs. Include TSTF-523 in the reference disposition tables, as "TSTF deferred for future consideration." This is resolved by dispositioningTSTF-523, Rev. 1 as not applicable to the GTS and stating that the concerns of the TSTF have been addressed by GTS Rev.19.

2. (Internal #3) Throughout the Bases, references to Sections and Chapters of the FSAR do not include the "FSAR" modifier. 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 to every FSAR reference in the Bases.

3. (Internal #6) The GTST sections often repeat VEGP LAR DOCs, which reference "existing" and "current" requirements. The inclusion in the GTST of references to "existing" and "current," are not always valid in the context of the GTS. Each occurrence of "existing" and "current" should be revised to be clear and specific to GTS, MTS, or VEGP COL TS (or other), as appropriate. This is resolved by making the APOG recommended changes to the GTST.

4. (Internal #13) 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.

5. (Internal #295) The NRC staff proposed change to replace “cu. ft.” with “cu ft” is part of comment #295.

6. (Internal #310) In GTST Section V, Applicability, last sentence, description of SR is incomplete. Add “Also including a Note to the SR stating: ‘Squib actuation may be excluded.” This is resolved by making the following changes to GTST Section V:

   “The SR includes a surveillance column Note stating, “Squib actuation may be excluded.”“

7. (Internal #311) Third item under “Rationale for changes in RCOL Std. Dep., RCOL COL Item(s), and RCOL PTS Changes” simply restates the change, but provides no rationale for the change. Add the following basis to the third item: “...to clarify the requirement is also applicable to solution volume increase greater than 15,000 gallons”. This is resolved by making the recommended changes with additional clarification.

8. (Internal #312) Editorial change is recommended. These non-technical changes provide improved clarity, consistency, and operator usability. This is resolved by making the recommended changes to the “Applicable Safety Analyses” section of the Bases as follows:

   “During non-LOCA events, the IRWST serves as the initial heat sink for the **Passive Residual Heat Removal (**PRHR**)** Heat Exchanger (PRHR HX) if used during reactor cooldown to MODE 4.”

9. (Internal #313) Revise TS 3.5.6 Applicable Safety Analyses Bases from “Injection from the IRWST provides core cooling until the tank empties and gravity recirculation from the containment starts” to “Injection from the IRWST provides core cooling until the tank empties and the containment is flooded up to a level sufficient to provide recirculation flow through the gravity injection lines back into the RCS” for consistency with AP1000 DCD 6.3.2.1.3. This is resolved by making the recommended changes to “Applicable Safety Analyses” section of the Bases as follows:

   “Injection from the IRWST provides core cooling until the tank empties and **the containment is flooded up to a level sufficient to provide recirculation flow through the gravity injection lines back into the RCS**~~gravity recirculation from the containment starts~~.”

10. (Internal #314) Function naming is revised consistent with naming convention in the AP1000 DCD and/or other TS Bases. This is resolved by making the recommended changes to the “Applicability” section of the Bases, first paragraph, second sentence, as indicated:

"In MODES 1, 2, 3, and 4, a second safety related function is the low ~~head~~**pressure** safety injection of borated water following a LOCA for core cooling and reactivity control."

11. (Internal #315) APOG recommends making the editorial changes in the "Actions" section of the Bases, under heading "A.1". These non-technical changes provide improved clarity, consistency, and operator usability. This is resolved by making the suggested changes and adding a comma after "(ECCS)" as follows:

    "The 72 hour Completion Time is consistent with times normally applied to **a** degraded two train **emergency core cooling system (**ECCS**)** ~~systems~~ which can provide 100% of the required flow without a single failure."

12. (Internal #316) Editorial change is recommended to the "Actions" section of the Bases, under heading "D.1". These non-technical changes provide improved clarity, consistency, and operator usability. This is resolved by making the suggested changes and additional changes to the assumed multiple failures of the boron injection sources statement as follows:

    "This limit prevents a significant change in boron concentration and is consistent with the long-term cooling analysis performed to justify **probabilistic risk assessment (**PRA**)** success criteria (Ref. 3), which assumed multiple failures with as many as **three of the four boron injection sources (two CMTs and two Accumulators)** ~~3 CMTs/Accum~~ not injecting..."

13. (Internal #317 and 318) Revise SR 3.5.6.8 Bases to make editorial improvements to more completely reference the stated ASME OM Code and add the Code as a Reference consistent with other TS Bases Specifications. The "paragraph 4.6" reference for squib valve testing is more specifically "paragraph ISTC 4.6," which is the applicable paragraph from ASME OM Code 1995, 1996 addenda, Subsection ISTC (refer to AP1000 DCD 3.9.6, and 3.9.9 Reference 2). With the change to SR 3.5.6.8 Bases to include a Reference citation, include ASME OM Code as new Reference. This is resolved by making the suggested changes.

14. (Internal #319) Editorial change for clarity - These changes are made for consistency with the TS requirement(s) being discussed in the TS Bases. in the "Surveillance Requirements" section of the Bases, under heading "SR 3.5.6.9", revise the second paragraph. This is resolved by making the following changes:

    "...overlaps this Surveillance to provide complete testing of the assumed safety function. **The OPERABILITY of the squib valves is checked by performing a continuity check of the circuit from the Protection Logic Cabinets to the squib valve.** The Frequency of 24 months is based on..."

NRC Final Approval Date: 12/15/2015

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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. 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).

4. TSTF-GG-05-01, "Writer's Guide for Plant-Specific Improved Technical Specifications," June 2005 (ML070660229).

5. 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)

6. 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).

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 (ML 14265A493).

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.

3.5 PASSIVE CORE COOLING SYSTEM (PXS)

3.5.6 In-containment Refueling Water Storage Tank (IRWST) – Operating

LCO 3.5.6 The IRWST, with two injection flow paths and two containment recirculation flow paths, shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One IRWST injection line actuation valve flow path inoperable. OR One containment recirculation line actuation valve flow path inoperable.	A.1 Restore the inoperable actuation valve flow path to OPERABLE status.	72 hours
B. One IRWST injection **flow path with**~~line inoperable due to presence of~~ noncondensible gas~~es in one high point vent~~ **volume in one squib valve outlet line pipe stub not within limit**.	B.1 ~~Vent noncondensible gases~~**Restore noncondensible gas volume in squib valve outlet line pipe stub to within limit**.	72 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. One IRWST injection **flow path with**~~line inoperable due to presence of~~ noncondensible gas~~es in both high point vents~~ **volume in both squib valve outlet line pipe stubs not within limit**.	C.1	~~Vent noncondensible gases from one high point vent~~**Restore noncondensible gas volume in one squib valve outlet line pipe stub to within limit**.	8 hours
D. IRWST boron concentration not within limits. <u>OR</u> IRWST borated water temperature not within limits. <u>OR</u> IRWST borated water volume **≤ 73,100 cu**~~.~~ **ft**~~.~~ **and > 70,907 cu**~~.~~ **ft**~~.~~~~< 100% and > 97% of limit~~.	D.1	Restore IRWST to OPERABLE status.	8 hours
E. One motor operated IRWST isolation valve not fully open. <u>OR</u> Power is not removed from one or more motor operated IRWST isolation valves.	E.1	Restore motor operated IRWST isolation valve to fully open condition with power removed from both valves.	1 hour

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. Required Action and associated Completion Time **of Condition A, B, C, D, or E** not met. <u>OR</u> LCO not met for reasons other than Condition A, B, C, D, or E.	F.1 Be in MODE 3. <u>AND</u> F.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.6.1	Verify the IRWST water temperature is < 120°F.	24 hours
SR 3.5.6.2	Verify the IRWST borated water volume is > 73,100 cu~~.~~ ft.	24 hours
SR 3.5.6.3	Verify the volume of noncondensible gases in each of the four IRWST injection squib valve outlet line pipe stubs has not caused the high-point water level to drop below the sensor.	24 hours

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.6.4	Verify the IRWST boron concentration is ≥ 2600 ppm and ≤ 2900 ppm.	31 days AND Once within 6 hours after each solution volume increase of ≥ 15,000 gal
SR 3.5.6.5	Verify each motor operated IRWST isolation valve is fully open.	12 hours
SR 3.5.6.6	Verify power is removed from each motor operated IRWST isolation valve.	31 days
SR 3.5.6.7	Verify each motor operated containment recirculation isolation valve is fully open.	31 days
SR 3.5.6.8	Verify each IRWST injection and containment recirculation squib valve is OPERABLE in accordance with the Inservice Testing Program.	In accordance with the Inservice Testing Program
SR 3.5.6.9	**-------------------------------NOTE-------------------------------** **Squib actuation may be excluded.** **---** **Verify continuity of the circuit from the Protection Logic Cabinets to each IRWST injection and containment recirculation squib valve on an actual or simulated actuation signal.**	**24 months**

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.6.10~~9~~	Verify by visual inspection that the IRWST screens and the containment recirculation screens are not restricted by debris.	24 months
SR 3.5.6.11~~10~~	Verify IRWST injection and recirculation system flow performance in accordance with the System Level OPERABILITY Testing Program.	10 years

B 3.5 PASSIVE CORE COOLING SYSTEM (PXS)

B 3.5.6 In-containment Refueling Water Storage Tank (IRWST) – Operating

BASES

BACKGROUND

The IRWST is a large stainless steel lined tank filled with borated water (Ref. 1). It is located below the operating deck in containment. The tank is designed to meet seismic Category 1 requirements. The floor of the IRWST is elevated above the reactor coolant loop so that borated water can drain by gravity into the Reactor Coolant System (RCS). The IRWST is maintained at ambient containment pressure.

The IRWST has two injection flow paths. The injection paths are connected to the reactor vessel through two direct vessel injection lines which are also used by the accumulators and the core makeup tanks. Each path includes an injection flow path and a containment recirculation flow path. Each injection path includes a normally open motor operated isolation valve and two parallel actuation lines each isolated by one check valve and one squib valve in series.

The IRWST has two containment recirculation flow paths. Each containment recirculation path contains two parallel actuation flow paths, one path is isolated by a normally open motor operated valve in series with a squib valve and one path is isolated by a check valve in series with a squib valve.

During refueling operations, the IRWST is used to flood the refueling cavity. During abnormal events, the IRWST serves as a heat sink for the passive residual heat removal heat exchangers, as a heat sink for the depressurization spargers, and as a source of low head (ambient containment pressure) safety injection during loss of coolant accidents (LOCAs) and loss of decay heat removal in MODE 5 (loops not filled). The IRWST can be cooled by the Normal Residual Heat Removal System (RNS) system.

The IRWST size and injection capability is selected to provide adequate core cooling for the limiting Design Basis Accidents (DBAs) (Ref. 2).

APPLICABLE SAFETY ANALYSES

During non-LOCA events, the IRWST serves as the initial heat sink for the **Passive Residual Heat Removal (**PRHR**)** Heat Exchanger (PRHR HX) if used during reactor cooldown to MODE 4. If RNS is available, it will be actuated in MODE 4 and used to continue the plant cooldown to MODE 5. If RNS is not available, cooldown can continue on

BASES

APPLICABLE SAFETY ANALYSES (continued)

PRHR. Continued PRHR HX operation will result in the water in the IRWST heating up to saturation conditions and boiling. The steam generated in the IRWST enters the containment through the IRWST vents. Most of the steam generated in the IRWST condenses on the inside of the containment vessel and drains back to the IRWST.

For events which involve a loss of primary coolant inventory, such as a large break LOCA, or other events involving automatic depressurization, the IRWST provides low pressure safety injection (Ref. 2). The IRWST drain down time is dependent on several factors, including break size, location, and the return of steam condensate from the passive containment cooling system. During drain down, when the water in the IRWST reaches the Low 5 level, the containment sump will be sufficiently flooded, to initiate containment sump recirculation. This permits continued cooling of the core by recirculation of the spilled water in the containment sumps via the sump recirculation flow paths. In this situation, core cooling can continue indefinitely.

When the plant is in midloop operation, the pressurizer Automatic Depressurization System (ADS) valves are open, and the RNS is used to cool the RCS. The RNS is not a safety related system, so its failure must be considered. In this situation, with the RCS drained and the pressure boundary open, the PRHR HX cannot be used. In such a case, core cooling is provided by gravity injection from the IRWST, venting the RCS through the ADS. Injection from the IRWST provides core cooling until the tank empties and **the containment is flooded up to a level sufficient to provide recirculation flow through the gravity injection lines back into the RCS**~~gravity recirculation from the containment starts~~. With the containment closed, the recirculation can continue indefinitely, with the decay heat generated steam condensing on the containment vessel and draining back into the IRWST.

The IRWST satisfies Criteria 2 and 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The IRWST requirements ensure that an adequate supply of borated water is available to act as a heat sink for PRHR and to supply the required volume of borated water as safety injection for core cooling and reactivity control.

BASES

LCO (continued)

To be considered OPERABLE, the IRWST must meet the water volume, boron concentration, and temperature limits defined in the surveillance requirements. The motor operated injection isolation valves must be open with power removed, and the motor operated sump recirculation isolation valves must be open. OPERABILITY is not expected to be challenged due to small gas accumulations in the high point, and rapid gas accumulations are not expected during plant operation. However, a relatively small gas volume was incorporated into the design for alerting operators to provide sufficient time to initiate venting operations before the gas volume would be expected to increase to a sufficient volume that might potentially challenge the OPERABILITY of passive safety injection flow. Therefore, noncondensible gas accumulation in the injection line high point that causes the water level to drop below the sensor will require operator action to investigate the cause of the gas accumulation and to vent the associated high point(s).

APPLICABILITY

In MODES 1, 2, 3, and 4, a safety related function of the IRWST is to provide a heat sink for PRHR. In MODES 1, 2, 3, and 4, a second safety related function is the low ~~head~~**pressure** safety injection of borated water following a LOCA for core cooling and reactivity control. Both of these functions must be available to meet the initial assumptions of the safety analyses. These assumptions require the specified boron concentration, the minimum water volume, and the maximum water temperature.

The requirements for the IRWST in MODES 5 and 6 are specified in LCO 3.5.7, In-containment Refueling Water Storage Tank (IRWST) - Shutdown, MODE 5 and LCO 3.5.8, In-containment Refueling Water Storage Tank (IRWST) - Shutdown, MODE 6.

ACTIONS

A.1

If an IRWST injection line actuation valve flow path or a containment recirculation line actuation valve flow path is inoperable, then the valve actuation flow path must be restored to OPERABLE status within 72 hours. In this condition, three other IRWST injection or containment sump recirculation flow paths are available and can provide 100% of the required flow assuming a break in the direct vessel injection line associated with the other injection train, but with no single failure of the actuation valve flow path in the same injection or sump recirculation flow path. The 72 hour Completion Time is consistent with times normally

BASES

ACTIONS (continued)

applied to **a** degraded two train **emergency core cooling system (**ECCS**),** ~~systems~~ which can provide 100% of the required flow without a single failure.

B.1

Excessive amounts of noncondensible gases in one of the **injection flow path squib valve outlet line pipe stubs**~~high point vents~~ in one IRWST injection line may interfere with the passive injection of IRWST water into the reactor vessel from the associated parallel flow path in the affected injection line. Analyses have shown that with enough noncondensible gas accumulation, IRWST injection through the affected flow path could be delayed. However, the presence of some noncondensible gases does not mean that the IRWST injection capability is immediately inoperable, but that gases are collecting and should be vented. The venting of these gases requires containment entry to manually operate the vent valves. In this Condition, the parallel flow path in the affected injection line is capable of providing 100% of the required injection flow and the other IRWST injection line remains fully OPERABLE. These IRWST flow paths can provide the credited flow in the event of a direct vessel injection (DVI) line break downstream of the fully OPERABLE injection line, provided a single failure of the remaining parallel isolation valve does not occur. A Completion Time of 72 hours is acceptable for two train ECCS systems, which are capable of performing their safety function without a single failure.

C.1

Excessive amounts of noncondensible gases in both of the **injection flow path squib valve outlet line pipe stubs**~~high point vents~~ in one IRWST injection line may affect the passive injection of IRWST water into the reactor vessel from the affected injection line. Sufficient gas accumulation could potentially challenge IRWST injection capability. However, the presence of some noncondensible gases does not immediately render the IRWST injection capability inoperable, but that gases are collecting and should be vented.

The level sensor location has been selected to permit additional gas accumulation before injection flow is significantly affected so that adequate time may be provided to permit containment entry for venting the gas. Anticipated noncondensible gas accumulation in this piping segment is expected to be relatively slow.

BASES

ACTIONS (continued)

In this Condition, the remaining OPERABLE IRWST injection line is capable of performing the safety function for all plant events except for one, DVI line break. For this one event, the line with gas accumulation in both **injection flow path squib valve outlet line pipe stubs**high point vents will be capable of performing the safety function with a small amount of voiding that is not expected to significantly challenge the required injection flow.

The venting of these gases requires containment entry to manually operate the vent valves. Considering the relatively slow rate of gas accumulation, venting within 8 hours should normally prevent accumulation of amounts of noncondensible gases that could significantly challenge IRWST injection capability. A Completion Time of 8 hours is permitted for venting noncondensible gases and is acceptable since the injection capability of the other IRWST injection line is sufficient to ensure event mitigation, or in the event of a break in the DVI line connected to the OPERABLE injection line, the injection line with gas accumulation will be capable of providing the required injection flow with some voiding. If only one of the affected **injection flow path squib valve outlet line pipe stubs**high point vents is vented, then Condition B will apply to the remaining **injection flow path squib valve outlet line pipe stub**high point vent with noncondensible gas accumulation.

D.1

If the IRWST water volume, boron concentration, or temperature are not within limits, the core cooling capability from injection or PRHR HX heat transfer and the reactivity benefit of injection assumed in safety analyses may not be available. Due to the large volume of the IRWST, online monitoring of volume and temperature, and frequent surveillances, the deviation of these parameters is expected to be minor. The allowable deviation of the water volume is limited to 3%. This limit prevents a significant change in boron concentration and is consistent with the long-term cooling analysis performed to justify **probabilistic risk assessment (**PRA**)** success criteria (Ref. 3), which assumed multiple failures with as many as **three of the four boron injection sources (two CMTs and two Accumulators)**3 CMTs/Accum not injecting. This analysis shows that there is significant margin with respect to the water supplies that support containment recirculation operation. The 8-hour Completion Time is acceptable, considering that the IRWST will be fully capable of performing its assumed safety function in response to DBAs with slight deviations in these parameters.

BASES

ACTIONS (continued)

E.1

If the motor operated IRWST isolation valves are not fully open or valve power is not removed, injection flow from the IRWST may be less than assumed in the safety analysis. In this situation, the valves must be restored to fully open with valve power removed in 1 hour. This Completion Time is acceptable based on risk considerations.

F.1 and F.2

If the IRWST cannot be returned to OPERABLE status within the associated Completion Times **of Condition A, B, C, D, or E,** or the LCO is not met for reasons other than Conditions A, B, C, D, or E, 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 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.5.6.1

The IRWST borated water temperature must be verified every 24 hours to ensure that the temperature is within the limit assumed in the accident analysis. This Frequency is sufficient to identify a temperature change that would approach the limit and has been shown to be acceptable through operating experience.

SR 3.5.6.2

Verification every 24 hours that the IRWST borated water volume is above the required minimum level will ensure that a sufficient initial supply is available for safety injection and floodup volume for recirculation and as the heat sink for PRHR. During shutdown with the refueling cavity flooded with water from the IRWST, this Surveillance requires that the combined volume of borated water in the IRWST and refueling cavity meet the specified limit. Since the IRWST volume is normally stable, and is monitored by redundant main control indication and alarm, a 24 hour Frequency is appropriate.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.6.3

Verification that excessive amounts of noncondensible gases have not caused the water level to drop below the sensor in the four IRWST injection line squib valve lines is required every 24 hours. The 8x8x8 inch tee after the outlet of the IRWST injection line squib valve lines has a vertical section of pipe which serves as a high point collection point for noncondensible gases. The thermal dispersion sensor locations on the vertical pipe sections have been selected to permit additional gas accumulation prior to significantly affecting the injection flow so that adequate time may be provided to permit containment entry for venting the gas.

Control room indication of the water level in this high point collection point is available to verify that noncondensible gases have not collected to the extent that the water level is depressed below the allowable level. The 24 hour Frequency is based on the expected low rate of gas accumulation and the availability of control room indication.

SR 3.5.6.4

Verification every 31 days that the boron concentration of the IRWST is greater than the required limit, ensures that the reactor will remain subcritical following a LOCA. Since the IRWST volume is large and normally stable, the 31 day Frequency is acceptable, considering additional verifications are required within 6 hours after each solution volume increase of ≥ 15,000 gal. In addition, the relatively frequent surveillance of the IRWST water volume provides assurance that the IRWST boron concentration is not changed.

SR 3.5.6.5

This surveillance requires verification that each motor operated isolation valve is fully open. This surveillance may be performed with available remote position indication instrumentation. The 12 hour Frequency is acceptable, considering the redundant remote indication and alarms and that power is removed from the valve operator.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.6.6

Verification is required to confirm that power is removed from each motor operated IRWST isolation valve each 31 days. Removal of power from these valves reduces the likelihood that the valves will be inadvertently closed. The 31 day Frequency is acceptable considering frequent surveillance of valve position and that the valve has a confirmatory open signal.

SR 3.5.6.7

Each motor operated containment recirculation isolation valve must be verified to be fully open. This valve is required to be open to improve containment recirculation reliability. The 31 day Frequency is acceptable considering the valve has a confirmatory open signal. This surveillance may be performed with available remote position indication instrumentation.

SR 3.5.6.8

This Surveillance requires verification that each IRWST injection and each containment recirculation squib valve is OPERABLE in accordance with the Inservice Testing Program. The Surveillance Frequency for verifying valve OPERABILITY references the Inservice Testing Program.

The squib valves will be tested in accordance with the ASME OM Code **(Ref. 4)**. The applicable ASME OM Code squib valve requirements are specified in paragraph **ISTC** 4.6, Inservice Tests for Category D Explosively Actuated Valves. The requirements include actuation of a sample of the installed valves each 2 years and periodic replacement of charges.

SR 3.5.6.9

This SR ensures that each IRWST injection and containment recirculation squib valve actuates to the correct position on an actual or simulated actuation signal. The ACTUATION LOGIC TEST overlaps this Surveillance to provide complete testing of the assumed safety function. The OPERABILITY of the squib valves is checked by performing a continuity check of the circuit from the Protection Logic Cabinets to the squib valve. The Frequency of 24 months is based on the need to perform this surveillance during

BASES

SURVEILLANCE REQUIREMENTS (continued)

periods in which the plant is shutdown for refueling to prevent any upsets of plant operation.

SR 3.5.6.~~9~~**10**

Visual inspection is required each 24 months to verify that the IRWST screens and the containment recirculation screens are not restricted by debris. A Frequency of 24 months is adequate, since there are no known sources of debris with which the gutters could become restricted.

SR 3.5.6.~~10~~**11**

This SR requires performance of a system inspection and performance test of the IRWST injection and recirculation flow paths to verify system flow capabilities. The system inspection and performance test demonstrates that the IRWST injection and recirculation capabilities assumed in accident analyses is maintained. Although the likelihood that system performance would degrade with time is low, it is considered prudent to periodically verify system performance. The System Level Operability Testing Program provides specific test requirements and acceptance criteria.

REFERENCES

1. **FSAR** Section 6.3, "Passive Core Cooling."

2. **FSAR** Section 15.6, "Decrease in Reactor Coolant Inventory."

3. ~~AP1000 PRA~~**FSAR Chapter 19, "Probabilistic Risk Assessment**."

4. **ASME OM Code, "Code for Operation and Maintenance of Nuclear Power Plants."**

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.

3.5 PASSIVE CORE COOLING SYSTEM (PXS)

3.5.6 In-containment Refueling Water Storage Tank (IRWST) – Operating

LCO 3.5.6 The IRWST, with two injection flow paths and two containment recirculation flow paths, shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One IRWST injection line actuation valve flow path inoperable. OR One containment recirculation line actuation valve flow path inoperable.	A.1	Restore the inoperable actuation valve flow path to OPERABLE status.	72 hours
B. One IRWST injection flow path with noncondensible gas volume in one squib valve outlet line pipe stub not within limit.	B.1	Restore noncondensible gas volume in squib valve outlet line pipe stub to within limit.	72 hours
C. One IRWST injection flow path with noncondensible gas volume in both squib valve outlet line pipe stubs not within limit.	C.1	Restore noncondensible gas volume in one squib valve outlet line pipe stub to within limit.	8 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. IRWST boron concentration not within limits. <u>OR</u> IRWST borated water temperature not within limits. <u>OR</u> IRWST borated water volume ≤ 73,100 cu ft and > 70,907 cu ft.	D.1	Restore IRWST to OPERABLE status.	8 hours
E. One motor operated IRWST isolation valve not fully open. <u>OR</u> Power is not removed from one or more motor operated IRWST isolation valves.	E.1	Restore motor operated IRWST isolation valve to fully open condition with power removed from both valves.	1 hour
F. Required Action and associated Completion Time of Condition A, B, C, D, or E not met. <u>OR</u> LCO not met for reasons other than Condition A, B, C, D, or E.	F.1 <u>AND</u> F.2	Be in MODE 3. Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.6.1	Verify the IRWST water temperature is < 120°F.	24 hours
SR 3.5.6.2	Verify the IRWST borated water volume is > 73,100 cu ft.	24 hours
SR 3.5.6.3	Verify the volume of noncondensible gases in each of the four IRWST injection squib valve outlet line pipe stubs has not caused the high-point water level to drop below the sensor.	24 hours
SR 3.5.6.4	Verify the IRWST boron concentration is ≥ 2600 ppm and ≤ 2900 ppm.	31 days <u>AND</u> Once within 6 hours after each solution volume increase of ≥ 15,000 gal
SR 3.5.6.5	Verify each motor operated IRWST isolation valve is fully open.	12 hours
SR 3.5.6.6	Verify power is removed from each motor operated IRWST isolation valve.	31 days
SR 3.5.6.7	Verify each motor operated containment recirculation isolation valve is fully open.	31 days
SR 3.5.6.8	Verify each IRWST injection and containment recirculation squib valve is OPERABLE in accordance with the Inservice Testing Program.	In accordance with the Inservice Testing Program

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.6.9	-------------------------------NOTE------------------------------- Squib actuation may be excluded. --- Verify continuity of the circuit from the Protection Logic Cabinets to each IRWST injection and containment recirculation squib valve on an actual or simulated actuation signal.	24 months
SR 3.5.6.10	Verify by visual inspection that the IRWST screens and the containment recirculation screens are not restricted by debris.	24 months
SR 3.5.6.11	Verify IRWST injection and recirculation system flow performance in accordance with the System Level OPERABILITY Testing Program.	10 years

B 3.5 PASSIVE CORE COOLING SYSTEM (PXS)

B 3.5.6 In-containment Refueling Water Storage Tank (IRWST) – Operating

BASES

BACKGROUND

The IRWST is a large stainless steel lined tank filled with borated water (Ref. 1). It is located below the operating deck in containment. The tank is designed to meet seismic Category 1 requirements. The floor of the IRWST is elevated above the reactor coolant loop so that borated water can drain by gravity into the Reactor Coolant System (RCS). The IRWST is maintained at ambient containment pressure.

The IRWST has two injection flow paths. The injection paths are connected to the reactor vessel through two direct vessel injection lines which are also used by the accumulators and the core makeup tanks. Each path includes an injection flow path and a containment recirculation flow path. Each injection path includes a normally open motor operated isolation valve and two parallel actuation lines each isolated by one check valve and one squib valve in series.

The IRWST has two containment recirculation flow paths. Each containment recirculation path contains two parallel actuation flow paths, one path is isolated by a normally open motor operated valve in series with a squib valve and one path is isolated by a check valve in series with a squib valve.

During refueling operations, the IRWST is used to flood the refueling cavity. During abnormal events, the IRWST serves as a heat sink for the passive residual heat removal heat exchangers, as a heat sink for the depressurization spargers, and as a source of low head (ambient containment pressure) safety injection during loss of coolant accidents (LOCAs) and loss of decay heat removal in MODE 5 (loops not filled). The IRWST can be cooled by the Normal Residual Heat Removal System (RNS) system.

The IRWST size and injection capability is selected to provide adequate core cooling for the limiting Design Basis Accidents (DBAs) (Ref. 2).

APPLICABLE SAFETY ANALYSES

During non-LOCA events, the IRWST serves as the initial heat sink for the Passive Residual Heat Removal (PRHR) Heat Exchanger (PRHR HX) if used during reactor cooldown to MODE 4. If RNS is available, it will be actuated in MODE 4 and used to continue the plant cooldown to MODE 5. If RNS is not available, cooldown can continue on

BASES

APPLICABLE SAFETY ANALYSES (continued)

PRHR. Continued PRHR HX operation will result in the water in the IRWST heating up to saturation conditions and boiling. The steam generated in the IRWST enters the containment through the IRWST vents. Most of the steam generated in the IRWST condenses on the inside of the containment vessel and drains back to the IRWST.

For events which involve a loss of primary coolant inventory, such as a large break LOCA, or other events involving automatic depressurization, the IRWST provides low pressure safety injection (Ref. 2). The IRWST drain down time is dependent on several factors, including break size, location, and the return of steam condensate from the passive containment cooling system. During drain down, when the water in the IRWST reaches the Low 5 level, the containment sump will be sufficiently flooded, to initiate containment sump recirculation. This permits continued cooling of the core by recirculation of the spilled water in the containment sumps via the sump recirculation flow paths. In this situation, core cooling can continue indefinitely.

When the plant is in midloop operation, the pressurizer Automatic Depressurization System (ADS) valves are open, and the RNS is used to cool the RCS. The RNS is not a safety related system, so its failure must be considered. In this situation, with the RCS drained and the pressure boundary open, the PRHR HX cannot be used. In such a case, core cooling is provided by gravity injection from the IRWST, venting the RCS through the ADS. Injection from the IRWST provides core cooling until the tank empties and the containment is flooded up to a level sufficient to provide recirculation flow through the gravity injection lines back into the RCS. With the containment closed, the recirculation can continue indefinitely, with the decay heat generated steam condensing on the containment vessel and draining back into the IRWST.

The IRWST satisfies Criteria 2 and 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The IRWST requirements ensure that an adequate supply of borated water is available to act as a heat sink for PRHR and to supply the required volume of borated water as safety injection for core cooling and reactivity control.

BASES

LCO (continued)

To be considered OPERABLE, the IRWST must meet the water volume, boron concentration, and temperature limits defined in the surveillance requirements. The motor operated injection isolation valves must be open with power removed, and the motor operated sump recirculation isolation valves must be open. OPERABILITY is not expected to be challenged due to small gas accumulations in the high point, and rapid gas accumulations are not expected during plant operation. However, a relatively small gas volume was incorporated into the design for alerting operators to provide sufficient time to initiate venting operations before the gas volume would be expected to increase to a sufficient volume that might potentially challenge the OPERABILITY of passive safety injection flow. Therefore, noncondensible gas accumulation in the injection line high point that causes the water level to drop below the sensor will require operator action to investigate the cause of the gas accumulation and to vent the associated high point(s).

APPLICABILITY

In MODES 1, 2, 3, and 4, a safety related function of the IRWST is to provide a heat sink for PRHR. In MODES 1, 2, 3, and 4, a second safety related function is the low pressure safety injection of borated water following a LOCA for core cooling and reactivity control. Both of these functions must be available to meet the initial assumptions of the safety analyses. These assumptions require the specified boron concentration, the minimum water volume, and the maximum water temperature.

The requirements for the IRWST in MODES 5 and 6 are specified in LCO 3.5.7, In-containment Refueling Water Storage Tank (IRWST) - Shutdown, MODE 5 and LCO 3.5.8, In-containment Refueling Water Storage Tank (IRWST) - Shutdown, MODE 6.

ACTIONS

A.1

If an IRWST injection line actuation valve flow path or a containment recirculation line actuation valve flow path is inoperable, then the valve actuation flow path must be restored to OPERABLE status within 72 hours. In this condition, three other IRWST injection or containment sump recirculation flow paths are available and can provide 100% of the required flow assuming a break in the direct vessel injection line associated with the other injection train, but with no single failure of the actuation valve flow path in the same injection or sump recirculation flow path. The 72 hour Completion Time is consistent with times normally

BASES

ACTIONS (continued)

applied to a degraded two train emergency core cooling system (ECCS), which can provide 100% of the required flow without a single failure.

B.1

Excessive amounts of noncondensible gases in one of the injection flow path squib valve outlet line pipe stubs in one IRWST injection line may interfere with the passive injection of IRWST water into the reactor vessel from the associated parallel flow path in the affected injection line. Analyses have shown that with enough noncondensible gas accumulation, IRWST injection through the affected flow path could be delayed. However, the presence of some noncondensible gases does not mean that the IRWST injection capability is immediately inoperable, but that gases are collecting and should be vented. The venting of these gases requires containment entry to manually operate the vent valves. In this Condition, the parallel flow path in the affected injection line is capable of providing 100% of the required injection flow and the other IRWST injection line remains fully OPERABLE. These IRWST flow paths can provide the credited flow in the event of a direct vessel injection (DVI) line break downstream of the fully OPERABLE injection line, provided a single failure of the remaining parallel isolation valve does not occur. A Completion Time of 72 hours is acceptable for two train ECCS systems, which are capable of performing their safety function without a single failure.

C.1

Excessive amounts of noncondensible gases in both of the injection flow path squib valve outlet line pipe stubs in one IRWST injection line may affect the passive injection of IRWST water into the reactor vessel from the affected injection line. Sufficient gas accumulation could potentially challenge IRWST injection capability. However, the presence of some noncondensible gases does not immediately render the IRWST injection capability inoperable, but that gases are collecting and should be vented.

The level sensor location has been selected to permit additional gas accumulation before injection flow is significantly affected so that adequate time may be provided to permit containment entry for venting the gas. Anticipated noncondensible gas accumulation in this piping segment is expected to be relatively slow.

BASES

ACTIONS (continued)

In this Condition, the remaining OPERABLE IRWST injection line is capable of performing the safety function for all plant events except for one, DVI line break. For this one event, the line with gas accumulation in both injection flow path squib valve outlet line pipe stubs will be capable of performing the safety function with a small amount of voiding that is not expected to significantly challenge the required injection flow.

The venting of these gases requires containment entry to manually operate the vent valves. Considering the relatively slow rate of gas accumulation, venting within 8 hours should normally prevent accumulation of amounts of noncondensible gases that could significantly challenge IRWST injection capability. A Completion Time of 8 hours is permitted for venting noncondensible gases and is acceptable since the injection capability of the other IRWST injection line is sufficient to ensure event mitigation, or in the event of a break in the DVI line connected to the OPERABLE injection line, the injection line with gas accumulation will be capable of providing the required injection flow with some voiding. If only one of the affected injection flow path squib valve outlet line pipe stubs is vented, then Condition B will apply to the remaining injection flow path squib valve outlet line pipe stub with noncondensible gas accumulation.

D.1

If the IRWST water volume, boron concentration, or temperature are not within limits, the core cooling capability from injection or PRHR HX heat transfer and the reactivity benefit of injection assumed in safety analyses may not be available. Due to the large volume of the IRWST, online monitoring of volume and temperature, and frequent surveillances, the deviation of these parameters is expected to be minor. The allowable deviation of the water volume is limited to 3%. This limit prevents a significant change in boron concentration and is consistent with the long-term cooling analysis performed to justify probabilistic risk assessment (PRA) success criteria (Ref. 3), which assumed multiple failures with as many as three of the four boron injection sources (two CMTs and two Accumulators) not injecting. This analysis shows that there is significant margin with respect to the water supplies that support containment recirculation operation. The 8-hour Completion Time is acceptable, considering that the IRWST will be fully capable of performing its assumed safety function in response to DBAs with slight deviations in these parameters.

BASES

ACTIONS (continued)

E.1

If the motor operated IRWST isolation valves are not fully open or valve power is not removed, injection flow from the IRWST may be less than assumed in the safety analysis. In this situation, the valves must be restored to fully open with valve power removed in 1 hour. This Completion Time is acceptable based on risk considerations.

F.1 and F.2

If the IRWST cannot be returned to OPERABLE status within the associated Completion Times of Condition A, B, C, D, or E, or the LCO is not met for reasons other than Conditions A, B, C, D, or E, 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 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.5.6.1

The IRWST borated water temperature must be verified every 24 hours to ensure that the temperature is within the limit assumed in the accident analysis. This Frequency is sufficient to identify a temperature change that would approach the limit and has been shown to be acceptable through operating experience.

SR 3.5.6.2

Verification every 24 hours that the IRWST borated water volume is above the required minimum level will ensure that a sufficient initial supply is available for safety injection and floodup volume for recirculation and as the heat sink for PRHR. During shutdown with the refueling cavity flooded with water from the IRWST, this Surveillance requires that the combined volume of borated water in the IRWST and refueling cavity meet the specified limit. Since the IRWST volume is normally stable, and is monitored by redundant main control indication and alarm, a 24 hour Frequency is appropriate.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.6.3

Verification that excessive amounts of noncondensible gases have not caused the water level to drop below the sensor in the four IRWST injection line squib valve lines is required every 24 hours. The 8x8x8 inch tee after the outlet of the IRWST injection line squib valve lines has a vertical section of pipe which serves as a high point collection point for noncondensible gases. The thermal dispersion sensor locations on the vertical pipe sections have been selected to permit additional gas accumulation prior to significantly affecting the injection flow so that adequate time may be provided to permit containment entry for venting the gas.

Control room indication of the water level in this high point collection point is available to verify that noncondensible gases have not collected to the extent that the water level is depressed below the allowable level. The 24 hour Frequency is based on the expected low rate of gas accumulation and the availability of control room indication.

SR 3.5.6.4

Verification every 31 days that the boron concentration of the IRWST is greater than the required limit, ensures that the reactor will remain subcritical following a LOCA. Since the IRWST volume is large and normally stable, the 31 day Frequency is acceptable, considering additional verifications are required within 6 hours after each solution volume increase of ≥ 15,000 gal. In addition, the relatively frequent surveillance of the IRWST water volume provides assurance that the IRWST boron concentration is not changed.

SR 3.5.6.5

This surveillance requires verification that each motor operated isolation valve is fully open. This surveillance may be performed with available remote position indication instrumentation. The 12 hour Frequency is acceptable, considering the redundant remote indication and alarms and that power is removed from the valve operator.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.6.6

Verification is required to confirm that power is removed from each motor operated IRWST isolation valve each 31 days. Removal of power from these valves reduces the likelihood that the valves will be inadvertently closed. The 31 day Frequency is acceptable considering frequent surveillance of valve position and that the valve has a confirmatory open signal.

SR 3.5.6.7

Each motor operated containment recirculation isolation valve must be verified to be fully open. This valve is required to be open to improve containment recirculation reliability. The 31 day Frequency is acceptable considering the valve has a confirmatory open signal. This surveillance may be performed with available remote position indication instrumentation.

SR 3.5.6.8

This Surveillance requires verification that each IRWST injection and each containment recirculation squib valve is OPERABLE in accordance with the Inservice Testing Program. The Surveillance Frequency for verifying valve OPERABILITY references the Inservice Testing Program.

The squib valves will be tested in accordance with the ASME OM Code (Ref. 4). The applicable ASME OM Code squib valve requirements are specified in paragraph ISTC 4.6, Inservice Tests for Category D Explosively Actuated Valves. The requirements include actuation of a sample of the installed valves each 2 years and periodic replacement of charges.

SR 3.5.6.9

This SR ensures that each IRWST injection and containment recirculation squib valve actuates to the correct position on an actual or simulated actuation signal. The ACTUATION LOGIC TEST overlaps this Surveillance to provide complete testing of the assumed safety function. The OPERABILITY of the squib valves is checked by performing a continuity check of the circuit from the Protection Logic Cabinets to the squib valve. The Frequency of 24 months is based on the need to

BASES

SURVEILLANCE REQUIREMENTS (continued)

perform this surveillance during periods in which the plant is shutdown for refueling to prevent any upsets of plant operation.

SR 3.5.6.10

Visual inspection is required each 24 months to verify that the IRWST screens and the containment recirculation screens are not restricted by debris. A Frequency of 24 months is adequate, since there are no known sources of debris with which the gutters could become restricted.

SR 3.5.6.11

This SR requires performance of a system inspection and performance test of the IRWST injection and recirculation flow paths to verify system flow capabilities. The system inspection and performance test demonstrates that the IRWST injection and recirculation capabilities assumed in accident analyses is maintained. Although the likelihood that system performance would degrade with time is low, it is considered prudent to periodically verify system performance. The System Level Operability Testing Program provides specific test requirements and acceptance criteria.

REFERENCES

1. FSAR Section 6.3, “Passive Core Cooling.”
2. FSAR Section 15.6, “Decrease in Reactor Coolant Inventory.”
3. FSAR Chapter 19, “Probabilistic Risk Assessment.”
4. ASME OM Code, “Code for Operation and Maintenance of Nuclear Power Plants.”