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

Title: Changes Related to LCO 3.3.11, Engineered Safety Feature Actuation System (ESFAS) Startup Feedwater Flow Instrumentation

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-411-A, Rev 1,	Surveillance Test Interval Extensions for Components of the Reactor Protection System (WCAP-15376-P)
TSTF-418-A, Rev 2,	RPS and ESFAS Test Times and Completion Times (WCAP-14333)
TSTF-519-T, Rev 0,	Increase Standardization in Condition and Required Action Notes

STS NUREGs Affected:

TSTF-411-A, Rev 1:	NUREG 1431
TSTF-418-A, Rev 2:	NUREG 1431
TSTF-519-T, Rev 0:	NUREG 1430 and 1431

NRC Approval Date:

TSTF-411-A, Rev 1:	30-Aug-02
TSTF-418-A, Rev 2:	02-Apr-03
TSTF-519-T, Rev 0:	16-Oct-09 (TSTF Review)

TSTF Classification:

TSTF-411-A, Rev 1:	Technical Change
TSTF-418-A, Rev 2:	Technical Change
TSTF-519-T, Rev 0:	NUREG Only Change

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

RCOL Std. Dep. Number and Title:

There are no Vogtle Electric Generating Plant Units 3 and 4 (Vogtle or VEGP) departures applicable to GTS 3.3.2.

RCOL COL Item Number and Title:

There are no Vogtle COL items applicable to GTS 3.3.2.

RCOL PTS Change Number and Title:

The VEGP License Amendment Request (LAR) proposed the following changes to the initial version of the PTS (referred to as the current TS by the VEGP LAR). These changes include Administrative Changes (A), Detail Removed Changes (D), Less Restrictive Changes (L), and More Restrictive Changes (M). These changes are discussed in Sections VI and VII of this GTST.

VEGP LAR DOC A028:	Reformat of GTS 3.3.2 into Nine Parts; 3.3.8 through 3.3.16; note that this maps GTS 3.3.2 requirements into interim A028-modified TS (MTS) Subsection 3.3.11, to which the other changes are applied.
VEGP LAR DOC A025:	SR text phrase change from “the prescribed values” to “within limits.”
VEGP LAR DOC M02:	Provision for Two or More Inoperable Divisions or Channels

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

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(1) applicable to operating reactor designs, but not to the AP1000 design; (2) already incorporated in the GTS; or (3) superseded by another change.

TSTF-411-A, Rev.1 provides justification to (1) increase the required action completion time and the bypass test time allowance for the reactor trip breakers and (2) increase the surveillance test intervals for the reactor trip breakers, master relays, logic cabinets, and analog channels based on analysis provided in WCAP-15376-P, Rev. 0, “Risk-Informed Assessment of the RTS and ESFAS Surveillance Test Intervals and Reactor Trip Breaker Test and Completion Times.” WCAP-15376-P, Rev. 0 did not specifically consider the AP1000 design. The AP1000 GTS completion times and surveillance frequencies for instrumentation functions and reactor trip breakers were justified by APP-GW-GSC-020 (WCAP-16787), which is listed as Reference 6 in the GTS Subsection 3.3.2 Bases. Therefore, TSTF-411-A is not applicable to the AP1000 STS, and is not discussed further in this GTST.

TSTF-418-A adjusts the WOG STS (NUREG-1431) required action completion times for the conventional Westinghouse Plant Protection System instrumentation design for which the WOG STS instrumentation requirements are applicable. The changes in TSTF-418 are based on the analysis in WCAP-14333-P, which did not consider the AP1000 protection and safety monitoring system (PMS) instrumentation design. The AP1000 GTS required action completion times (and surveillance frequencies) for the PMS were justified by APP-GW-GSC-020 (WCAP-16787), which is listed as Reference 6 in the GTS Subsection 3.3.2 Bases. APP-GW-GSC-020 does not reference WCAP-14333-P, but notes, “the AP1000 protection and safety monitoring system (PMS) redundancy is as good as or better than that of the conventional Westinghouse Plant Protection System. Although the PMS equipment reliability is considered to be equivalent to or better than that of the conventional Westinghouse Plant Protection System, a common basis for comparison to the digital portion of the PMS is not readily available.”

TSTF-519-T has already been incorporated into the AP1000 GTS regarding the Writer's Guide for Improved Standard Technical Specifications (Reference 4) placement of Notes in TS Actions tables.

DOC A035 removes the design related detail “coincident with” from the second part of the Function 13.b name. This is documented as part of GTST O61-3.3.8. The remaining portion of the second half of the Function 13.b name, “Low Startup Feedwater Flow” is identified independently in this GTST as MTS 3.3.11.

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)

The reference to Table 3.3.11-1 in the Actions section of the Bases is deleted. There is no Table 3.3.11-1 after the reorganization described by DOC A028.

In the "ASA, LCO, and Applicability" section of the Bases, the last sentence of the third paragraph should be revised for clarity:

> Therefore, startup feedwater flow is not required, and PRHR actuation on low startup feedwater flow **coincident with an SG Narrow Range Water Level – Low signal** is not required.

In the "ASA, LCO, and Applicability" section of the Bases, the Action A.1 discussion should be revised for clarity:

> With one or more startup feedwater lines with one startup feedwater channel inoperable, the inoperable channel must be placed in a trip condition within 6 hours. If one channel is tripped, the **coincidence logic** ~~interlock~~ condition is satisfied **so that PRHR actuation will occur on a SG Narrow Range Water Level – Low signal**. The specified Completion Time is reasonable considering the time required to complete this action.

In the MTS 3.3.11 "Actions" section of the Bases, the phrase "...then all affected Functions provided by that channel must be declared inoperable..." is revised to "...then all affected protection Functions supported by or dependent on that channel must be declared inoperable..."

Editorial changes are made throughout the Bases to provide consistent instrumentation terminology. Additional minor editorial changes are also implemented throughout the Bases to correct grammar, provide consistency between sections, and improve clarity.

Identify all acronyms at the first occurrence in the Bases discussion.

Added appropriate references. Adjusted the listed reference order to reflect the order of their initial appearance.

APOG Recommended Changes to Improve the Bases

In the "Surveillance Requirements" section of the Bases for STS Subsection 3.3.8 under the heading "SR 3.3.8.2," the next to last paragraph, last line uses the phrase "integrated protection cabinets." The Bases for SR 3.3.8.3, first paragraph uses the term "IPC," which is the acronym for integrated protection cabinets. The SR 3.3.8.2 Bases should be changed from "integrated protection cabinets" to "integrated protection cabinets (IPCs)." This change also applies to Section 3.3.10 (SR 3.3.10.2), Section 3.3.11 (SR 3.3.11.2), Section 3.3.13 (SR 3.3.13.2), and Section 3.3.14 (SR 3.3.14.2). Add the acronym "(IPCs)" after the words "integrated protection cabinets" in SR 3.3.8.2 (and other SRs identified above). Use "PMS" everywhere following its initial definition and in Bases for SR 3.3.11.2 and SR 3.3.11.3 the phrase "allowed tolerance" is changed to "allowed as-left tolerance" (APOG Comment and NRC Staff Edit).

The "SRs" section of the Bases under the heading "SR 3.3.11.2," uses the term "ESF." ESF – Engineered Safety Features – has not been previously defined. Change "ESF" to "Engineered Safety Features (ESF)."

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

V. Applicability

Affected Generic Technical Specifications and Bases:

Section 3.3.11, Engineered Safety Feature Actuation System (ESFAS) Startup Feedwater Flow Instrumentation

Changes to the Generic Technical Specifications and Bases:

GTS 3.3.2, "Engineered Safety Feature Actuation System (ESFAS) Instrumentation," is reformatted by DOC A028 into multiple Specifications including interim A028-modified TS (MTS) 3.3.11, "Engineered Safety Feature Actuation System (ESFAS) Startup Feedwater Flow Instrumentation." The reformatting relocates the GTS 3.3.2 Function 13.b coincidence statement regarding startup feedwater flow into MTS 3.3.11 as part of the LCO statement.

Further discussion of the treatment of coincidence among multiple instrument and logic actuation signals in GTS Table 3.3.2-1 is detailed in GTST O61-3.3.8. (DOC A035) A complete function tracking list (GTS to MTS to STS) appears in GTST 3.3.8. In general, such instrumentation actuation logic design details are included in the TS Bases and in the ESFAS Actuation function descriptions in the AP1000 DCD, Rev 19, Section 7.3. The MTS format is depicted in Section XI of this GTST as the reference case in the markup of the GTST instrumentation requirements for startup feedwater flow.

MTS 3.3.11 LCO Title	GTS 3.3.2 Function
Engineered Safety Feature Actuation System (ESFAS) Startup Feedwater Flow Instrumentation	13. Passive Residual Heat Removal Heat Exchanger Actuation b. Steam Generator (SG) Narrow Range Water Level – Low Coincident with Startup Feedwater Flow – Low

References 2, 3, and 6 provide details showing the correspondence of GTS 3.3.2 Functions and STS 3.3.8 through 3.3.16 Functions.

GTS 3.3.2 Conditions H and N are reordered and relabeled as AP1000 MTS 3.3.11 Conditions A and B. (DOC A028)

GTS Table 3.3.2-1 footnote (b), "With the RCS not being cooled by the Normal Residual Heat Removal System (RNS)," applies to operation in MODE 4 for Startup Feedwater Flow – Low. GTS Table 3.3.2-1 footnote (b) is incorporated into the MTS 3.3.11 LCO Applicability statement for MODE 4. (DOC A028)

GTS SR 3.3.2.1, SR 3.3.2.4, SR 3.3.2.5, and SR 3.3.2.6 are retained and renumbered as MTS SR 3.3.11.1, SR 3.3.11.3, SR 3.3.11.2, and SR 3.3.11.4, respectively. (DOC A028)

MTS SR 3.3.11.3 Note is revised from "...adjusted to the prescribed values." to "... adjusted to within limits." This change is made for clarity and consistency. (DOC A025)

MTS 3.3.11 Condition B is revised by adding a second condition statement for the condition "one or more startup feedwater lines with two channels inoperable." Otherwise, LCO 3.0.3 would apply when the LCO is not met and the associated Actions are not met or an associated Action is not provided. (DOC M02)

The following tables are provided as an aid to tracking the various changes to GTS 3.3.2 Conditions, Required Actions, Functions, Applicability Footnotes, and Surveillance Requirements that result in interim A028-modified TS (MTS) 3.3.11 and as further changed, STS 3.3.11.

Changes to Conditions

GTS 3.3.2 Condition	MTS 3.3.11 Condition	STS 3.3.11 Condition	Other STS Subsections Addressing the Listed Condition	Additional DOC Changes
A	→	→	3.3.8, 3.3.9, 3.3.10	---
B	→	→	3.3.8	---
C	→	→	3.3.10	---
D	→	→	3.3.12, 3.3.15	---
E	→	→	3.3.9	---
F	→	→	3.3.13	---
G	→	→	3.3.9, 3.3.13, 3.3.16	---
H	A	A	3.3.14	---
I	→	→	3.3.8	---
J	→	→	3.3.8	---
K	→	→	3.3.13	---
L	→	→	3.3.8	---
M	→	→	3.3.8, 3.3.12	---
N	B	B	3.3.8, 3.3.9	M02
O	→	→	3.3.8, 3.3.9, 3.3.13, 3.3.15	---
P	→	→	3.3.8, 3.3.14	---
Q	→	→	3.3.8, 3.3.9	---
R	→	→	3.3.8, 3.3.9	---
S	→	→	3.3.8, 3.3.9	---
T	→	→	3.3.8	---
U	→	→	3.3.9	---
V	→	→	3.3.8	---
W	→	→	3.3.16	---
X	→	→	3.3.8, 3.3.9	---
Y	→	→	3.3.8, 3.3.9, 3.3.10	---
Z	→	→	3.3.8	---
AA	→	→	3.3.10	---
BB	→	→	3.3.10	---
CC	→	→	3.3.8, 3.3.9	---

Changes to Functions (a complete function list appears in GTST AP1000-O61-3.3.8)

Function [Modes(footnote)]					
GTS 3.3.2	MTS 3.3.11	STS 3.3.11	STS 3.3.11 Conditions	Other STS Subsections and Additional Changes	Additional DOC Changes
13.b [1,2,3,4(b)]	LCO 3.3.11	LCO 3.3.11	A, B	3.3.8	---

Changes to Applicability Footnotes

GTS 3.3.2 Footnote	MTS 3.3.11 Footnote	STS 3.3.11 Footnote	STS 3.3.11 Function	STS Subsections Also Addressing Listed footnote	Additional Changes DOC Number
b	-----LCO Applicability-----		---	3.3.8, 3.3.9	---

Changes to Surveillance Requirements

GTS 3.3.2 SR	MTS 3.3.11 SR	STS 3.3.11 SR	STS Subsections Also Addressing the Listed SR	Example Surveillance No. Surveillance Description
3.3.2.1	3.3.11.1	3.3.11.1	3.3.8, 3.3.10, 3.3.13, 3.3.14	3.3.8.1 CHANNEL CHECK
3.3.2.2	→	→	3.3.15, 3.3.16	3.3.15.1 ACTUATION LOGIC TEST
3.3.2.3	→	→	3.3.9, 3.3.12	3.3.9.1 TRIP ACTUATING DEVICE OPERATIONAL TEST

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GTS 3.3.2 SR	MTS 3.3.11 SR	STS 3.3.11 SR	STS Subsections Also Addressing the Listed SR	Example Surveillance No. Surveillance Description
3.3.2.4	3.3.11.3	3.3.11.3	3.3.8, 3.3.10, 3.3.13, 3.3.14	3.3.8.3 CHANNEL CALIBRATION
3.3.2.5	3.3.11.2	3.3.11.2	3.3.8, 3.3.10, 3.3.13, 3.3.14	3.3.8.2 CHANNEL OPERATIONAL TEST
3.3.2.6	3.3.11.4	3.3.11.4	3.3.8, 3.3.10, 3.3.13, 3.3.14	3.3.8.4 ESF RESPONSE TIME
3.3.2.7	→	→	3.3.8, 3.1.9, 3.5.2, 3.5.4, 3.5.6, 3.6.10, 3.7.7	ACTUATION DEVICE TEST*
3.3.2.8	→	→	3.3.8, 3.4.11, 3.4.13	Squib Valve ACTUATION DEVICE TEST
3.3.2.9	→	→	3.3.15, 3.3.16	Pressurizer Heater ACTUATION DEVICE TEST

* Typically, the associated STS system specification or STS 3.3.15 or 3.3.16, will include a SR for the actuation device, as follows: “Verify [tested required component] actuates to the [required position or state] on an actual or simulated actuation signal.” Such SRs overlap with the Actuation Logic Test for complete testing of the actuation device. (DOC L01)

The discussion in the “Surveillance Requirements” section of the Bases under the headings “SR 3.3.11.2” is revised for clarity and consistency. (APOG Comment and NRC Staff Edit)

The third paragraph in the “ASA, LCO, and Applicability” section of the Bases is revised for clarity.

The Action A.1 discussion in the “ASA, LCO, and Applicability” section of the Bases is revised for clarity.

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

VI. Traveler Information

Description of TSTF changes:

Not Applicable

Rationale for TSTF changes:

Not Applicable

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

The Vogtle Electric Generating Plant Units 3 and 4 (VEGP) technical specifications upgrade (TSU) License Amendment Request (VEGP TSU LAR) (Reference 2) proposed changes to the initial version of the VEGP PTS (referred to as the current TS by the VEGP TSU LAR). As detailed in VEGP TSU LAR Enclosure 1, administrative change number 28 (DOC A028) reformats PTS 3.3.2 into multiple Specifications as follows:

- 3.3.8, “Engineered Safety Feature Actuation System (ESFAS) Instrumentation,”
- 3.3.9, “Engineered Safety Feature Actuation System (ESFAS) Manual Initiation,”
- 3.3.10, “Engineered Safety Feature Actuation System (ESFAS) Reactor Coolant System (RCS) Hot Leg Level Instrumentation,”
- 3.3.11, “Engineered Safety Feature Actuation System (ESFAS) Startup Feedwater Flow Instrumentation,”
- 3.3.12, “Engineered Safety Feature Actuation System (ESFAS) Reactor Trip Initiation,”
- 3.3.13, “Engineered Safety Feature Actuation System (ESFAS) Control Room Air Supply Radiation Instrumentation,”
- 3.3.14, “Engineered Safety Feature Actuation System (ESFAS) Spent Fuel Pool Level Instrumentation,”
- 3.3.15, “Engineered Safety Feature Actuation System (ESFAS) Actuation Logic – Operating,” and
- 3.3.16, “Engineered Safety Feature Actuation System (ESFAS) Actuation Logic – Shutdown.”

Since PTS 3.3.2, “Engineered Safety Feature Actuation System (ESFAS) Instrumentation,” is identical to GTS 3.3.2, it is appropriate for this GTST to consider the proposed changes to PTS 3.3.2 as changes to GTS 3.3.2 for incorporation in AP1000 STS 3.3.11. DOC A028 is extensive, but retains the intention of PTS 3.3.2 while improving operational use of the TS. The numerous Functions, Conditions and extensive bases discussion associated with PTS 3.3.2 are repackaged into nine smaller parts. Therefore, the changes implemented by DOC A028 are presented in the attached Subsection 3.3.11 markup, in Section XI of this GTST, as the “clean” starting point and are identified as interim A028-modified TS (MTS) 3.3.11. The specific details of the reformatting for MTS 3.3.11 can be found in VEGP TSU LAR (Reference 2), in Enclosure 2 (markup) and Enclosure 4 (clean). The NRC staff safety evaluation regarding DOC A028 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.

DOC A025 revises MTS 3.3.11 SR 3.3.11.3 Note to change the phrase “the prescribed values” to “within limits.”

DOC M02 addresses the fact that MTS 3.3.11, “Engineered Safety Feature Actuation System (ESFAS) Startup Feedwater Flow Instrumentation,” does not specify Actions for inoperability of more than one inoperable automatic initiation channel in one or both startup feedwater lines. This results in entry into LCO 3.0.3 when two channels are inoperable in one or both startup feedwater lines.

A more detailed description of the changes by each of the above DOCs can be found in Reference 2, VEGP TSU LAR in Enclosure 1; 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 (Reference 5) by Southern Nuclear Operating Company’s RAI Response in Reference 6.

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

The reformatting per DOC A028, except where addressed in other DOCs, addresses inconsistencies in formatting and approach between PTS 3.3.1 and PTS 3.3.2, respectively. Simplification and clarification are proposed for each Specification. In breaking down each PTS Specification into specific subsets of the Protection and Safety Monitoring System (PMS) function, improved human factored operator usability results.

These improvements also reflect the general approach currently in use in the Improved Standard Technical Specifications (STS) for Babcock and Wilcox Plants, NUREG-1430, Rev. 4. That is to separate the functions for [sensor] instrumentation, Manual Actuation, Trip/Actuation Logic, and Trip Actuation Devices (e.g., Reactor Trip Breakers (RTBs)) into separate Specification subsections. Furthermore, the Actions for some ESFAS Functions generally involve a more complex presentation than needed for other Functions, such that simple common Actions are not reasonable. Such Functions are also provided with separate Specification subsections.

When TS instrument function tables are utilized to reference Actions, the generally preferred format of the Actions for an instrumentation Specification in NUREG-1430 is to provide the initial Actions that would be common to all of the specified functions (typically for bypassing and/or tripping one or two inoperable channels), then the “default” Action would direct consulting the function table for follow-on Actions applicable to the specific affected function. These follow-up Actions generally reflect the actions to exit the Applicability for that function.

This format also allows splitting the default Actions from the initial preferred actions. This general approach is the standard format for other Specifications and for Instrumentation Specifications for other vendors’ Improved STS.

DOC A025 is consistent with similar requirements elsewhere in the AP1000 GTS and STS (NUREG-1431).

DOC M02 directly provides for the default Actions of LCO 3.0.3 without allowing for the additional hour that LCO 3.0.3 permits prior to initiating shutdown. This provides clarity for the operator and is more restrictive than LCO 3.0.3.

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

All acronyms are identified at the first occurrence in the Bases discussion.

The phrase “each Function listed on Table 3.3.11-1” in the second sentence of the first paragraph in the Actions section of the Bases is replaced by “startup feedwater line”.

The last sentence of the third paragraph in the “ASA, LCO, and Applicability” section of the Bases is revised to state:

> Therefore, startup feedwater flow is not required, and PRHR actuation on low startup feedwater flow **coincident with an SG Narrow Range Water Level – Low signal** is not required.

The Action A.1 discussion in the “ASA, LCO, and Applicability” section of the Bases is revised to state:

> With one or more startup feedwater lines with one startup feedwater channel inoperable, the inoperable channel must be placed in a trip condition within 6 hours. If one channel is tripped, the **coincidence logic** ~~interlock~~ condition is satisfied **so that PRHR actuation will occur on a SG Narrow Range Water Level – Low signal**. The specified Completion Time is reasonable considering the time required to complete this action.

In the second paragraph of the MTS 3.3.11 “Actions” section of the Bases, the phrase “...then all affected Functions provided by that channel must be declared inoperable...” is revised to “...then all affected protection Functions supported by or dependent on that channel must be declared inoperable...”

A reference to the PRHR Heat Exchanger Actuation ESFAS protective function description in the Bases for LCO 3.3.8 is added for clarity.

In the “Surveillance Requirements” section of the Bases for STS Subsection 3.3.11 under the heading “SR 3.3.11.2,” the next to last paragraph, last line is revised from “integrated protection cabinets” to “integrated protection cabinets (IPCs).” In addition, “PMS” is used everywhere following its initial definition and in Bases for SR 3.3.11.2 and SR 3.3.11.3 the phrase “allowed tolerance” is changed to “allowed as-left tolerance” (APOG Comment and NRC Staff Edit).

The acronym “ESF” in the “SRs” section of the Bases under the heading “SR 3.3.11.2,” is revised to “Engineered Safety Features (ESF).” (APOG Comment)

Adjusted the reference order to reflect the order of their first appearance.

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

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

There is no Table 3.3.11-1 after the reorganization described by DOC A028. The phrase "startup feedwater line" matches the respective Action Note.

The last sentence of the third paragraph in the "ASA, LCO, and Applicability" section of the Bases is revised for clarity.

The Action A.1 discussion in the "ASA, LCO, and Applicability" section of the Bases is revised for clarity. The startup feedwater flow - low is not a defined interlock, therefore, "coincidence logic" provides better clarification of the interaction.

The change in the second paragraph of the Bases "Actions" section was requested by the NRC staff in an RAI (Reference 5) concerning the VEGP LAR 12-002. Southern Nuclear Operating Company declined to make this change in its plant-specific TS Bases for VEGP, as documented in its RAI response (Reference 6), because it had not proposed to revise this paragraph as part of its VEGP LAR; and because the paragraph is unchanged from the GTS Bases paragraph adopted as part of the COL plant-specific TS Bases. However, the NRC staff is proposing this GTS Bases change to clarify the AP1000 STS Bases.

The non-technical changes to the "Surveillance Requirements" section of the Bases under the headings "SR 3.3.11.2" and "SR 3.3.11.3" provide clarity and consistency.

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

VII. GTST Safety Evaluation

Technical Analysis:

AP1000 GTS LCO 3.0.3 is only applicable in MODES 1, 2, 3, and 4, and states:

> When an LCO is not met and the associated ACTIONS are not met, an associated ACTION is not provided, or if directed by the associated ACTIONS, the unit shall be placed in a MODE or other specified condition in which the LCO is not applicable. Action shall be initiated within 1 hour to place the unit, as applicable,
>
> a. MODE 3 within 7 hours; and
> b. MODE 4 within 13 hours; and
> c. MODE 5 within 37 hours.

GTS 3.3.1 and 3.3.2 Functions with applicability statements that include MODE 1, 2, 3, or 4, generally have no Actions specified for addressing a loss of function condition, such as when all required channels are inoperable. Upon discovery of such a condition, LCO 3.0.3 would apply. The intent of LCO 3.0.3 (as stated in the TS Bases) is to "impose time limits for placing the unit in a safe MODE or other specified condition when operation cannot be maintained within the limits for safe operation as defined by the LCO and its ACTIONS."

The Actions for inoperable RTS and ESFAS instrumentation provide restoration time and/or compensatory action allowances (e.g., place the inoperable channel in trip); but only for inoperability of some of the channels (e.g., 1 or 2 out of 4 required channels, typically). If these restoration and/or compensatory actions cannot be met in the required time, "default" actions are provided, which are designed to place the unit in a safe MODE or other specified condition – typically, actions that result in exiting the Applicability for that Function.

The shutdown actions of LCO 3.0.3 are typical of "default" actions throughout the TS that direct plant shutdown to exit the Applicability, with the exception that LCO 3.0.3 includes an additional 1 hour before the shutdown is required to be initiated.

The revisions described in DOC M02 address multiple-channel inoperability. The revisions will immediately impose the "default" Actions for that Function – without allowance for the 1 hour delay that is provided in LCO 3.0.3. Furthermore, the Function-specific "default" actions (currently, or proposed to be, specified for some Functions) impose requirements intended to establish safe operation that are not necessarily required by LCO 3.0.3. Since each Function-specific default action is specifically considering that Function's safety-basis, such default actions necessarily result in more appropriate actions than the general default actions of LCO 3.0.3. Specifically, the Actions for each new Condition associated with DOC M02 for RTS and ESFAS Functions applicable in MODES1, 2, 3, or 4, are compared to LCO 3.0.3, and in each case, the new Actions are equivalent to or more restrictive than the actions of LCO 3.0.3.

STS 3.3.11, Condition B requires Mode 3 in 6 hours, which is more restrictive than the time allowed by LCO 3.0.3, and Mode 4 "with the Reactor Coolant System (RCS) cooling provided by the Normal Residual Heat Removal System (RNS)" in 24 hours. The specific RNS alignment and RCS heat removal requirement is not a requirement found in LCO 3.0.3.

GTS 3.3.1 and 3.3.2 actions do not specify conditions that explicitly address multiple inoperable channels (that is, more than two inoperable channels or divisions, in most cases), and therefore default to LCO 3.0.3. In each instance, the proposed actions to address these conditions are

more restrictive than the LCO 3.0.3 actions because completion times for reaching lower operational modes are shorter by 1 hour. In addition, Function-specific actions, where specified, are more appropriate for the affected Function than the unit-shutdown actions of LCO 3.0.3 alone. Therefore, the changes specified by DOC M02 do not introduce any adverse impact on public health and safety.

The remaining changes, including changes made by DOC A028, 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 3.3.11 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

Randy Belles
Oak Ridge National Laboratory
865-574-0388
bellesrj@ornl.gov

Review Information:

Availability for public review and comment on Revision 0 of this traveler approved by NRC staff on 5/29/2014.

APOG Comments (Ref. 7) and Resolutions:

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

2. (Internal # 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. Noted ambiguities are corrected in the GTST body.

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

4. (Internal # 116 and 165) In GTST for Subsection 3.3.8, Section VI, under the heading “Rationale for changes in RCOL Std. Dep., RCOL COL Item(s), and RCOL PTS Changes,” the first paragraph mentions DOC A024. This DOC is for changes to RTS Instrumentation and does not affect Subsection 3.3.8. Note that it is not mentioned anywhere else in this Subsection. This is also stated in Subsections 3.3.9 through 3.3.16. Change “DOCs A024 and A028” to “DOC A028” in GTST 3.3.8 through GTST 3.3.16. This is resolved by making the recommended change. Note that comment # 116 is actually directed at removing DOC A028 in Subsections 3.3.1 through 3.3.7, but the opposite is true for DOC A024 in Subsections 3.3.8 through 3.3.16 as stated above.

5. (Internal # 178) In the “Surveillance Requirements” section of the Bases for STS Subsection 3.3.8 under the heading “SR 3.3.8.2,” the next to last paragraph, last line uses the phrase “integrated protection cabinets.” The Bases for SR 3.3.8.3, first paragraph uses the term “IPC,” which is the acronym for integrated protection cabinets. The SR 3.3.8.2 Bases should be changed from “integrated protection cabinets” to “integrated protection

cabinets (IPCs)." This change also applies to Section 3.3.10 (SR 3.3.10.2), Section 3.3.11 (SR 3.3.11.2), Section 3.3.13 (SR 3.3.13.2), and Section 3.3.14 (SR 3.3.14.2). Add the acronym "(IPCs)" after the words "integrated protection cabinets" in SR 3.3.8.2 (and other SRs identified above). This is resolved by making the recommended change with additional edits for added clarity. Use "PMS" everywhere following its initial definition and in the Bases for SR 3.3.11.2 and SR 3.3.11.3 the phrase "allowed tolerance" is changed to "allowed as-left tolerance."

6. (Internal # 189) In GTST for Subsection 3.3.11, Section V, under the heading "Changes to the Generic Technical Specifications and Bases," the paragraph regarding MTS 3.3.11 Condition B states that Condition B is revised by adding a second condition that states "one or more Functions with more than two channels inoperable." The Condition actually reads "one or more startup feedwater lines with two channels inoperable." Change the sentence to read "one or more startup feedwater lines with two channels inoperable" This is resolved by making the recommended change.

7. (Internal # 190) In GTST for Subsection 3.3.11, Section VI, under the heading "Description of changes in RCOL Std. Dep., RCOL COL Item(s), and RCOL PTS Changes," the fourth paragraph states that MTS 3.3.11 "...does not specify Actions for inoperability of more than two inoperable automatic initiation channels. This results in entry into LCO 3.0.3 when three or more channels are inoperable." MTS 3.3.11 actually requires only two channels. The MTS did not have an Action for more than one channel. The description does not reflect the specific details of MTS 3.3.11. Revise the discussion to reflect the actual requirement:

   > DOC M02 addresses the fact that MTS 3.3.11, "Engineered Safety Feature Actuation System (ESFAS) Startup Feedwater Flow Instrumentation," does not specify Actions for inoperability of more than ~~two~~ **one** inoperable automatic initiation channel~~s~~ **in one or both startup feedwater lines**. This results in entry into LCO 3.0.3 when ~~three or more~~ **two** channels are inoperable **in one or both startup feedwater lines**.

   This is resolved by making the recommended change, including additional edits for added clarity.

8. (Internal # 191) The "SRs" section of the Bases under the heading "SR 3.3.11.2," uses the term "ESF." ESF – Engineered Safety Features – has not been previously defined. Change "ESF" to "Engineered Safety Features (ESF)." This is resolved by making the recommended change.

NRC Final Approval Date: 12/14/2015

NRC Contact:

C. Craig Harbuck
United States Nuclear Regulatory Commission
301-415-3140
Craig.Harbuck@nrc.gov

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

None

X. References Used in GTST

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

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

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

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

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

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

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

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

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

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

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

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

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

3.3 INSTRUMENTATION

3.3.11 Engineered Safety Feature Actuation System (ESFAS) Startup Feedwater Flow Instrumentation

LCO 3.3.11 Two channels of ESFAS Startup Feedwater Flow instrumentation for each startup feedwater line shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3,
MODE 4 with the Reactor Coolant System (RCS) not being cooled by the Normal Residual Heat Removal System (RNS).

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each startup feedwater line.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more startup feedwater lines with one channel inoperable.	A.1 Place channel in trip.	6 hours
B. Required Action and associated Completion Time of Condition A not met. **OR** **One or more startup feedwater lines with two channels inoperable.**	B.1 Be in MODE 3. AND B.2 Be in MODE 4 with the RCS cooling provided by the RNS.	6 hours 24 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.11.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.11.2	Perform CHANNEL OPERATIONAL TEST (COT) in accordance with Setpoint Program.	92 days
SR 3.3.11.3	----------NOTE---------- This surveillance shall include verification that the time constants are adjusted to **within limits** ~~the prescribed values~~. ---------- Perform CHANNEL CALIBRATION in accordance with Setpoint Program.	 24 months
SR 3.3.11.4	Verify ESF RESPONSE TIME is within limit.	24 months on a STAGGERED TEST BASIS

B 3.3 INSTRUMENTATION

B 3.3.11 Engineered Safety Feature Actuation System (ESFAS) Startup Feedwater Flow Instrumentation

BASES

BACKGROUND

A description of the ESFAS Instrumentation is provided in the Bases for LCO 3.3.8, “Engineered Safety Feature Actuation System (ESFAS) Instrumentation.”

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The required channels of ESFAS instrumentation provide plant protection in the event of any of the analyzed accidents **(Ref. 1)**. ESFAS protective functions include **Passive Residual Heat Removal (**PRHR**)** Heat Exchanger **(HX)** Actuation. **A description of the PRHR HX Actuation ESFAS protective function is provided in the Bases for LCO 3.3.8.**

PRHR is actuated when the Steam Generator **(SG)** Narrow Range **Water** Level reaches its **Low** ~~low~~ setpoint **(LCO 3.3.8, Function 20)** coincident with an indication of low Startup Feedwater Flow.

Startup Feedwater Flow – Low uses a one-out-of-two logic on each of the two startup feedwater lines. This Function is required to be OPERABLE in MODES 1, 2, and 3 and in MODE 4 when the **Reactor** ~~reactor~~ Coolant System (RCS) is not being cooled by the Normal Residual Heat Removal System (RNS). This ensures that PRHR can be actuated in the event of a loss of the normal heat removal systems. In MODE 4 when the RCS is being cooled by the RNS, and in MODES 5 and 6, the steam generators (SGs) are not required to provide the normal RCS heat sink. Therefore, startup feedwater flow is not required, and PRHR actuation on low startup feedwater flow **coincident with an SG Narrow Range Water Level – Low signal** is not required.

ESFAS ~~instrumentation~~ Startup Feedwater Flow **instrumentation** satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

ACTIONS

A Note has been added in the ACTIONS to clarify the application of Completion Time rules. The Conditions of this specification may be entered independently for each **startup feedwater line** ~~Function listed on Table 3.3.11-1~~. The Completion Time(s) of the inoperable equipment of a Function will be tracked separately for each Function starting from the time the Condition was entered for that Function. Because the

BASES

ACTIONS (continued)

required channels are specified on a per startup feedwater line basis, separate Condition entry is allowed for each startup feedwater line.

In the event a channel's as-found condition is outside the as-found tolerance described in the Setpoint Program **(SP)**, or the channel is not functioning as required, or the transmitter, or the Protection and Safety Monitoring System **(PMS)** Division, associated with a specific Function is found inoperable, then all affected **protection** Functions ~~provided~~ **supported** by **or dependent on** that channel must be declared inoperable and the LCO Condition(s) entered for the particular protection Function(s) affected.

A.1

With one or more startup feedwater lines with one startup feedwater channel inoperable, the inoperable channel must be placed in a trip condition within 6 hours. If one channel is tripped, the **coincidence logic** ~~interlock~~ condition is satisfied **so that PRHR actuation will occur on a SG Narrow Range Water Level – Low signal**. The specified Completion Time is reasonable considering the time required to complete this action.

B.1 and B.2

If the Required Action and associated Completion Time of Condition A **are** ~~is~~ not met **or if one or more startup feedwater lines has two channels inoperable**, the plant must be placed in a MODE in which the LCO does not apply. This is accomplished by placing the plant in MODE 3 within 6 hours and in MODE 4 with the RCS being cooled by the RNS within 24 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 without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.3.11.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the two

SURVEILLANCE REQUIREMENTS (continued)

instrument channels could be an indication of excessive instrument drift in one of the channels or even something more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined by the plant staff~~,~~ based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the match criteria, it may be an indication that the sensor or the signal processing equipment has drifted outside their corresponding limits.

The Surveillance Frequency is based on operating experience that demonstrates that channel failure is rare. Automated operator aids may be used to facilitate performance of the CHANNEL CHECK.

SR 3.3.11.2

SR 3.3.11.2 is the performance of a CHANNEL OPERATIONAL TEST (COT) every 92 days. The test is performed in accordance with the SP. If the actual setting of the channel is found to be outside the as-found tolerance, the channel is considered inoperable. This condition of the channel will be further evaluated during performance of the SR. This evaluation will consist of resetting the channel setpoint to the NTS (within the allowed **as-left** tolerance), and evaluating the channel's response. If the channel is functioning as required and is expected to pass the next surveillance, then the channel is OPERABLE and can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel as-found condition will be entered into the Corrective Action Program for further evaluation.

A COT is performed on each required channel to provide reasonable assurance that the entire channel will perform the intended **Engineered Safety Features (**ESF**)** Function.

A test subsystem is provided with the **PMS** ~~protection and safety monitoring system~~ to aid the plant staff in performing the COT. The test subsystem is designed to allow for complete functional testing by using a combination of system self-checking features, functional testing features, and other testing features. Successful functional testing consists of verifying that the capability of the system to perform the safety function has not failed or degraded.

BASES

SURVEILLANCE REQUIREMENTS (continued)

For hardware functions this would involve verifying that the hardware components and connections have not failed or degraded. Generally this verification includes a comparison of the outputs from two or more redundant subsystems or channels.

Since software does not degrade, software functional testing involves verifying that the software code has not changed and that the software code is executing.

To the extent possible, **PMS** ~~protection and safety monitoring system~~ functional testing is accomplished with continuous system self-checking features and the continuous functional testing features. The COT shall include a review of the operation of the test subsystem to verify the completeness and adequacy of the results.

If the COT cannot be completed using the built-in test subsystem, either because of failures in the test subsystem or failures in redundant channel hardware used for functional testing, the COT can be performed using portable test equipment.

The 92 day Frequency is based on Reference 2 and the use of continuous diagnostic test features, such as deadman timers, cross-check of redundant channels, memory checks, numeric coprocessor checks, and tests of timers, counters and crystal time bases, which will report a failure within the integrated protection cabinets **(IPCs)** to the operator.

During the COT, the **PMS** ~~protection and safety monitoring system~~ cabinets in the division under test may be placed in bypass.

SR 3.3.11.3

SR 3.3.11.3 is the performance of a CHANNEL CALIBRATION every 24 months or approximately at every refueling. CHANNEL CALIBRATION is a complete check of the instrument loop, including the sensor and the IPC. The test is performed in accordance with the SP. If the actual setting of the channel is found to be outside the as-found tolerance, the channel is considered inoperable. This condition of the channel will be further evaluated during performance of the SR. This evaluation will consist of resetting the channel setpoint to the NTS (within the allowed **as-left** tolerance), and evaluating the channel's response. If the channel is functioning as required and is expected to pass the next

SURVEILLANCE REQUIREMENTS (continued)

surveillance, then the channel is OPERABLE and can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel as-found condition will be entered into the Corrective Action Program for further evaluation. Transmitter calibration must be performed consistent with the assumptions of the setpoint methodology. The difference between the current as-found values and the previous as-left values must be consistent with the transmitter drift allowance used in the setpoint methodology.

The setpoint methodology requires that 30 months drift be used (1.25 times the surveillance calibration interval, 24 months).

The Frequency is based on operating experience and consistency with the refueling cycle.

This Surveillance Requirement is modified by a Note. The Note states that this test should include verification that the time constants are adjusted to within limits.

SR 3.3.11.4

This SR ensures the individual channel ESF RESPONSE TIME is less than or equal to the maximum value assumed in the accident analysis. Individual component response times are not modeled in the analyses. The analyses model the overall or total elapsed time, from the point at which the parameter exceeds the NTS value at the sensor, to the point at which the equipment reaches the required functional state (e.g., valves in full open or closed position).

For channels that include dynamic transfer functions (e.g., lag, lead/lag, rate/lag, etc.), the response time test may be performed with the transfer functions set to one with the resulting measured response time compared to the appropriate **FSAR** Chapter 7 (Ref. 3~~2~~) response time. Alternately, the response time test can be performed with the time constants set to their nominal value provided the required response time is analytically calculated assuming the time constants are set at their nominal values. The response time may be measured by a series of overlapping tests such that the entire response time is measured.

BASES

SURVEILLANCE REQUIREMENTS (continued)

Response time may be verified by actual response time tests in any series of sequential, overlapping or total channel measurements, or by the summation of allocated sensor, signal processing and actuation logic response times with actual response time tests on the remainder of the channel. Allocations for sensor response times may be obtained from: (1) historical records based on acceptable response time tests (hydraulic, noise, or power interrupt tests), (2) in place, onsite, or offsite (e.g., vendor) test measurements, or (3) utilizing vendor engineering specifications. WCAP-13632-P-A, Revision 2, "Elimination of Pressure Sensor Response Time Testing Requirements" (Ref. 4), provides the basis and methodology for using allocated sensor response times in the overall verification of the channel response time for specific sensors identified in the WCAP. Response time verification for other sensor types must be demonstrated by test.

ESF RESPONSE TIME tests are conducted on a 24 month STAGGERED TEST BASIS. Testing of the devices, which make up the bulk of the response time, is included in the testing of each channel. The final actuation device in one train is tested with each channel. Therefore, staggered testing results in response time verification of these devices every 24 months. The 24 month Frequency is consistent with the typical refueling cycle and is based on unit operating experience, which shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent occurrences.

REFERENCES

1. **FSAR** Chapter 15.0, "Accident **Analyses** ~~Analysis~~."

2. **APP-GW-GSC-020, "Technical Specification Completion Time and Surveillance Frequency Justification."** ~~Chapter 7.0, "Instrumentation and Controls."~~

3. **FSAR Chapter 7.0, "Instrumentation and Controls."** ~~APP-GW-GSC-020, "Technical Specification Completion Time and Surveillance Frequency Justification."~~

4. WCAP-13632-P-A (Proprietary) and WCAP-13787-A (Non Proprietary), Revision 2, "Elimination of Pressure Sensor Response Time Testing Requirements," January 1996.

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.

3.3 INSTRUMENTATION

3.3.11 Engineered Safety Feature Actuation System (ESFAS) Startup Feedwater Flow Instrumentation

LCO 3.3.11 Two channels of ESFAS Startup Feedwater Flow instrumentation for each startup feedwater line shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3,
MODE 4 with the Reactor Coolant System (RCS) not being cooled by the Normal Residual Heat Removal System (RNS).

ACTIONS

----------NOTE----------
Separate Condition entry is allowed for each startup feedwater line.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more startup feedwater lines with one channel inoperable.	A.1 Place channel in trip.	6 hours
B. Required Action and associated Completion Time of Condition A not met. OR One or more startup feedwater lines with two channels inoperable.	B.1 Be in MODE 3. AND B.2 Be in MODE 4 with the RCS cooling provided by the RNS.	6 hours 24 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.11.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.11.2	Perform CHANNEL OPERATIONAL TEST (COT) in accordance with Setpoint Program.	92 days
SR 3.3.11.3	----------NOTE---------- This surveillance shall include verification that the time constants are adjusted to within limits. ---------- Perform CHANNEL CALIBRATION in accordance with Setpoint Program.	 24 months
SR 3.3.11.4	Verify ESF RESPONSE TIME is within limit.	24 months on a STAGGERED TEST BASIS

B 3.3 INSTRUMENTATION

B 3.3.11 Engineered Safety Feature Actuation System (ESFAS) Startup Feedwater Flow Instrumentation

BASES

BACKGROUND

A description of the ESFAS Instrumentation is provided in the Bases for LCO 3.3.8, “Engineered Safety Feature Actuation System (ESFAS) Instrumentation.”

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The required channels of ESFAS instrumentation provide plant protection in the event of any of the analyzed accidents (Ref. 1). ESFAS protective functions include Passive Residual Heat Removal (PRHR) Heat Exchanger (HX) Actuation. A description of the PRHR HX Actuation ESFAS protective function is provided in the Bases for LCO 3.3.8.

PRHR is actuated when the Steam Generator Narrow Range Water Level reaches its Low setpoint (LCO 3.3.8, Function 20) coincident with an indication of low Startup Feedwater Flow.

Startup Feedwater Flow – Low uses a one-out-of-two logic on each of the two startup feedwater lines. This Function is required to be OPERABLE in MODES 1, 2, and 3 and in MODE 4 when the Reactor Coolant System (RCS) is not being cooled by the Normal Residual Heat Removal System (RNS). This ensures that PRHR can be actuated in the event of a loss of the normal heat removal systems. In MODE 4 when the RCS is being cooled by the RNS, and in MODES 5 and 6, the steam generators (SGs) are not required to provide the normal RCS heat sink. Therefore, startup feedwater flow is not required, and PRHR actuation on low startup feedwater flow coincident with an SG Narrow Range Water Level – Low signal is not required.

ESFAS Startup Feedwater Flow instrumentation satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

ACTIONS

A Note has been added in the ACTIONS to clarify the application of Completion Time rules. The Conditions of this specification may be entered independently for each startup feedwater line. The Completion Time(s) of the inoperable equipment of a Function will be tracked separately for each Function starting from the time the Condition was entered for that Function. Because the required channels are specified

BASES

ACTIONS (continued)

on a per startup feedwater line basis, separate Condition entry is allowed for each startup feedwater line.

In the event a channel's as-found condition is outside the as-found tolerance described in the Setpoint Program (SP), or the channel is not functioning as required, or the transmitter, or the Protection and Safety Monitoring System (PMS) Division, associated with a specific Function is found inoperable, then all affected protection Functions supported by or dependent on that channel must be declared inoperable and the LCO Condition(s) entered for the particular protection Function(s) affected.

A.1

With one or more startup feedwater lines with one startup feedwater channel inoperable, the inoperable channel must be placed in a trip condition within 6 hours. If one channel is tripped, the coincidence logic condition is satisfied so that PRHR actuation will occur on a SG Narrow Range Water Level – Low signal. The specified Completion Time is reasonable considering the time required to complete this action.

B.1 and B.2

If the Required Action and associated Completion Time of Condition A are not met or if one or more startup feedwater lines has two channels inoperable, the plant must be placed in a MODE in which the LCO does not apply. This is accomplished by placing the plant in MODE 3 within 6 hours and in MODE 4 with the RCS being cooled by the RNS within 24 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 without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.3.11.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the two instrument channels could be an indication of excessive instrument drift in one of the channels or even something more serious. A CHANNEL

BASES

SURVEILLANCE REQUIREMENTS (continued)

CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined by the plant staff based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the match criteria, it may be an indication that the sensor or the signal processing equipment has drifted outside their corresponding limits.

The Surveillance Frequency is based on operating experience that demonstrates that channel failure is rare. Automated operator aids may be used to facilitate performance of the CHANNEL CHECK.

SR 3.3.11.2

SR 3.3.11.2 is the performance of a CHANNEL OPERATIONAL TEST (COT) every 92 days. The test is performed in accordance with the SP. If the actual setting of the channel is found to be outside the as-found tolerance, the channel is considered inoperable. This condition of the channel will be further evaluated during performance of the SR. This evaluation will consist of resetting the channel setpoint to the NTS (within the allowed as-left tolerance), and evaluating the channel's response. If the channel is functioning as required and is expected to pass the next surveillance, then the channel is OPERABLE and can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel as-found condition will be entered into the Corrective Action Program for further evaluation.

A COT is performed on each required channel to provide reasonable assurance that the entire channel will perform the intended Engineered Safety Features (ESF) Function.

A test subsystem is provided with the PMS to aid the plant staff in performing the COT. The test subsystem is designed to allow for complete functional testing by using a combination of system self-checking features, functional testing features, and other testing features. Successful functional testing consists of verifying that the capability of the system to perform the safety function has not failed or degraded.

BASES

SURVEILLANCE REQUIREMENTS (continued)

For hardware functions this would involve verifying that the hardware components and connections have not failed or degraded. Generally this verification includes a comparison of the outputs from two or more redundant subsystems or channels.

Since software does not degrade, software functional testing involves verifying that the software code has not changed and that the software code is executing.

To the extent possible, PMS functional testing is accomplished with continuous system self-checking features and the continuous functional testing features. The COT shall include a review of the operation of the test subsystem to verify the completeness and adequacy of the results.

If the COT cannot be completed using the built-in test subsystem, either because of failures in the test subsystem or failures in redundant channel hardware used for functional testing, the COT can be performed using portable test equipment.

The 92 day Frequency is based on Reference 2 and the use of continuous diagnostic test features, such as deadman timers, cross-check of redundant channels, memory checks, numeric coprocessor checks, and tests of timers, counters and crystal time bases, which will report a failure within the integrated protection cabinets (IPCs) to the operator.

During the COT, the PMS cabinets in the division under test may be placed in bypass.

SR 3.3.11.3

SR 3.3.11.3 is the performance of a CHANNEL CALIBRATION every 24 months or approximately at every refueling. CHANNEL CALIBRATION is a complete check of the instrument loop, including the sensor and the IPC. The test is performed in accordance with the SP. If the actual setting of the channel is found to be outside the as-found tolerance, the channel is considered inoperable. This condition of the channel will be further evaluated during performance of the SR. This evaluation will consist of resetting the channel setpoint to the NTS (within the allowed as-left tolerance), and evaluating the channel's response. If the channel is functioning as required and is expected to pass the next surveillance, then the channel is OPERABLE and can be restored to

SURVEILLANCE REQUIREMENTS (continued)

service at the completion of the surveillance. After the surveillance is completed, the channel as-found condition will be entered into the Corrective Action Program for further evaluation. Transmitter calibration must be performed consistent with the assumptions of the setpoint methodology. The difference between the current as-found values and the previous as-left values must be consistent with the transmitter drift allowance used in the setpoint methodology.

The setpoint methodology requires that 30 months drift be used (1.25 times the surveillance calibration interval, 24 months).

The Frequency is based on operating experience and consistency with the refueling cycle.

This Surveillance Requirement is modified by a Note. The Note states that this test should include verification that the time constants are adjusted to within limits.

SR 3.3.11.4

This SR ensures the individual channel ESF RESPONSE TIME is less than or equal to the maximum value assumed in the accident analysis. Individual component response times are not modeled in the analyses. The analyses model the overall or total elapsed time, from the point at which the parameter exceeds the NTS value at the sensor, to the point at which the equipment reaches the required functional state (e.g., valves in full open or closed position).

For channels that include dynamic transfer functions (e.g., lag, lead/lag, rate/lag, etc.), the response time test may be performed with the transfer functions set to one with the resulting measured response time compared to the appropriate FSAR Chapter 7 (Ref. 3) response time. Alternately, the response time test can be performed with the time constants set to their nominal value provided the required response time is analytically calculated assuming the time constants are set at their nominal values. The response time may be measured by a series of overlapping tests such that the entire response time is measured.

Response time may be verified by actual response time tests in any series of sequential, overlapping or total channel measurements, or by the summation of allocated sensor, signal processing and actuation logic response times with actual response time tests on the remainder of the

BASES

SURVEILLANCE REQUIREMENTS (continued)

channel. Allocations for sensor response times may be obtained from: (1) historical records based on acceptable response time tests (hydraulic, noise, or power interrupt tests), (2) in place, onsite, or offsite (e.g., vendor) test measurements, or (3) utilizing vendor engineering specifications. WCAP-13632-P-A, Revision 2, “Elimination of Pressure Sensor Response Time Testing Requirements” (Ref. 4), provides the basis and methodology for using allocated sensor response times in the overall verification of the channel response time for specific sensors identified in the WCAP. Response time verification for other sensor types must be demonstrated by test.

ESF RESPONSE TIME tests are conducted on a 24 month STAGGERED TEST BASIS. Testing of the devices, which make up the bulk of the response time, is included in the testing of each channel. The final actuation device in one train is tested with each channel. Therefore, staggered testing results in response time verification of these devices every 24 months. The 24 month Frequency is consistent with the typical refueling cycle and is based on unit operating experience, which shows that random failures of instrumentation components causing serious response time degradation, but not channel failure, are infrequent occurrences.

REFERENCES

1. FSAR Chapter 15.0, “Accident Analyses.”

2. APP-GW-GSC-020, “Technical Specification Completion Time and Surveillance Frequency Justification.”

3. FSAR Chapter 7.0, “Instrumentation and Controls.”

4. WCAP-13632-P-A (Proprietary) and WCAP-13787-A (Non Proprietary), Revision 2, “Elimination of Pressure Sensor Response Time Testing Requirements,” January 1996.