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

Title: Changes Related to LCO 3.3.3, Reactor Trip System (RTS) Intermediate Range 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-425-A, Rev 3,	Relocate Surveillance Frequencies to Licensee Control – RITSTF Initiative 5b
TSTF-469-T, Rev 0,	Correct Action to Suspend Positive Reactivity Additions
TSTF-519-T, Rev 0,	Increase Standardization in Condition and Required Action Notes

STS NUREGs Affected:

TSTF-425-A, Rev 3:	NUREGs 1430, 1431, 1432, 1433, and 1434
TSTF-469-T, Rev 0:	NUREG 1431 and 1432
TSTF-519-T, Rev 0:	NUREG 1430 and 1431

NRC Approval Date:

TSTF-425-A, Rev. 3:	06-Jul-09
TSTF-469-T, Rev 0:	22-Apr-04
TSTF-519-T, Rev 0:	16-Oct-09 (TSTF Review)

TSTF Classification:

TSTF-425-A, Rev 3:	Technical Change
TSTF-469-T, Rev 1:	Editorial 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 3.3.1.

RCOL COL Item Number and Title:

There are no Vogtle COL items applicable to GTS 3.3.1.

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 A024:	Reformat of GTS 3.3.1 into Seven Parts; 3.3.1 through 3.3.7; note that this maps GTS 3.3.1 requirements into interim A024-modified TS (MTS) Subsection 3.3.3, to which the other changes are applied.
VEGP LAR DOC A026:	SR Note Change
VEGP LAR DOC M01:	Deletion of Reactor Trip Channel Operational Test (RTCOT) Definition
VEGP LAR DOC M02:	Provision for Two or More Inoperable Divisions or Channels
VEGP LAR DOC L10:	Delete PTS 3.3.1 Function 16, Interlocks

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

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(1) applicable to operating reactor designs, but not to the AP1000 design; (2) already incorporated in the GTS; or (3) superseded by another change.

TSTF-425-A deferred for future consideration.

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.

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)

Uniformly use:

- Power Range Neutron Flux,
- Intermediate Range Neutron Flux, and
- Source Range Neutron Flux

in place of other phrases that refer to power, intermediate, and source range instrumentation channels or detectors.

Insert “as-left” in SR phrases “within the allowed **as-left** tolerance.” (NRC Staff Comment)

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

For added clarity, revise the opening sentence of the “ASA, LCO, and Applicability” section of the Bases for STS Subsections 3.3.1 through 3.3.7 to state:

> The RTS functions to maintain **compliance with** the SLs during all AOOs and mitigates the consequences of DBAs in all MODES in which the **reactor trip breakers (**RTBs**)** are closed.

In the “Surveillance Requirements” section of the Bases for proposed STS Subsection 3.3.3 under the heading “SR 3.3.3.2,” the second paragraph, states there are two Notes to SR 3.3.3.2. The first note described concerning P-6 and P-10 interlocks is not in the actual SR 3.3.3.2. Delete references to the first Note. There is only one Note that needs to be described.

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 3.3.3, Reactor Trip System (RTS) Intermediate Range Instrumentation

Changes to the Generic Technical Specifications and Bases:

GTS 3.3.1, "Reactor Trip System (RTS) Instrumentation," is reformatted by DOC A024 into multiple Specifications including interim A024-modified TS (MTS) 3.3.3, "Reactor Trip System (RTS) Intermediate Range Instrumentation." The reformatting relocates GTS 3.3.1 Function 4, "Intermediate Range Neutron Flux," into MTS 3.3.3 as part of the LCO statement. The MTS format is depicted in Section XI of this GTST as the reference case in the markup of the GTS instrumentation requirements for the intermediate range instrumentation.

MTS 3.3.3 LCO Title	GTS 3.3.1 Function
Reactor Trip System (RTS) Intermediate Range Instrumentation	4. Intermediate Range Neutron Flux

References 2, 3, and 6 provide details showing the correspondence of GTS 3.3.1 Functions and STS 3.3.1 through 3.3.7 Functions.

GTS 3.3.1 Conditions F, G and H are reordered and relabeled as AP1000 MTS 3.3.3 Conditions A, B, C and D. No Function Table is required. (DOC A024)

GTS Table 3.3.1-1 footnote (b), "Below the P-10 (Power Range Neutron Flux) interlocks," applies to operation in MODE 1 for intermediate range instrumentation. GTS Table 3.3.1-1 footnote (b) is incorporated into the MTS 3.3.3 LCO Applicability statement for MODE 1. GTS Table 3.3.1-1 footnote (c), "Above the P-6 (Intermediate Range Neutron Flux) interlocks," and footnote (d), "Below the P-6 (Intermediate Range Neutron Flux) interlocks," applies to operation in MODE 2 for intermediate range instrumentation. GTS Table 3.3.1-1 footnotes (c) and (d) are incorporated into the MTS 3.3.3 LCO Applicability statement for MODE 2. (DOC A024)

MTS 3.3.3 Condition D is revised to address three or more inoperable channels. 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)

MTS 3.3.3 Required Action statement D.1 is revised to "Suspend positive reactivity additions that could result in a loss of required SDM." The accident analyses assume that events are initiated with the required SDM present. The proposed Required Actions will protect this assumption. (TSTF-469-T)

GTS SR 3.3.1.1 is retained and renumbered as MTS SR 3.3.3.1. GTS SR 3.3.1.9 is retained and renumbered as STS SR 3.3.3.2. GTS SR 3.3.1.11 is retained and renumbered as STS SR 3.3.3.3. GTS SR 3.3.1.13 is retained and renumbered as STS SR 3.3.3.4. The MTS format is depicted as the reference case in the attached markup. (DOC A024)

The MTS SR 3.3.3.2 Surveillance Note regarding verification that interlocks P-6 and P-10 are in the required state for existing unit conditions is deleted. As discussed in the Bases, the interlock

operability is adequately addressed by each related Function's requirement to be Operable and the requirement for actuation logic operability. (DOC L10)

MTS SR 3.3.3.2 is revised from "Perform RTCOT..." to "Perform COT..." and the Frequency Note is repositioned as a Surveillance Note. The definition of RTCOT does not explicitly require adjustments of required alarm, interlock, and trip setpoints required for channel OPERABILITY such that the setpoints are within the necessary range and accuracy. NUREG-1431 specifies the COT for similar Functions. The Note relocation is per the Writer's Guide (Reference 5). (DOC M01 and DOC A026)

The Bases are revised to reflect these changes.

The following tables are provided as an aid to tracking the various changes to GTS 3.3.1 Conditions, Required Actions, Functions, Applicability Footnotes, and Surveillance Requirements that result in interim A024-modified TS (MTS) 3.3.3 and as further changed, STS 3.3.3.

Changes to Conditions

GTS 3.3.1 Condition	MTS 3.3.3 Condition	STS 3.3.3 Condition	Other STS Subsections Addressing the Listed Condition	Additional DOC Changes
A	→	→	3.3.1	---
B	→	→	3.3.5	---
C	→	→	3.3.5	---
D	→	→	3.3.1	---
E	→	→	3.3.1	---
F	A	A	GTS Condition F split into 2 Conditions	---
F	B	B	---	---
G	D	D	---	---
H	C	C	---	---
I	→	→	3.3.2	---
J	→	→	3.3.2	---
K	→	→	3.3.1	---
L	→	→	3.3.4, 3.3.6	---
M	→	→	3.3.1	---
N	→	→	3.3.7	---
O	→	→	3.3.7	---
P	→	→	3.3.4, 3.3.6	---
Q	→	→	3.3.2	---
R	→	→	3.3.2	---

Changes to Functions

----------	Function [Modes(footnote)]	----------	STS 3.3.3	Other STS Subsections	Additional
GTS 3.3.1	MTS 3.3.3	STS 3.3.3	Conditions	and Additional Changes	DOC Changes
4 [1(b),2(c)]	LCO 3.3.3	LCO 3.3.3	A, B	---	---
4 [2(d)]	LCO 3.3.3	LCO 3.3.3	C, D	---	---

Changes to Applicability Footnotes

GTS 3.3.1 Footnote	MTS 3.3.3 Footnote	STS 3.3.3 Footnote	STS 3.3.3 Function	STS Subsections Also Addressing Listed footnote	Additional Changes DOC Number
b	-----LCO Applicability-----		---	---	---
c	-----LCO Applicability-----		---	---	---
d	-----LCO Applicability-----		---	3.3.2	---

Changes to Surveillance Requirements

GTS 3.3.1 SR	MTS 3.3.3 SR	STS 3.3.3 SR	STS Subsections Also Addressing the Listed SR	Example Surveillance No. Surveillance Description
3.3.1.1	3.3.3.1	3.3.3.1	3.3.1, 3.3.2	3.3.1.1 CHANNEL CHECK

GTS 3.3.1 SR	MTS 3.3.3 SR	STS 3.3.3 SR	STS Subsections Also Addressing the Listed SR	Example Surveillance No. Surveillance Description
3.3.1.2	→	→	3.3.1	3.3.1.2 Compare calorimetric heat balance to NI channel output
3.3.1.3	→	→	3.3.1	3.3.1.3 Compare calorimetric heat balance to delta-T power calculation
3.3.1.4	→	→	3.3.1	3.3.1.4 Compare incore detector measurement to NI AXIAL FLUX DIFFERENCE
3.3.1.5	→	→	3.3.1	3.3.1.5 Calibrate excore channels
3.3.1.6	→	→	3.3.7	3.3.7.1 Perform TADOT
3.3.1.7	→	→	3.3.4, 3.3.6	3.3.4.1 ACTUATION LOGIC TEST
3.3.1.8	→	→	3.3.1, 3.3.2	3.3.1.6 Perform COT
3.3.1.9	3.3.3.2	3.3.3.2	3.3.1, 3.3.2	3.3.1.7 Perform COT
3.3.1.10	→	→	3.3.1	3.3.1.8 CHANNEL CALIBRATION
3.3.1.11	3.3.3.3	3.3.3.3	3.3.1, 3.3.2	3.3.1.9 CHANNEL CALIBRATION
3.3.1.12	→	→	3.3.1, 3.3.5	3.3.1.10 Perform TADOT
3.3.1.13	3.3.3.4	3.3.3.4	3.3.1, 3.3.2	3.3.1.11 Verify RTS RESPONSE

The opening sentence of the “ASA, LCO, and Applicability” section of the Bases for STS Subsections 3.3.1 through 3.3.7 is revised to provide additional clarity. (APOG Comment)

The nomenclature for “Power Range,” “Intermediate Range,” and “Source Range,” Neutron Flux detectors is revised for consistency throughout the Bases. (APOG Comment and NRC Staff Edit)

The word “interlock” is removed after P-6 and P-10, except when used to refer to the interlock and not the setpoint-and to be consistent with TS wording. (NRC Staff Comment)

The “Surveillance Requirements” section of the Bases under the heading “SR 3.3.3.2,” is revised to correct an error. (APOG Comment)

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

VI. Traveler Information

Description of TSTF changes:

Required Actions which prohibit positive reactivity additions are corrected by TSTF-469-T to prohibit positive reactivity additions that could result in a loss of required SDM. The existing Required Actions do not accomplish the purpose as described in the Bases.

Rationale for TSTF changes:

The proposed Required Actions will prohibit activities which could result in a loss of SDM. That is consistent with the intent of the existing Required Actions, but eliminates the inconsistencies in the existing actions.

The accident analyses assume that events are initiated with the required SDM present. The proposed Required Actions will protect this assumption. Previous changes made in TSTF-286 (Reference 4) did not accomplish the desired goal of allowing positive reactivity additions that did not violate the required SDM because the Required Actions did not prohibit positive reactivity additions that violate the required SDM. This is corrected by TSTF-469-T, Rev 0.

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 24 (DOC A024) reformats PTS 3.3.1 into multiple Specifications as follows:

- 3.3.1, “Reactor Trip System (RTS) Instrumentation”;
- 3.3.2, “Reactor Trip System (RTS) Source Range Instrumentation”;
- 3.3.3, “Reactor Trip System (RTS) Intermediate Range Instrumentation”;
- 3.3.4, “Reactor Trip System (RTS) Engineered Safety Feature Actuation
- 3.3.5, “Reactor Trip System (RTS) Manual Actuation”;
- 3.3.6, “Reactor Trip System (RTS) Automatic Trip Logic”; and
- 3.3.7, “Reactor Trip System (RTS) Trip Actuation Devices.”

Since PTS 3.3.1, “Reactor Trip System (RTS) Instrumentation,” is identical to GTS 3.3.1, it is appropriate for this GTST to consider the proposed changes to PTS 3.3.1 as changes to GTS 3.3.1 for incorporation in AP1000 STS 3.3.3. DOC A024 is extensive, but retains the intention of PTS 3.3.1 while improving operational use of the TS. The numerous Functions, Conditions and extensive bases discussion associated with PTS 3.3.1 are repackaged into seven smaller parts. Therefore, the changes implemented by DOC A024 are presented in the attached Subsection 3.3.3 markup, in Section XI of this GTST, as the “clean” starting point for this GTST and are identified as interim A024-modified TS (MTS) 3.3.3. The specific details of the reformatting for MTS 3.3.3 can be found in VEGP TSU LAR (Reference 2), in Enclosure 2 (markup) and Enclosure 4 (clean). The NRC staff safety evaluation regarding DOC A024 can be found in Reference 3, VEGP LAR SER. The VEGP TSU LAR was modified in response to NRC staff RAIs in Reference 6 and the Southern Nuclear Operating Company RAI Response in Reference 7.

DOC A026 moves MTS SR 3.3.3.2 Frequency Note “Only required when not performed within previous 92 days” to the surveillance column as a Surveillance Note. The new Surveillance Note states “Only required to be performed when not performed within previous 92 days.”

DOC M01 revises MTS SR 3.3.3.2 requirements to “Perform RTCOT in accordance with Setpoint Program,” to “Perform COT in accordance with Setpoint Program.”

DOC M02 addresses the fact that MTS 3.3.3, “Reactor Trip System (RTS) Intermediate Range Instrumentation,” does not specify Actions for inoperability of more than three inoperable Intermediate Range Neutron Flux channels with power above P-6, or more than two inoperable Intermediate Range Neutron Flux channels below P-6. This results in entry into LCO 3.0.3 when additional channels are inoperable.

DOC L10 removes the MTS SR 3.3.3.2 Surveillance Note regarding verification that interlocks P-6 and P-10 are in the required state for existing unit conditions.

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 6) by Southern Nuclear Operating Company’s RAI Response in Reference 7.

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

The reformatting per DOC A024, 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 A026 is consistent with the TS Writer's Guide found in reference 5. DOC L10 notes that the GTS SR 3.3.1.9 Surveillance Note provides details of performing a Channel Operational Test (COT) and is deleted. GTS SR 3.3.1.9 is proposed as MTS SR 3.3.3.2. The requirement of

MTS SR 3.3.3.2 Surveillance Note for verification that interlocks P-6 and P-10 are in their required state for existing unit conditions is an implicit condition for meeting MTS LCO 3.3.3 and any other LCOs supported by these interlocks; although the Note is being removed from MTS SR 3.3.3.2, the requirement is unchanged and is appropriately summarized in the Bases.

DOC M01 notes that the definition of RTCOT does not explicitly require "adjustments of required alarm, interlock, and trip setpoints" that are "required for channel OPERABILITY such that the setpoints are within the necessary range and accuracy." The PTS Bases associated with the RTCOT describe these adjustments, but the bases are intended to clarify, not provide additional requirements. The COT definition explicitly requires these adjustments. Therefore, because the definition of COT more closely aligns with the RTCOT test description provided in the bases, the COT is specified instead of an RTCOT. The RTCOT definition is deleted from TS Section 1.1. A COT may be performed by means of any series of sequential, overlapping, or total channel steps. The changes are consistent with the intent of the required TS testing, and are consistent with NUREG-1431.

DOC M02 directly provides for the default Actions of LCO 3.0.3 in STS 3.3.3. Required Action D.3 by allowing 7 hours to be in MODE 3 in the event three or more Intermediate Range Neutron Flux channels are inoperable, regardless of whether power is above or below P-6. This is more restrictive because Required Action D.3 does not explicitly specify the 1 hour delay in commencing the power reduction that LCO 3.0.3 permits, even though the total time to be in MODE 3 is unchanged. This simplified presentation clarifies the shutdown actions making them easier to implement by the unit operator.

DOC L10 notes that Interlock Operability is adequately addressed by each related Function's requirement to be Operable and the requirement for actuation logic operability. Interlock functions do not directly trip the reactor or initiate an ESFAS function (except for P-4), and as such are removed from the actuation instrumentation listing in TS.

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

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

The opening sentence of the "ASA, LCO, and Applicability" section of the Bases for STS Subsections 3.3.1 through 3.3.7 is revised to state:

> The RTS functions to maintain **compliance with** the SLs during all AOOs and mitigates the consequences of DBAs in all MODES in which the **reactor trip breakers (**RTBs**)** are closed. (APOG Comment)

The second and fifth paragraphs in the "ASA, LCO, and Applicability" section of the Bases for STS Subsection 3.3.3 are revised to state:

> ...The Protection and **S**afety Monitoring System (PMS) ~~intermediate range~~ **Intermediate Range Neutron Flux** detectors are located external to the reactor vessel and measure neutrons leaking from the core. ...This trip **Function** can be manually blocked by the main control room operator when above the P-10 setpoint, which is the respective PMS **division** ~~power range~~ **Power Range Neutron Flux** channel greater than 10% power, and is automatically unblocked when below the P-10 setpoint, which is the respective PMS **division** ~~power range~~ **Power Range Neutron Flux** channel less than 10% power.

> ...In MODE 6, all rods are fully inserted and the core has a required increased SDM. Also, the ~~PMS intermediate range~~ **Intermediate Range Neutron Flux** detectors cannot detect neutron **flux** levels present in this MODE. (APOG Comment and NRC Staff Edit)

The first and second paragraphs in the "Actions" section of the Bases for STS Subsection 3.3.3 under the heading "A.1, A.2, and A.3" are revised to state:

> Condition A addresses the situation where one ~~intermediate range~~ **Intermediate Range Neutron Flux – High reactor trip Function** ~~instrumentation~~ channel is inoperable with THERMAL POWER greater than or equal to the P-6 ~~interlock~~ setpoint. With one ~~or two~~ channel~~s~~ inoperable, ~~one~~ **the** affected channel must be placed in a bypass or trip condition within 2 hours, or THERMAL POWER must be either reduced below the P-6 ~~interlock~~ setpoint or increased above the P-10 ~~interlock~~ setpoint within 2 hours. . . .
>
> As an alternative to placing the inoperable channel~~(s)~~ in bypass or trip if THERMAL POWER is greater than the P-6 setpoint but less than the P-10 setpoint, 2 hours are allowed to reduce THERMAL POWER below the P-6 setpoint or to increase the THERMAL POWER above the P-10 setpoint. The Intermediate Range Neutron Flux channels must be OPERABLE when the power level is above the capability of the ~~source range~~ **Source Range Neutron Flux detectors**, P-6, and below the capability of the ~~power range~~ **Power Range Neutron Flux detectors**, P-10. If THERMAL POWER is greater than the P-10 setpoint, the ~~PMS~~ ~~power range~~ **Power Range Neutron Flux channels** ~~detectors~~ perform the monitoring and protective functions and the ~~intermediate range~~ **Intermediate Range Neutron Flux channels are** ~~is~~ not required. The Completion Times allow for a slow and controlled power adjustment below P-6, and take into account the redundant capability afforded by the ~~two~~ **three** remaining OPERABLE **Intermediate Range Neutron Flux – High reactor trip Function** channels and the low probability of their failure during this period. (APOG Comment and NRC Staff Edit)

the first and second paragraphs in the "Actions" section of the Bases for STS Subsection 3.3.3 under the heading "B.1.1, B.1.2, B.2, and B.3" are revised to state:

> Condition B addresses the situation where two ~~intermediate range instrumentation~~ **Intermediate Range Neutron Flux – High** channels are inoperable with THERMAL POWER greater than or equal to the P-6 ~~interlock~~ setpoint. With two ~~intermediate range~~ **Intermediate Range Neutron Flux – High** channels inoperable, one inoperable channel must be placed in a bypass condition and one inoperable channel must be placed in a trip condition within 2 hours, or THERMAL POWER must be either reduced below the P-6 ~~interlock~~ setpoint or increased above the P-10 ~~interlock~~ setpoint within 2 hours. . . .
>
> ...The Intermediate Range Neutron Flux channels must be OPERABLE when the power level is above the capability of the ~~source range~~ **Source Range Neutron Flux detectors**, P-6, and below the capability of the ~~power range~~ **Power Range Neutron Flux detectors**, P-10. If THERMAL POWER is greater than the P-10 setpoint, the ~~PMS power range~~ **Power Range Neutron Flux channels** ~~detectors~~ perform the monitoring and protective functions and the ~~intermediate range~~ **Intermediate Range Neutron Flux channels are** ~~is~~ not required. ... (APOG Comment and NRC Staff Edit)

The “Actions” section of the Bases for STS Subsection 3.3.3 under the heading “C.1” is revised to state:

> Condition C addresses the situation of one or two ~~intermediate range instrumentation~~ **Intermediate Range Neutron Flux – High reactor trip Function** channels are inoperable with THERMAL POWER below the P-6 ~~interlock~~ setpoint. Below P-6, the Source Range Neutron Flux channels will be able to monitor the core power level. With one or two ~~intermediate range instrumentation~~ **Intermediate Range Neutron Flux – High reactor trip Function** channels inoperable, three of the four ~~required~~ channels must be restored to OPERABLE status prior to increasing THERMAL POWER above the P-6 setpoint. With the unit in this condition, below P-6, the Source Range Neutron Flux channels perform the monitoring and protection functions. (APOG Comment and NRC Staff Edit)

The “Actions” section of the Bases for STS Subsection 3.3.3 under the heading “D.1, D.2, and D.3” is revised to state:

> Condition D **addresses the situation where** ~~applies to~~ three **or more** Intermediate Range Neutron Flux **– High reactor** trip **Function** channels **are** inoperable ~~in MODE 2 above the P-6 setpoint and below the P-10 setpoint~~. **With three or more channels inoperable, positive reactivity additions that could result in a loss of required SDM must be suspended immediately. This will preclude any power level increase since there are insufficient OPERABLE Intermediate Range Neutron Flux – High reactor trip Function channels to adequately monitor power escalation. In addition, THERMAL POWER must be reduced below the P-6** ~~interlock~~ **setpoint within 2 hours, and the plant must be placed in MODE 3 within 7 hours. The allowed Completion Times for Required Actions D.2 and D.3 are reasonable, based on operating experience, to reach the specified condition from full power conditions in an orderly manner and without challenging plant systems.** (APOG Comment and NRC Staff Edit)

The first paragraph in the “Surveillance Requirements” section of the Bases for STS Subsection 3.3.3 under the heading “SR 3.3.3.2” is revised to state:

> SR 3.3.3.2 is the performance of a ~~RT~~COT. The test is performed in accordance with the SP. If the actual **trip** 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 **Trip Setpoint** to the NTS (within the allowed **as-left** tolerance), and evaluating the ~~channels~~ **channel** response. ... (APOG Comment and NRC Staff Edit)

The third paragraph in the same section is revised to state:

> A test subsystem is provided with the ~~protection and safety monitoring system~~ **Protection and Safety Monitoring System (PMS)** to aid the plant staff in performing the ~~RT~~COT. (APOG Comment and NRC Staff Edit)

The ninth, tenth, and eleventh paragraphs in the same section are revised to state:

> ~~This~~ **The** ~~test frequency~~ **COT Surveillance Frequency** of 92 days is justified based on Reference 2 **(which refers to this test as “RTCOT”)** 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 ~~Protection and Safety Monitoring System~~ **PMS** cabinets to the operator within 10 minutes of a detectable failure.

SR 3.3.3.2 is modified by ~~**two**~~ **a** Note~~**s The first Note states** that this test shall include verification that the P-6 and P-10 interlocks are in their required state for the existing unit condition~~. **The** ~~**second**~~ **Note allows this surveillance to be satisfied if it has been performed within 92 days of the Frequencies of prior to reactor startup and** ~~**four**~~**4 hours after reducing power below P-10.**

The Frequency of prior to reactor startup ensures this surveillance is performed prior to critical operations and applies to the ~~source~~ **Source Range Neutron Flux – High (SR 3.3.2.2)**, ~~intermediate~~ **Intermediate Range Neutron Flux – High** and ~~power range low~~ **Power Range Neutron Flux – Low Setpoint (SR 3.3.1.7) reactor trip Function** instrument channels. . . . This test ensures that the ~~NIS intermediate range instrumentation~~ **Intermediate Range Neutron Flux – High reactor trip Function instrumentation** channels are OPERABLE prior to taking the reactor critical and after reducing power into the applicable MODE (< P-10) for periods ~~> 4~~ **of greater than four** hours. (APOG Comment and NRC Staff Edit)

The first three paragraphs in the “Surveillance Requirements” section of the Bases for STS Subsection 3.3.3 under the heading “SR 3.3.3.3” are revised to state:

~~SR 3.3.3.3 is the performance of a~~ **A** CHANNEL CALIBRATION **is performed** every 24 months **or approximately at every refueling**. This SR is modified by a Note stating that neutron detectors are excluded from the CHANNEL CALIBRATION. ~~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~~.

The ~~test~~ **CHANNEL CALIBRATION** is performed in accordance with the SP. If the actual **trip** 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~~ **channel Trip Setpoint** to the NTS (within the allowed **as-left** tolerance), and evaluating the **channel** response.

The CHANNEL CALIBRATION for the ~~intermediate range neutron~~ **Intermediate Range Neutron Flux** detectors consists of obtaining the detector plateau curves, evaluating those curves, and comparing the curves to the manufacturer’s data. This Surveillance is not required for the ~~intermediate range~~ **Intermediate Range Neutron Flux** detectors for entry into MODE 2, because the plant must be in at least MODE 2 to perform the test. (APOG Comment and NRC Staff Edit)

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:

The opening sentence of the “ASA, LCO, and Applicability” section of the Bases for STS Subsections 3.3.1 through 3.3.7 is revised for additional clarity.

The Bases modifier “PMS” for “Power Range,” “Intermediate Range,” and “Source Range” detectors is unnecessary and inconsistent with other PMS instruments. The Bases references to all these detector types are standardized for consistency.

The non-technical change to the “Surveillance Requirements” section of the Bases under the heading “SR 3.3.3.2” corrects an error regarding the number of Notes affecting this SR.

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:

TSTF-469-T revises MTS Action D.1 to “Suspend positive reactivity additions that could result in a loss of required SDM.” The Required Action will prohibit activities which could result in a loss of SDM. This is consistent with the intent of the existing Required Action, but eliminates its ambiguity. The accident analyses assume that events are initiated with the required SDM present. The Required Action will protect this assumption.

DOC M01 revises MTS SR 3.3.3.2 description to state “Perform COT in accordance with Setpoint Program,” in place of “Perform RTCOT in accordance with Setpoint Program.” PTS Section 1.1 defines a Reactor Trip Channel Operational Test (RTCOT) as “A RTCOT shall be the injection of a simulated or actual signal into the reactor trip channel as close to the sensor as practicable to verify OPERABILITY of the required interlock and/or trip functions. The RTCOT may be performed by means of a series of sequential, overlapping, or total channel steps so that the entire channel is tested from the signal conditioner through the trip logic.”

The STS Section 1.1 definition for Channel Operational Test (COT) per reference 2, DOC A001, states “A COT shall be the injection of a simulated or actual signal into the channel as close to the sensor as practicable to verify OPERABILITY of all devices in the channel required for channel OPERABILITY. The COT shall include adjustments, as necessary, of the required alarm, interlock, and trip setpoints required for channel OPERABILITY such that the setpoints are within the necessary range and accuracy. The COT may be performed by means of any series of sequential, overlapping, or total channel steps.”

MTS SR 3.3.3.2 requires an RTCOT, in accordance with the Setpoint Program, to be performed on each TS required automatic protection instrumentation Function. Each Function requiring performance of an RTCOT by MTS SR 3.3.3.2 also requires performance of a Channel Calibration by MTS SR 3.3.3.4. Therefore, the Functions referencing MTS SR 3.3.3.2 contain adjustable devices.

The definition of RTCOT does not explicitly require adjustments of required alarm, interlock, and trip setpoints required for channel OPERABILITY such that the setpoints are within the necessary range and accuracy. The Bases associated with the RTCOT describe these adjustments, but the Bases are intended to clarify, not provide additional requirements. A COT explicitly requires these adjustments. Therefore, the definition of a COT more closely aligns with the description of the testing provided in the Bases for MTS SR 3.3.3.2. Use of COT for this SR is consistent with similar testing specified in NUREG-1431, STS 3.3.1. Use of COT is also consistent with testing performed on other instrumentation specified in the PTS.

The GTS/PTS Section 1.1 definition of RTCOT is deleted for a series of reasons as described in DOC M01. Changes made by DOC M01 result in consistency with the use of Actuation Logic Test and COT in other TS requirements, are consistent with the intent of the required TS testing, and are consistent with NUREG-1431, Rev.4.

DOC M02 addresses the fact that MTS 3.3.3, “Reactor Trip System (RTS) Intermediate Range Instrumentation,” does not specify Actions for inoperability of more than two inoperable intermediate range channels. This results in entry into LCO 3.0.3 when three or more channels are inoperable. 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 LCO 3.0.3 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 Function channels 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 the affected Function.

The shutdown actions of LCO 3.0.3 are typical of “default” actions throughout the TS that direct a unit shutdown to exit the Applicability of the affected LCO, 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 the affected 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 MODES 1, 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 3.3.3, Condition D leads to new default actions to immediately suspend operations involving positive reactivity additions, which is an action not required by LCO 3.0.3. The remainder of Action D includes actions to reduce power below P-6 in 2 hours, which is more restrictive than the time allowed by LCO 3.0.3, and be in Mode 3 within 7 hours, which is equivalent to the time allowed by 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.

DOC L10 removes Function 12, Reactor Trip System Interlocks (P-6, P-10, and P-11), from MTS 3.3.1, Table 3.3.1-1. RTS interlocks are provided to ensure reactor trip system instrumentation and actuation Functions are in the correct configuration for the current plant status. They back up operator actions to ensure protection system Functions are not blocked during plant conditions in which the safety analysis assumes the Functions are Operable.

The interlocks, as separate RTS and ESFAS Functions are removed from the GTS and the associated action requirements are deleted. Interlock Operability is adequately addressed by each supported Function's requirement to be Operable and the requirement for reactor trip logic and ESF actuation logic operability.

For these related RTS and ESFAS instrumentation and actuation Functions to be Operable, the associated RTS and ESFAS interlock functions would have to be in the required state as a support feature for Operability. For these RTS trip and ESFAS actuation Functions to be Operable, the associated RTS and ESFAS interlock Functions would have to be in the required state as a support feature for operability. These RTS and ESFAS interlock functions do not directly trip the reactor or actuate ESFAS, and as such are removed from the actuation instrumentation listing in TS. The role of the interlocks, and their support for the operability of RTS trip and ESFAS actuation Functions, are described in the TS Bases, as well as in Final Safety Analysis Report (FSAR) Chapter 7, Instrumentation and Controls.

Furthermore, each RTS trip and ESFAS actuation Function is required operable during the stated TS Applicability. The Applicability for certain trip or actuation Functions is based on transitioning above or below an interlock; while other Functions are not directly supported by an interlock. For Functions supported by an interlock, while operating within the TS required Applicability for that Function, its associated supporting interlock is not required to automatically change state. The interlock status must be established in conjunction with assuring supported Function's operability prior to entering the required Applicability. In addition, LCO 3.0.4 requires the operators to ensure RTS trip and ESFAS operability prior to entering their Applicability. These TS requirements remain in effect and specify the necessary operability requirements related to the removed interlock Functions. As such, interlocks are adequately addressed by each related Function's requirement to be operable and the requirement for actuation logic operability.

MTS SR 3.3.3.2 Surveillance Note provides details of performing a Channel Operational Test (COT) and is deleted. The requirement for verification that interlocks P-6 and P-10 are in their required state for existing unit conditions is unchanged and is appropriately summarized in the Bases.

If the interlock is not automatically functioning as designed, the condition is entered into the Corrective Action Program and appropriate operability evaluations performed for the affected Function(s), which would evaluate potential operability impact on individual instrument Function channels and/or the coincident logic subsystem channel. Adverse impacts to operability could be evaluated to affect individual instrumentation channels, or may be evaluated to impact the divisional coincident logic. In either outcome, the appropriate actions are provided by the LCO Actions for the affected supported feature(s).

Instrument channel Functions with interlocks implicitly required to support the Function's operability, are also addressed by the COT and Channel Calibration Surveillance Requirements. Actuation logic with interlocks implicitly required to support operability of the logic is also addressed by the Actuation Logic Test Surveillance Requirements. The applicable COT, Channel Calibration, and Actuation Logic Test Bases will include the following discussion supporting this change ("CHANNEL CALIBRATION" is replaced with "COT" or "ACTUATION LOGIC TEST" as appropriate):

> "Interlocks implicitly required to support the Function's OPERABILITY are also addressed by this CHANNEL CALIBRATION. This portion of the CHANNEL CALIBRATION ensures the associated Function is not bypassed when required to be enabled. This can be accomplished by ensuring the interlocks are calibrated properly in accordance with the SP. If the interlock is not automatically functioning as designed, the condition is entered into the Corrective Action Program and appropriate OPERABILITY evaluations performed for the affected Function. The affected Function's OPERABILITY can be met if the interlock is manually enforced to properly enable the affected Function. When an interlock is not supporting the associated Function's OPERABILITY at the existing plant conditions, the affected Function's channels must be declared inoperable and appropriate ACTIONS taken."

The remaining changes, including those made by DOC A024, 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 3.3.3 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 5/29/2014.

APOG Comments (Ref. 8) and Resolutions:

1. (Internal # 3 and 153) 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 #13) Many GTSTs evaluated TSTF-425 with the following note: Risk-informed TS changes will be considered at a later time for application to the AP1000 STS.

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

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

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

NRC Staff disagreed with implementing TSTF-425 in the initial version of the STS. Although the APOG thinks the analysis supporting this traveler is general enough to be applicable to AP1000, staff thinks an AP1000-specific proposal from APOG is needed to identify any GTS SRs that should be excluded. Also, with the adoption of a Surveillance Frequency Control Program (SFCP) in the AP1000 STS, bracketed Frequencies, which provide a choice between the GTS Frequency and the SFCP Frequency, are needed because the NRC will use the AP1000 STS as a reference, and to be consistent with NUREG-1431, Rev. 4. APOG was requested to consider proposing an AP1000 version of TSTF-425 for a subsequent revision of the STS.

5. (Internal # 116) In GTST for Subsection 3.3.3, 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 A028. This DOC is for changes to ESFAS TS and does not affect Subsection 3.3.3. Note that it is not mentioned anywhere else in this Subsection. This is also stated in Subsections 3.3.1 through 3.3.2 and Subsections 3.3.4 through 3.3.7. Change “DOCs A024 and A028” to “DOC A024” in GTST 3.3.1 through GTST 3.3.7. This is resolved by making the recommended change.

6. (Internal # 119) The modifier “PMS” for “power range detectors,” “Intermediate Range Neutron Flux,” and “Source Range, Neutron Flux,” is unnecessary. Inclusion of “PMS” in the Bases is inconsistent with other PMS instruments, with the LCO requirement nomenclature, and the general AP1000 DCD presentation. Delete “PMS” as a modifier to “power range,” “Intermediate Range,” and “Source Range,” throughout the Bases. NRC Staff notes that this comment also applies to STS Subsections 3.3.1, 3.3.2, 3.3.8, and 3.9.3. This is resolved by making the recommended change with additional edits. NRC staff notes that the initial use of Protection and Safety Monitoring System (PMS) in the Bases for an STS Subsection should be retained. In addition, NRC staff proposes to uniformly use

   - Power Range Neutron Flux,
   - Intermediate Range Neutron Flux, and
   - Source Range Neutron Flux

   in place of other phrases that refer to power, intermediate, and source range instrumentation channels or detectors. NRC staff further proposes to remove “interlock” after P-6 and P-10, except when used to refer to the interlock and not the setpoint-and to be consistent with TS wording.

   In the “ASA, LCO, and Applicability” section of the Bases for STS Subsection 3.3.3, revise the second and fifth paragraphs as indicated:

   > ...The Protection and **S**afety Monitoring System (PMS) ~~intermediate range~~ **Intermediate Range Neutron Flux** detectors are located external to the reactor vessel and measure neutrons leaking from the core. ...This trip **Function** can be manually blocked by the main control room operator when above the P-10 setpoint, which is the respective PMS **division** ~~power range~~ **Power Range Neutron Flux** channel greater than 10% power, and is automatically unblocked when below the P-10 setpoint, which is the respective PMS **division** ~~power range~~ **Power Range Neutron Flux** channel less than 10% power.

> ...In MODE 6, all rods are fully inserted and the core has a required increased SDM. Also, the ~~PMS intermediate range~~ **Intermediate Range Neutron Flux** detectors cannot detect neutron **flux** levels present in this MODE.

In the "Actions" section of the Bases for STS Subsection 3.3.3 under the heading "A.1, A.2, and A.3," revise the first and second paragraphs as indicated:

> Condition A addresses the situation where one ~~intermediate range~~ **Intermediate Range Neutron Flux – High reactor trip Function** ~~instrumentation~~ channel is inoperable with THERMAL POWER greater than or equal to the P-6 ~~interlock~~ setpoint. With one ~~or two~~ channel~~s~~ inoperable, ~~one~~ **the** affected channel must be placed in a bypass or trip condition within 2 hours, or THERMAL POWER must be either reduced below the P-6 ~~interlock~~ setpoint or increased above the P-10 ~~interlock~~ setpoint within 2 hours. . . .
>
> As an alternative to placing the inoperable channel~~(s)~~ in bypass or trip if THERMAL POWER is greater than the P-6 setpoint but less than the P-10 setpoint, 2 hours are allowed to reduce THERMAL POWER below the P-6 setpoint or to increase the THERMAL POWER above the P-10 setpoint. The Intermediate Range Neutron Flux channels must be OPERABLE when the power level is above the capability of the ~~source range~~ **Source Range Neutron Flux detectors**, P-6, and below the capability of the ~~power range~~ **Power Range Neutron Flux detectors**, P-10. If THERMAL POWER is greater than the P-10 setpoint, the ~~PMS~~ ~~power range~~ **Power Range Neutron Flux channels** ~~detectors~~ perform the monitoring and protective functions and the ~~intermediate range~~ **Intermediate Range Neutron Flux channels are** ~~is~~ not required. The Completion Times allow for a slow and controlled power adjustment below P-6, and takes into account the redundant capability afforded by the ~~two~~ **three** remaining OPERABLE **Intermediate Range Neutron Flux – High reactor trip Function** channels and the low probability of their failure during this period.

In the "Actions" section of the Bases for STS Subsection 3.3.3 under the heading "B.1.1, B.1.2, B.2, and B.3," revise the first and second paragraphs as indicated:

> Condition B addresses the situation where two ~~intermediate range~~ ~~instrumentation~~ **Intermediate Range Neutron Flux – High** channels are inoperable with THERMAL POWER greater than or equal to the P-6 ~~interlock~~ setpoint. With two ~~intermediate range~~ **Intermediate Range Neutron Flux – High** channels inoperable, one inoperable channel must be placed in a bypass condition and one inoperable channel must be placed in a trip condition within 2 hours, or THERMAL POWER must be either reduced below the P-6 ~~interlock~~ setpoint or increased above the P-10 ~~interlock~~ setpoint within 2 hours. . . .
>
> ...The Intermediate Range Neutron Flux channels must be OPERABLE when the power level is above the capability of the ~~source range~~ **Source Range Neutron Flux detectors**, P-6, and below the capability of the ~~power range~~ **Power Range Neutron Flux detectors**, P-10. If THERMAL POWER is greater than the P-10 setpoint, the ~~PMS power range~~ **Power Range Neutron Flux channels** ~~detectors~~ perform the monitoring and protective

functions and the ~~intermediate range~~ **Intermediate Range Neutron Flux channels are** ~~is~~ not required. ...

In the "Actions" section of the Bases for STS Subsection 3.3.3 under the heading "C.1," revise the paragraph as indicated:

Condition C addresses the situation of one or two ~~intermediate range instrumentation~~ **Intermediate Range Neutron Flux – High reactor trip Function** channels are inoperable with THERMAL POWER below the P-6 ~~interlock~~ setpoint. Below P-6, the Source Range Neutron Flux channels will be able to monitor the core power level. With one or two ~~intermediate range instrumentation~~ **Intermediate Range Neutron Flux – High reactor trip Function** channels inoperable, three of the four ~~required~~ channels must be restored to OPERABLE status prior to increasing THERMAL POWER above the P-6 setpoint. With the unit in this condition, below P-6, the Source Range Neutron Flux channels perform the monitoring and protection functions.

In the "Actions" section of the Bases for STS Subsection 3.3.3 under the heading "D.1, D.2, and D.3," revise the paragraph as indicated:

Condition D **addresses the situation where** ~~applies to~~ three **or more** Intermediate Range Neutron Flux **– High reactor** trip **Function** channels **are** inoperable ~~in MODE 2 above the P-6 setpoint and below the P-10 setpoint~~. **With three or more channels inoperable, positive reactivity additions that could result in a loss of required SDM must be suspended immediately. This will preclude any power level increase since there are insufficient OPERABLE Intermediate Range Neutron Flux – High reactor trip Function channels to adequately monitor power escalation. In addition, THERMAL POWER must be reduced below the P-6** ~~interlock~~ **setpoint within 2 hours, and the plant must be placed in MODE 3 within 7 hours. The allowed Completion Times for Required Actions D.2 and D.3 are reasonable, based on operating experience, to reach the specified condition from full power conditions in an orderly manner and without challenging plant systems.**

In the "Surveillance Requirements" section of the Bases for STS Subsection 3.3.3 under the heading "SR 3.3.3.2," revise the first paragraph as indicated:

SR 3.3.3.2 is the performance of a ~~RT~~COT. The test is performed in accordance with the SP. If the actual **trip** 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 **Trip Setpoint** to the NTS (within the allowed **as-left** tolerance), and evaluating the ~~channels~~ **channel** response. ...

In the same section, revise the third paragraph as indicated:

A test subsystem is provided with the ~~protection and safety monitoring system~~ **Protection and Safety Monitoring System (PMS)** to aid the plant staff in performing the ~~RT~~COT.

In the same section, revise the ninth, tenth, and eleventh paragraphs as indicated:

~~This~~ **The** ~~test frequency~~ **COT Surveillance Frequency** of 92 days is justified based on Reference 2 **(which refers to this test as "RTCOT")** 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 ~~Protection and Safety Monitoring System~~ **PMS** cabinets to the operator within 10 minutes of a detectable failure.

SR 3.3.3.2 is modified by ~~**two**~~ **a** Note~~**s**~~ ~~**The first Note states** that this test shall include verification that the P-6 and P-10 interlocks are in their required state for the existing unit condition~~. **The** ~~**second**~~ **Note allows this surveillance to be satisfied if it has been performed within 92 days of the Frequencies of prior to reactor startup and** ~~**four**~~**4 hours after reducing power below P-10.**

The Frequency of prior to reactor startup ensures this surveillance is performed prior to critical operations and applies to the ~~source~~ **Source Range Neutron Flux – High (SR 3.3.2.2)**, ~~intermediate~~ **Intermediate Range Neutron Flux – High** and ~~power range low~~ **Power Range Neutron Flux – Low Setpoint (SR 3.3.1.7) reactor trip Function** instrument channels. . . . This test ensures that the ~~NIS intermediate range instrumentation~~ **Intermediate Range Neutron Flux – High reactor trip Function instrumentation** channels are OPERABLE prior to taking the reactor critical and after reducing power into the applicable MODE (< P-10) for periods ~~> 4~~ **of greater than four** hours

In the "Surveillance Requirements" section of the Bases for STS Subsection 3.3.3 under the heading "SR 3.3.3.3," revise the first three paragraphs as indicated, , and move the last two sentences of paragraph 1 to the beginning of paragraph 2 for consistency with the Bases for STS SR 3.3.1.8:

~~SR 3.3.3.3 is the performance of a~~ **A** CHANNEL CALIBRATION **is performed** every 24 months **or approximately at every refueling**. This SR is modified by a Note stating that neutron detectors are excluded from the CHANNEL CALIBRATION. ~~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~~.

The ~~test~~ **CHANNEL CALIBRATION** is performed in accordance with the SP. If the actual **trip** 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~~ **channel Trip Setpoint** to the NTS (within the allowed **as-left** tolerance), and evaluating the **channel** response. ...

The CHANNEL CALIBRATION for the ~~intermediate range neutron~~ **Intermediate Range Neutron Flux** detectors consists of obtaining the detector plateau curves, evaluating those curves, and comparing the curves to the manufacturer's data. This Surveillance is not required for the ~~intermediate range~~ **Intermediate Range Neutron Flux** detectors for entry into MODE 2, because the plant must be in at least MODE 2 to perform the test.

7. (Internal # 126) In the "ASA, LCO, and Applicability" section of the Bases for STS Subsections 3.3.1 through 3.3.7, revise the opening sentence to state:

   > The RTS functions to maintain **compliance with** the SLs during all AOOs and mitigates the consequences of DBAs in all MODES in which the **reactor trip breakers (**RTBs**)** are closed.

   This provides additional clarity. This is resolved by making the recommended change.

8. (Internal # 135) The "Surveillance Requirements" section of the Bases under the heading "SR 3.3.1.7," states that the Frequency is "prior to startup." The TS SR 3.3.1.7 Frequency is actually "prior to reactor startup." Change "prior to startup" to "prior to reactor startup" This is resolved by making the recommended change with additional edits including the Bases discussion for SR 3.3.3.2 as shown in the resolution of comments for comment # 119 above.

9. (Internal # 147) In GTST Section VI under the heading "Description of changes in RCOL Std. Dep., RCOL COL Item(s), and RCOL PTS Changes:," DOC M02 addresses the fact that MTS 3.3.3 "does not specify Actions for inoperability of more than two inoperable intermediate range channels with power above P-6..." DOC M02 also discussed that there are no Actions for this condition when below P-6. This portion of the change needs to be described here. By deleting the phrase "with power above P-6," it would apply both above and below P-6. Delete the phrase "with power above P-6" This is resolved by making the recommended change with additional clarifying edits to correctly describe the GTS 3.3.1 action requirements and correct the rationale discussion for DOC M02. Replace the description of DOC M02 with the following:

   > DOC M02 addresses the fact that MTS 3.3.3, "Reactor Trip System (RTS) Intermediate Range Instrumentation," does not specify Actions for inoperability of more than three inoperable Intermediate Range Neutron Flux channels with power above P-6, or more than two inoperable Intermediate Range Neutron Flux channels below P-6. This results in entry into LCO 3.0.3 when additional channels are inoperable.

   Replace the rationale for DOC M02 with the following:

   > DOC M02 directly provides for the default Actions of LCO 3.0.3 in STS 3.3.3.Required Action D.3 by allowing 7 hours to be in MODE 3 in the event three or more Intermediate Range Neutron Flux channels are inoperable, regardless of whether power is above or below P-6. This is more restrictive because Required Action D.3 does not explicitly specify the 1 hour delay in commencing the power reduction that LCO 3.0.3 permits. This simplified presentation clarifies the shutdown actions making them easier to implement by the unit operator.

10. (Internal # 148 and 149) In GTST Section VII under the heading "GTST Safety Evaluation" the sixth paragraph states, "Based on the DOC L01 changes, an RTCOT is not required by the TS. Therefore, the Section 1.1 RTCOT definition is deleted." The definition of RTCOT is deleted for a series of reasons as described in DOC M01. Replace sentences with "Current section 1.1 definition of RTCOT is deleted per DOC M01." This is resolved by making the recommended GTST change (consistent with comment # 117 and 142):

The GTS/PTS Section 1.1 definition of RTCOT is deleted for a series of reasons as described in DOC M01. Changes made by DOC M01 result in consistency with the use of Actuation Logic Test and COT in other TS requirements, are consistent with the intent of the required TS testing, and are consistent with NUREG-1431, Rev.4.

11. (Internal # 150) In GTST Section VII under heading “Technical Analysis,” the discussion states the Required Action is changed to state, “Suspend positive reactivity additions that could result in a loss of SDM,” consistent with TSTF-469-T. TSTF-469-T and the AP1000 STS markups state, “Suspend positive reactivity additions that could result in a loss of required SDM.” Revise the discussions to add the word “required” to be consistent with the TS markups. This is resolved by making the recommended GTST change.

12. (Internal # 151) The logical “OR” connector between Required Actions A.1 and A.2 is not underlined. Underline “OR” between Required Actions A.1 and A.2. This is resolved by making the recommended GTST change.

13. (Internal # 152) In the “Surveillance Requirements” section of the Bases for STS Subsection 3.3.3 under the heading “SR 3.3.3.2,” the second paragraph, states there are two Notes to SR 3.3.3.2. The first note described concerning P-6 and P-10 interlocks is not in the actual SR 3.3.3.2. Delete references to the first Note. There is only one Note that needs to be described. This is resolved by making the recommended change with additional edits including the “Surveillance Requirements” section of the Bases as shown in the resolution of comments for comment # 119 above.

NRC Final Approval Date: 12/14/2015

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

None

X. References Used in GTST

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

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

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

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

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

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

4. TSTF-286, Revision 2, “Define “Operations Involving Positive Reactivity Additions.”

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

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. 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)

8. 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

3.3.3 Reactor Trip System (RTS) Intermediate Range Instrumentation

LCO 3.3.3 Four channels of RTS Intermediate Range Neutron Flux – High Instrumentation shall be OPERABLE.

APPLICABILITY: MODE 1 with Power Range Neutron Flux below the P-10 interlock, MODE 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One channel inoperable with THERMAL POWER ≥ P-6.	A.1 Place one inoperable channel in bypass or trip. OR A.2 Reduce THERMAL POWER to < P-6. OR A.3 Increase THERMAL POWER to > P-10.	2 hours 2 hours 2 hours
B. Two channels inoperable with THERMAL POWER ≥ P-6.	B.1.1 Place one inoperable channel in bypass. AND B.1.2 Place one inoperable channel in trip. OR	2 hours 2 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.2 Reduce THERMAL POWER to < P-6. OR B.3 Increase THERMAL POWER to > P-10.	2 hours 2 hours
C. One or two channels inoperable with THERMAL POWER < P-6.	C.1 Restore three of four channels to OPERABLE status.	Prior to increasing THERMAL POWER to > P-6
D. **Three or more** ~~THERMAL POWER between P-6 and P-10, three Intermediate Range Neutron Flux~~ channels inoperable.	D.1 Suspend ~~operations involving~~ positive reactivity additions **that could result in a loss of required SDM**. AND D. 2 Reduce THERMAL POWER to < P-6. **AND** **D.3 Be in MODE 3.**	Immediately 2 hours **7 hours**

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.3.1	Perform CHANNEL CHECK.	12 hours

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.3.2	----------NOTE~~S~~---------- - ~~This Surveillance shall include verification that interlocks P-6 and P-10 are in their required state for existing unit conditions.~~ **Only required to be performed when not performed within previous 92 days.** ---------- Perform ~~RT~~COT in accordance with Setpoint Program.	~~-----NOTE-----~~ ~~Only required when not performed within previous 92 days~~ ~~----------~~ Prior to reactor startup <u>AND</u> 4 hours after reducing power below P-10 <u>AND</u> 92 days thereafter
SR 3.3.3.3	----------NOTE---------- Neutron detectors are excluded from CHANNEL CALIBRATION. ---------- Perform CHANNEL CALIBRATION in accordance with Setpoint Program.	24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.3.4	----------NOTE---------- Neutron detectors are excluded from response time testing. ---------- Verify RTS RESPONSE TIME is within limits.	24 months on a STAGGERED TEST BASIS

B 3.3 INSTRUMENTATION

B 3.3.3 Reactor Trip System (RTS) Intermediate Range Instrumentation

BASES

BACKGROUND

A description of the RTS Instrumentation is provided in the Bases for LCO 3.3.1, “Reactor Trip System (RTS) Instrumentation.”

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The RTS functions to maintain **compliance with** the SLs during all AOOs and mitigates the consequences of DBAs in all MODES in which the **reactor trip breakers (**RTBs**)** are closed.

The Intermediate Range Neutron Flux – High trip Function ensures that protection is provided against an uncontrolled RCCA bank withdrawal accident from a subcritical condition during startup. This trip Function provides redundant protection to the Power Range Neutron Flux – Low Setpoint trip Function. The Protection and **Safety** ~~safety~~ Monitoring System (PMS) **Intermediate Range Neutron Flux** ~~intermediate range~~ detectors are located external to the reactor vessel and measure neutrons leaking from the core. The safety analyses do not take credit for the Intermediate Range Neutron Flux trip Function. Even though the safety analyses take no credit for the Intermediate Range Neutron Flux trip, the functional capability at the specified Trip Setpoint enhances the overall diversity of the RTS. The Trip Setpoint reflects only steady state instrument uncertainties as the detectors do not provide primary protection for any events that result in a harsh environment. This trip **Function** can be manually blocked by the main control room operator when above the P-10 setpoint, which is the respective PMS **division Power Range Neutron Flux** ~~power range~~ channel greater than 10% power, and is automatically unblocked when below the P-10 setpoint, which is the respective PMS **division Power Range Neutron Flux** ~~power range~~ channel less than 10% power.

This Function also provides a signal to prevent automatic and manual rod withdrawal prior to initiating a reactor trip. Limiting further rod withdrawal may terminate the transient and eliminate the need to trip the reactor.

The LCO requires four channels of Intermediate Range Neutron Flux to be OPERABLE. Four channels are provided to permit one channel in trip or bypass indefinitely and still ensure no single random failure will disable this trip Function.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

In MODE 1 below the P-10 setpoint, and in MODE 2, when there is a potential for an uncontrolled rod withdrawal accident during reactor startup, the Intermediate Range Neutron Flux trip must be OPERABLE. Above the P-10 setpoint, the Power Range Neutron Flux – High Setpoint trip and the Power Range Neutron Flux – High Positive Rate trip provide core protection for a rod withdrawal accident. In MODE 3, 4, or 5, the Intermediate Range Neutron Flux trip does not have to be OPERABLE because the control rods must be fully inserted and only the shutdown rods may be withdrawn. The reactor cannot be started up in this condition. The core also has the required SDM to mitigate the consequences of a positive reactivity addition accident. In MODE 6, all rods are fully inserted and the core has a required increased SDM. Also, the **Intermediate Range Neutron Flux** ~~PMS intermediate range~~ detectors cannot detect neutron **flux** levels present in this MODE.

The RTS **Intermediate Range instrumentation (Neutron Flux – High trip Function)** ~~Automatic Trip Logic~~ satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

ACTIONS

In the event a channel's as-found condition is outside the as-found tolerance described in the SP, or the channel is not functioning as required, or the transmitter, instrument loop, signal processing electronics, or trip output is found inoperable, then all affected Functions provided by that channel must be declared inoperable and the LCO Condition(s) entered for the protection Function(s) affected.

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

Condition A addresses the situation where one **Intermediate Range Neutron Flux – High reactor trip Function** ~~intermediate range instrumentation~~ channel is inoperable with THERMAL POWER greater than or equal to the P-6 ~~interlock~~ setpoint. With one ~~or two~~ channel~~s~~ inoperable, **the** ~~one~~ affected channel must be placed in a bypass or trip condition within 2 hours, or THERMAL POWER must be either reduced below the P-6 ~~interlock~~ setpoint or increased above the P-10 ~~interlock~~ setpoint within 2 hours. If one channel is bypassed, the logic becomes two-out-of-three, while still meeting the single failure criterion. (A failure in one of the three remaining channels will not prevent the protective function.) If one channel is tripped, the logic becomes one-out-of-three, while still meeting the single failure criterion. (A failure in one of the three remaining channels will not prevent the protective function.) The 2 hours

BASES

ACTIONS (continued)

allowed to place the inoperable channel(s) in the bypassed or tripped condition is justified in Reference **1**~~2~~.

As an alternative to placing the inoperable channel~~(s)~~ in bypass or trip if THERMAL POWER is greater than the P-6 setpoint but less than the P-10 setpoint, 2 hours are allowed to reduce THERMAL POWER below the P-6 setpoint or to increase ~~the~~ THERMAL POWER above the P-10 setpoint. The Intermediate Range Neutron Flux channels must be OPERABLE when the power level is above the capability of the **Source Range Neutron Flux detectors** ~~source range~~, P-6, and below the capability of the **Power Range Neutron Flux detectors** ~~power range~~, P-10. If THERMAL POWER is greater than the P-10 setpoint, the **Power Range Neutron Flux channels** ~~PMS power range detectors~~ perform the monitoring and protective functions and the **Intermediate Range Neutron Flux channels are** ~~intermediate range is~~ not required. The Completion Times allow for a slow and controlled power adjustment below P-6, and take~~s~~ into account the redundant capability afforded by the **three** ~~two~~ remaining OPERABLE **Intermediate Range Neutron Flux – High reactor trip Function** channels and the low probability of their failure during this period.

B.1.1, B.1.2, B.2, and B.3

Condition B addresses the situation where two **Intermediate Range Neutron Flux – High** ~~intermediate range instrumentation~~ channels are inoperable with THERMAL POWER greater than or equal to the P-6 ~~interlock~~ setpoint. With two **Intermediate Range Neutron Flux – High** ~~intermediate range~~ channels inoperable, one inoperable channel must be placed in a bypass condition and one inoperable channel must be placed in a trip condition within 2 hours, or THERMAL POWER must be either reduced below the P-6 ~~interlock~~ setpoint or increased above the P-10 ~~interlock~~ setpoint within 2 hours. If one channel is bypassed and one channel is tripped, the logic becomes one-out-of-two, while still meeting the single failure criterion. The 2 hours allowed to place the inoperable channel(s) in the bypassed or tripped condition is justified in Reference **1**~~2~~.

As an alternative to placing the channels in bypass or trip if THERMAL POWER is greater than the P-6 setpoint but less than the P-10 setpoint, 2 hours are allowed to reduce THERMAL POWER below the P-6 setpoint or to increase the THERMAL POWER above the P-10 setpoint. The Intermediate Range Neutron Flux channels must be OPERABLE when

BASES

ACTIONS (continued)

the power level is above the capability of the **Source Range Neutron Flux detectors** ~~source range~~, P-6, and below the capability of the **Power Range Neutron Flux detectors** ~~power range~~, P-10. If THERMAL POWER is greater than the P-10 setpoint, the **Power Range Neutron Flux channels** ~~PMS power range detectors~~ perform the monitoring and protective functions and the **Intermediate Range Neutron Flux channels are** ~~intermediate range is~~ not required. The Completion Times allow for a slow and controlled power adjustment below P-6, and takes into account the redundant capability afforded by the two remaining OPERABLE channels and the low probability of their failure during this period.

C.1

Condition C addresses the situation of one or two **Intermediate Range Neutron Flux – High reactor trip Function** ~~intermediate range instrumentation~~ channels are inoperable with THERMAL POWER below the P-6 ~~interlock~~ setpoint. Below P-6, the Source Range Neutron Flux channels will be able to monitor the core power level. With one or two **Intermediate Range Neutron Flux – High reactor trip Function** ~~intermediate range instrumentation~~ channels inoperable, three of the four ~~required~~ channels must be restored to OPERABLE status prior to increasing THERMAL POWER above the P-6 setpoint. With the unit in this condition, below P-6, the Source Range Neutron Flux channels perform the monitoring and protection functions.

D.1**, D.2,** and **D.3** ~~D.2~~

Condition D **addresses the situation where** ~~applies to~~ three **or more** Intermediate Range Neutron Flux **– High reactor** trip **Function** channels **are** inoperable ~~in MODE 2 above the P-6 setpoint and below the P-10 setpoint~~. **With three or more channels inoperable, positive reactivity additions that could result in a loss of required SDM must be suspended immediately. This will preclude any power level increase since there are insufficient OPERABLE Intermediate Range Neutron Flux – High reactor trip Function channels to adequately monitor power escalation. In addition, THERMAL POWER must be reduced below the P-6 setpoint within 2 hours, and the plant must be placed in MODE 3 within 7 hours. The allowed Completion Times for Required Actions D.2 and D.3 are reasonable, based on operating experience, to reach the specified condition from full power conditions in an orderly manner and without challenging plant**

BASES

ACTIONS (continued)

systems. ~~Required Actions specified in this Condition are only applicable when channel failures do not result in reactor trip. Above the P-6 setpoint and below the P-10 setpoint, the PMS intermediate range detector performs the monitoring Functions. With only one intermediate range channel OPERABLE, the Required Actions are to suspend operations involving positive reactivity additions immediately. This will preclude any power level increase since there are insufficient OPERABLE Intermediate Range Neutron Flux channels to adequately monitor the power escalation. The operator must also reduce THERMAL POWER below the P-6 setpoint within 2 hours. Below P-6, the Source Range Neutron Flux channels will be able to monitor the core power level. The Completion Time of 2 hours will allow a slow and controlled power reduction to less than the P-6 setpoint and takes into account the low probability of occurrence of an event during this period that may require the protection afforded by the PMS Intermediate Range Neutron Flux trip.~~

SURVEILLANCE REQUIREMENTS

The CHANNEL CALIBRATION and ~~RT~~COT are performed in a manner that is consistent with the assumptions used in analytically calculating the required channel accuracies. For channels that include dynamic transfer functions, such as, lag, lead/lag, rate/lag, the response time test may be performed with the transfer function set to one, with the resulting measured response time compared to the appropriate **FSAR** Chapter 7 response time (Ref. **2**~~1~~). 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.

SR 3.3.3.1

Performance of the CHANNEL CHECK once every 12 hours ensures that gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally 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 of even something more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying that

BASES

SURVEILLANCE REQUIREMENTS (continued)

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 criteria, it may be an indication that the sensor or the signal processing equipment have drifted outside their corresponding limits.

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

SR 3.3.3.2

SR 3.3.3.2 is the performance of a ~~RT~~COT. The test is performed in accordance with the SP. If the actual **trip** 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 **Trip Setpoint** ~~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 ~~RT~~COT is performed on each required channel to provide reasonable assurance that the entire channel will perform the intended Function.

A test subsystem is provided with the **Protection and Safety Monitoring System (PMS)** ~~protection and safety monitoring system~~ to aid the plant staff in performing the ~~RT~~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 ~~RT~~COT shall include a review of the operation of the test subsystem to verify the completeness and adequacy of the results.

If the ~~RT~~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 ~~RT~~COT can be performed using portable test equipment.

Interlocks implicitly required to support the Function's OPERABILITY are also addressed by this COT. This portion of the COT ensures the associated Function is not bypassed when required to be enabled. This can be accomplished by ensuring the interlocks are calibrated properly in accordance with the SP. If the interlock is not automatically functioning as designed, the condition is entered into the Corrective Action Program and appropriate OPERABILITY evaluations performed for the affected Function. The affected Function's OPERABILITY can be met if the interlock is manually enforced to properly enable the affected Function. When an interlock is not supporting the associated Function's OPERABILITY at the existing plant conditions, the affected Function's channels must be declared inoperable and appropriate ACTIONS taken.

The COT Surveillance Frequency ~~This test frequency~~ of 92 days is justified based on Reference 2 **(which refers to this test as "RTCOT")** 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 **PMS** ~~protection and safety monitoring system~~ cabinets to the operator within 10 minutes of a detectable failure.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.3.2 is modified by a Note ~~that this test shall include verification that the P-6 and P-10 interlocks are in their required state for the existing unit condition~~. **The Note allows this surveillance to be satisfied if it has been performed within 92 days of the Frequencies of prior to reactor startup and 4 hours after reducing power below P-10.**

~~The Frequency is modified by a Note that allows this surveillance to be satisfied if it has been performed within 92 days of the Frequencies prior to reactor startup and four hours after reducing power below P-10 and P-6.~~ The Frequency of ~~"~~prior to reactor startup~~"~~ ensures this surveillance is performed prior to critical operations and applies to the **Source Range Neutron Flux – High (SR 3.3.2.2)** ~~source~~, **Intermediate Range Neutron Flux – High,** ~~intermediate~~ and **Power Range Neutron Flux – Low Setpoint (SR 3.3.1.7) reactor trip Function** ~~power range low~~ instrument channels. The Frequency of ~~"~~4 hours after reducing power below P-10~~"~~ allows a normal shutdown to be completed and the unit removed from the MODE of Applicability for this surveillance without a delay to perform the testing required by this surveillance. The Frequency of every 92 days thereafter applies if the plant remains in the MODE of Applicability after the initial performances of prior to reactor startup and four hours after reducing power below P-10. The MODE of Applicability for this surveillance is < P-10. Once the unit is in MODE 3, this surveillance is no longer required. If power is to be maintained < P-10 for more than 4 hours, then the testing required by this surveillance must be performed prior to the expiration of the 4 hour limit. Four hours is a reasonable time to complete the required testing or place the unit in a MODE where this surveillance is no longer required. This test ensures that the **Intermediate Range Neutron Flux – High reactor trip Function instrument** ~~NIS intermediate range instrumentation~~ channels are OPERABLE prior to taking the reactor critical and after reducing power into the applicable MODE (< P-10) for periods **of greater than four** ~~> 4~~ hours.

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

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.3.3

A ~~SR 3.3.3.3 is the performance of a~~ CHANNEL CALIBRATION **is performed** every 24 months **or approximately at every refueling**. This SR is modified by a Note stating that neutron detectors are excluded from the CHANNEL CALIBRATION. ~~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.~~

The CHANNEL CALIBRATION is performed in accordance with the SP. If the actual trip 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 **Trip Setpoint** ~~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.

The CHANNEL CALIBRATION for the **Intermediate Range Neutron Flux** ~~intermediate range neutron~~ detectors consists of obtaining the detector plateau curves, evaluating those curves, and comparing the curves to the manufacturer's data. This Surveillance is not required for the **Intermediate Range Neutron Flux** ~~intermediate range~~ detectors for entry into MODE 2, because the plant must be in at least MODE 2 to perform the test.

Interlocks implicitly required to support the Function's OPERABILITY are also addressed by this CHANNEL CALIBRATION. This portion of the CHANNEL CALIBRATION ensures the associated Function is not bypassed when required to be enabled. This can be accomplished by ensuring the interlocks are calibrated properly in accordance with the SP. If the interlock is not automatically functioning as designed, the condition is entered into the Corrective Action Program and appropriate OPERABILITY evaluations performed for the affected Function. The affected Function's OPERABILITY can be met if the interlock is manually enforced to properly enable the affected Function. When an interlock is not supporting the associated Function's OPERABILITY at the existing

BASES

SURVEILLANCE REQUIREMENTS (continued)

plant conditions, the affected Function's channels must be declared inoperable and appropriate ACTIONS taken.

The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown these components usually pass the Surveillance when performed on the 24 month Frequency.

SR 3.3.3.4

This SR 3.3.3.4 verifies that the individual channel actuation response times are less than or equal to the maximum values assumed in the accident analysis. Response Time testing criteria are included in Reference **2**~~1~~.

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 Function set to one, with the resulting measured response time compared to the appropriate **FSAR** ~~DCD~~ Chapter 7 **(Ref. 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.

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.

Each channel response must be verified every 24 months on a STAGGERED TEST BASIS (i.e., all four Protection Channel Sets would be tested after 96 months). Response times cannot be determined during plant operation because equipment operation is required to measure response times. Experience has shown that these components usually pass this surveillance when performed on a refueling frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.3.4 is modified by a note exempting neutron detectors from RTS RESPONSE TIME testing. This Note is necessary because of the difficulty in generating an appropriate detector input signal. Excluding the detectors is acceptable because the principles of detector operation ensure a virtually instantaneous response.

REFERENCES

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

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

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

3.3.3 Reactor Trip System (RTS) Intermediate Range Instrumentation

LCO 3.3.3 Four channels of RTS Intermediate Range Neutron Flux – High Instrumentation shall be OPERABLE.

APPLICABILITY: MODE 1 with Power Range Neutron Flux below the P-10 interlock, MODE 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One channel inoperable with THERMAL POWER ≥ P-6.	A.1 Place one inoperable channel in bypass or trip. OR	2 hours
	A.2 Reduce THERMAL POWER to < P-6. OR	2 hours
	A.3 Increase THERMAL POWER to > P-10.	2 hours
B. Two channels inoperable with THERMAL POWER ≥ P-6.	B.1.1 Place one inoperable channel in bypass. AND	2 hours
	B.1.2 Place one inoperable channel in trip. OR	2 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.2 Reduce THERMAL POWER to < P-6. OR B.3 Increase THERMAL POWER to > P-10.	2 hours 2 hours
C. One or two channels inoperable with THERMAL POWER < P-6.	C.1 Restore three of four channels to OPERABLE status.	Prior to increasing THERMAL POWER to > P-6
D. Three or more channels inoperable.	D.1 Suspend positive reactivity additions that could result in a loss of required SDM. AND D. 2 Reduce THERMAL POWER to < P-6. AND D.3 Be in MODE 3.	Immediately 2 hours 7 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.3.1	Perform CHANNEL CHECK.	12 hours

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.3.2	----------NOTE---------- Only required to be performed when not performed within previous 92 days. ---------- Perform COT in accordance with Setpoint Program.	Prior to reactor startup AND 4 hours after reducing power below P-10 AND 92 days thereafter
SR 3.3.3.3	----------NOTE---------- Neutron detectors are excluded from CHANNEL CALIBRATION. ---------- Perform CHANNEL CALIBRATION in accordance with Setpoint Program.	24 months
SR 3.3.3.4	----------NOTE---------- Neutron detectors are excluded from response time testing. ---------- Verify RTS RESPONSE TIME is within limits.	24 months on a STAGGERED TEST BASIS

B 3.3 INSTRUMENTATION

B 3.3.3 Reactor Trip System (RTS) Intermediate Range Instrumentation

BASES

BACKGROUND

A description of the RTS Instrumentation is provided in the Bases for LCO 3.3.1, “Reactor Trip System (RTS) Instrumentation.”

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The RTS functions to maintain compliance with the SLs during all AOOs and mitigates the consequences of DBAs in all MODES in which the reactor trip breakers (RTBs) are closed.

The Intermediate Range Neutron Flux – High trip Function ensures that protection is provided against an uncontrolled RCCA bank withdrawal accident from a subcritical condition during startup. This trip Function provides redundant protection to the Power Range Neutron Flux – Low Setpoint trip Function. The Protection and Safety Monitoring System (PMS) Intermediate Range Neutron Flux detectors are located external to the reactor vessel and measure neutrons leaking from the core. The safety analyses do not take credit for the Intermediate Range Neutron Flux trip Function. Even though the safety analyses take no credit for the Intermediate Range Neutron Flux trip, the functional capability at the specified Trip Setpoint enhances the overall diversity of the RTS. The Trip Setpoint reflects only steady state instrument uncertainties as the detectors do not provide primary protection for any events that result in a harsh environment. This trip Function can be manually blocked by the main control room operator when above the P-10 setpoint, which is the respective PMS division Power Range Neutron Flux channel greater than 10% power, and is automatically unblocked when below the P-10 setpoint, which is the respective PMS division Power Range Neutron Flux channel less than 10% power.

This Function also provides a signal to prevent automatic and manual rod withdrawal prior to initiating a reactor trip. Limiting further rod withdrawal may terminate the transient and eliminate the need to trip the reactor.

The LCO requires four channels of Intermediate Range Neutron Flux to be OPERABLE. Four channels are provided to permit one channel in trip or bypass indefinitely and still ensure no single random failure will disable this trip Function.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

In MODE 1 below the P-10 setpoint, and in MODE 2, when there is a potential for an uncontrolled rod withdrawal accident during reactor startup, the Intermediate Range Neutron Flux trip must be OPERABLE. Above the P-10 setpoint, the Power Range Neutron Flux – High Setpoint trip and the Power Range Neutron Flux – High Positive Rate trip provide core protection for a rod withdrawal accident. In MODE 3, 4, or 5, the Intermediate Range Neutron Flux trip does not have to be OPERABLE because the control rods must be fully inserted and only the shutdown rods may be withdrawn. The reactor cannot be started up in this condition. The core also has the required SDM to mitigate the consequences of a positive reactivity addition accident. In MODE 6, all rods are fully inserted and the core has a required increased SDM. Also, the Intermediate Range Neutron Flux detectors cannot detect neutron flux levels present in this MODE.

The RTS Intermediate Range instrumentation (Neutron Flux – High trip Function) satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

ACTIONS

In the event a channel's as-found condition is outside the as-found tolerance described in the SP, or the channel is not functioning as required, or the transmitter, instrument loop, signal processing electronics, or trip output is found inoperable, then all affected Functions provided by that channel must be declared inoperable and the LCO Condition(s) entered for the protection Function(s) affected.

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

Condition A addresses the situation where one Intermediate Range Neutron Flux – High reactor trip Function channel is inoperable with THERMAL POWER greater than or equal to the P-6 setpoint. With one channel inoperable, the affected channel must be placed in a bypass or trip condition within 2 hours, or THERMAL POWER must be either reduced below the P-6 setpoint or increased above the P-10 setpoint within 2 hours. If one channel is bypassed, the logic becomes two-out-of-three, while still meeting the single failure criterion. (A failure in one of the three remaining channels will not prevent the protective function.) If one channel is tripped, the logic becomes one-out-of-three, while still meeting the single failure criterion. (A failure in one of the three remaining channels will not prevent the protective function.) The 2 hours allowed to place the inoperable channel(s) in the bypassed or tripped condition is justified in Reference 1.

BASES

ACTIONS (continued)

As an alternative to placing the inoperable channel in bypass or trip if THERMAL POWER is greater than the P-6 setpoint but less than the P-10 setpoint, 2 hours are allowed to reduce THERMAL POWER below the P-6 setpoint or to increase THERMAL POWER above the P-10 setpoint. The Intermediate Range Neutron Flux channels must be OPERABLE when the power level is above the capability of the Source Range Neutron Flux detectors, P-6, and below the capability of the Power Range Neutron Flux detectors, P-10. If THERMAL POWER is greater than the P-10 setpoint, the Power Range Neutron Flux channels perform the monitoring and protective functions and the Intermediate Range Neutron Flux channels are not required. The Completion Times allow for a slow and controlled power adjustment below P-6, and take into account the redundant capability afforded by the three remaining OPERABLE Intermediate Range Neutron Flux – High reactor trip Function channels and the low probability of their failure during this period.

B.1.1, B.1.2, B.2, and B.3

Condition B addresses the situation where two Intermediate Range Neutron Flux – High channels are inoperable with THERMAL POWER greater than or equal to the P-6 setpoint. With two Intermediate Range Neutron Flux – High channels inoperable, one inoperable channel must be placed in a bypass condition and one inoperable channel must be placed in a trip condition within 2 hours, or THERMAL POWER must be either reduced below the P-6 setpoint or increased above the P-10 setpoint within 2 hours. If one channel is bypassed and one channel is tripped, the logic becomes one-out-of-two, while still meeting the single failure criterion. The 2 hours allowed to place the inoperable channel(s) in the bypassed or tripped condition is justified in Reference 1.

As an alternative to placing the channels in bypass or trip if THERMAL POWER is greater than the P-6 setpoint but less than the P-10 setpoint, 2 hours are allowed to reduce THERMAL POWER below the P-6 setpoint or to increase the THERMAL POWER above the P-10 setpoint. The Intermediate Range Neutron Flux channels must be OPERABLE when the power level is above the capability of the Source Range Neutron Flux detectors, P-6, and below the capability of the Power Range Neutron Flux detectors, P-10. If THERMAL POWER is greater than the P-10 setpoint, the Power Range Neutron Flux channels perform the monitoring and protective functions and the Intermediate Range Neutron Flux channels are not required. The Completion Times allow for a slow and

BASES

ACTIONS (continued)

controlled power adjustment below P-6, and takes into account the redundant capability afforded by the two remaining OPERABLE channels and the low probability of their failure during this period.

C.1

Condition C addresses the situation of one or two Intermediate Range Neutron Flux – High reactor trip Function channels are inoperable with THERMAL POWER below the P-6 setpoint. Below P-6, the Source Range Neutron Flux channels will be able to monitor the core power level. With one or two Intermediate Range Neutron Flux – High reactor trip Function channels inoperable, three of the four channels must be restored to OPERABLE status prior to increasing THERMAL POWER above the P-6 setpoint. With the unit in this condition, below P-6, the Source Range Neutron Flux channels perform the monitoring and protection functions.

D.1, D.2, and D.3

Condition D addresses the situation where three or more Intermediate Range Neutron Flux – High reactor trip Function channels are inoperable. With three or more channels inoperable, positive reactivity additions that could result in a loss of required SDM must be suspended immediately. This will preclude any power level increase since there are insufficient OPERABLE Intermediate Range Neutron Flux – High reactor trip Function channels to adequately monitor power escalation. In addition, THERMAL POWER must be reduced below the P-6 setpoint within 2 hours, and the plant must be placed in MODE 3 within 7 hours. The allowed Completion Times for Required Actions D.2 and D.3 are reasonable, based on operating experience, to reach the specified condition from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

The CHANNEL CALIBRATION and COT are performed in a manner that is consistent with the assumptions used in analytically calculating the required channel accuracies. For channels that include dynamic transfer functions, such as, lag, lead/lag, rate/lag, the response time test may be performed with the transfer function set to one, with the resulting measured response time compared to the appropriate FSAR Chapter 7 response time (Ref. 2). Alternately, the response time test can be performed with the time constants set to their nominal value provided the

BASES

SURVEILLANCE REQUIREMENTS (continued)

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.

SR 3.3.3.1

Performance of the CHANNEL CHECK once every 12 hours ensures that gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally 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 of even something more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying that 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 criteria, it may be an indication that the sensor or the signal processing equipment have drifted outside their corresponding limits.

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

SR 3.3.3.2

SR 3.3.3.2 is the performance of a COT. The test is performed in accordance with the SP. If the actual trip 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 Trip Setpoint to the NTS (within the allowed as-left tolerance), and evaluating the channel 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

BASES

SURVEILLANCE REQUIREMENTS (continued)

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 Function.

A test subsystem is provided with the Protection and Safety Monitoring System (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.

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.

Interlocks implicitly required to support the Function's OPERABILITY are also addressed by this COT. This portion of the COT ensures the associated Function is not bypassed when required to be enabled. This can be accomplished by ensuring the interlocks are calibrated properly in accordance with the SP. If the interlock is not automatically functioning as designed, the condition is entered into the Corrective Action Program and appropriate OPERABILITY evaluations performed for the affected Function. The affected Function’s OPERABILITY can be met if the interlock is manually enforced to properly enable the affected Function.

BASES

SURVEILLANCE REQUIREMENTS (continued)

When an interlock is not supporting the associated Function's OPERABILITY at the existing plant conditions, the affected Function's channels must be declared inoperable and appropriate ACTIONS taken.

The COT Surveillance Frequency of 92 days is justified based on Reference 2 (which refers to this test as "RTCOT") 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 PMS cabinets to the operator within 10 minutes of a detectable failure.

SR 3.3.3.2 is modified by a Note. The Note allows this surveillance to be satisfied if it has been performed within 92 days of the Frequencies of prior to reactor startup and 4 hours after reducing power below P-10.

The Frequency of prior to reactor startup ensures this surveillance is performed prior to critical operations and applies to the Source Range Neutron Flux – High (SR 3.3.2.2), Intermediate Range Neutron Flux – High, and Power Range Neutron Flux – Low Setpoint (SR 3.3.1.7) reactor trip Function instrument channels. The Frequency of 4 hours after reducing power below P-10 allows a normal shutdown to be completed and the unit removed from the MODE of Applicability for this surveillance without a delay to perform the testing required by this surveillance. The Frequency of every 92 days thereafter applies if the plant remains in the MODE of Applicability after the initial performances of prior to reactor startup and four hours after reducing power below P-10. The MODE of Applicability for this surveillance is < P-10. Once the unit is in MODE 3, this surveillance is no longer required. If power is to be maintained < P-10 for more than 4 hours, then the testing required by this surveillance must be performed prior to the expiration of the 4 hour limit. Four hours is a reasonable time to complete the required testing or place the unit in a MODE where this surveillance is no longer required. This test ensures that the Intermediate Range Neutron Flux – High reactor trip Function instrument channels are OPERABLE prior to taking the reactor critical and after reducing power into the applicable MODE (< P-10) for periods of greater than four hours.

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

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.3.3

A CHANNEL CALIBRATION is performed every 24 months or approximately at every refueling. This SR is modified by a Note stating that neutron detectors are excluded from the CHANNEL CALIBRATION.

The CHANNEL CALIBRATION is performed in accordance with the SP. If the actual trip 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 Trip Setpoint to the NTS (within the allowed as-left tolerance), and evaluating the channel 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.

The CHANNEL CALIBRATION for the Intermediate Range Neutron Flux detectors consists of obtaining the detector plateau curves, evaluating those curves, and comparing the curves to the manufacturer's data. This Surveillance is not required for the Intermediate Range Neutron Flux detectors for entry into MODE 2, because the plant must be in at least MODE 2 to perform the test.

Interlocks implicitly required to support the Function's OPERABILITY are also addressed by this CHANNEL CALIBRATION. This portion of the CHANNEL CALIBRATION ensures the associated Function is not bypassed when required to be enabled. This can be accomplished by ensuring the interlocks are calibrated properly in accordance with the SP. If the interlock is not automatically functioning as designed, the condition is entered into the Corrective Action Program and appropriate OPERABILITY evaluations performed for the affected Function. The affected Function's OPERABILITY can be met if the interlock is manually enforced to properly enable the affected Function. When an interlock is not supporting the associated Function's OPERABILITY at the existing plant conditions, the affected Function's channels must be declared inoperable and appropriate ACTIONS taken.

BASES

SURVEILLANCE REQUIREMENTS (continued)

The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown these components usually pass the Surveillance when performed on the 24 month Frequency.

SR 3.3.3.4

This SR 3.3.3.4 verifies that the individual channel actuation response times are less than or equal to the maximum values assumed in the accident analysis. Response Time testing criteria are included in Reference 2.

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 Function set to one, with the resulting measured response time compared to the appropriate FSAR Chapter 7 (Ref. 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.

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.

Each channel response must be verified every 24 months on a STAGGERED TEST BASIS (i.e., all four Protection Channel Sets would be tested after 96 months). Response times cannot be determined during plant operation because equipment operation is required to measure response times. Experience has shown that these components usually pass this surveillance when performed on a refueling frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.3.4 is modified by a note exempting neutron detectors from RTS RESPONSE TIME testing. This Note is necessary because of the difficulty in generating an appropriate detector input signal. Excluding the detectors is acceptable because the principles of detector operation ensure a virtually instantaneous response.

REFERENCES

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

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