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

Title: Changes Related to LCO 3.3.17, Post Accident Monitoring (PAM) 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-359-A, Rev 9,	Increase Flexibility in MODE Restraints
TSTF-369-A, Rev 1,	Removal of Monthly Operating Report and Occupational Radiation Exposure Report
TSTF-447-A, Rev 1,	Elimination of Hydrogen Recombiners and Change to Hydrogen and Oxygen Monitors
TSTF-470-T, Rev 0,	Correct Titles and References in PAM Instrumentation Bases

STS NUREGs Affected:

TSTF-359-A, Rev 9:	NUREGs 1430, 1431, 1432, 1433, and 1434
TSTF-369-A, Rev 1:	NUREGs 1430, 1431, 1432, 1433, and 1434
TSTF-447-A, Rev 1:	NUREGs 1430, 1431, 1432, 1433, and 1434
TSTF-470-T, Rev 0:	NUREGs 1430, 1431, and 1432

NRC Approval Date:

TSTF-359-A, Rev 9:	12-May-03
TSTF-369-A, Rev 1:	23-Jun-04
TSTF-447-A, Rev 1:	25-Sep-03
TSTF-470-T, Rev 0:	01-Dec-05

TSTF Classification:

TSTF-359-A, Rev 9:	Technical Change
TSTF-369-A, Rev 1:	Technical Change
TSTF-447-A, Rev 1:	Technical Change
TSTF-470-T, Rev 0:	Bases 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 3.3.3.

RCOL COL Item Number and Title:

There are no Vogtle COL items applicable to GTS 3.3.3.

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 A005:	Editorial Correction of Action Note
VEGP LAR DOC A024:	Reformat of GTS 3.3.1 into Seven Parts; 3.3.1 through 3.3.7
VEGP LAR DOC A028:	Reformat of GTS 3.3.2 into Nine Parts; 3.3.8 through 3.3.16
VEGP LAR DOC A037:	Removal of Reference to Divisions in Table 3.3.17-1
VEGP LAR DOC M03:	Corrections to Table 3.3.17-1, Function 18
VEGP LAR DOC L02:	Change in TS 5.6, Reporting Requirements (TSTF-447-A)
VEGP LAR DOC L13:	Corrections to Table 3.3.17-1, Functions 12 and 17
VEGP LAR DOC D02:	Corrections to Table 3.3.17-1, Function 5

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

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(1) applicable to operating reactor designs, but not to the AP1000 design; (2) already incorporated in the GTS; or (3) superseded by another change.

VEGP LAR DOC L02 incorporates the changes consistent with TSTF-369-A, Rev 1.

The justification for TSTF-359 is based on vendor-specific evaluations. For Westinghouse plants, that evaluation is in MUHP-3015, "Qualitative Risk Assessment Supporting Increased Flexibility in Mode Restraints," January 2002. This report evaluated "the key plant changes that occur during the Mode changes so it is possible to identify the initiating events that can occur and systems available for event detection, actuation, and mitigation." It also considered initiating events and equipment available to mitigate those events. Based on that evaluation, Notes were proposed for several systems to prohibit the use of LCO 3.0.4.b. These Notes were applied to LTOP, ECCS-Shutdown, AFW, and AC Sources - Operating. TSTF-359-A also removed existing Notes from the ISTS and revised SR 3.0.4. There is no technical basis for concluding that the analysis performed in support of TSTF-359-A and the high-risk configurations addressed by the Notes are applicable to AP1000 plants. TSTF-359-A is not implemented by this GTST and is deferred for future consideration.

TSTF-447-A, Revision 1, is consistent with AP1000 GTS 3.3.3. No further changes are required.

TSTF-470-T, Revision 0, inserts the phrase "penetration flow path" relative to the Bases discussion regarding containment isolation valves (CIVs). The AP1000 Bases discussion is not identical to the NUREG-1431 STS discussion. However, the AP1000 Bases text uses the phrase "penetration flow path" relative to the Bases discussion regarding CIVs, where the CIVs are discussed. Therefore, the AP1000 Bases text is consistent with the change outlined by TSTF-470-A. VEGP LAR DOC M03 inserts this phrase into the title of Function 18.

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)

APOG Recommended Changes to Improve the Bases

The “Background” section of the Bases for STS Subsection 3.3.17 is missing the NUREG-1431 discussion on basis for including Category 1 PAM instrumentation in the TS. FSAR 7.5.2.2.1 supports the TS Bases addition for the first two bullets from the NUREG only. The third bullet found in NUREG-1431 is descriptive of Type E variables, which are not required to be designed Category 1 to meet the VEGP licensing basis. Add the following after the end of the “Background” section of the Bases:

> Category 1 variables are the key variables deemed risk significant because they are needed to:
>
> - Determine whether other systems important to safety are performing their intended functions; and
>
> - Provide information to the operators that will enable them to determine the likelihood of a gross breach of the barriers to radioactivity release.

V. Applicability

Affected Generic Technical Specifications and Bases:

Section 3.3.17, Post Accident Monitoring (PAM) Instrumentation

Changes to the Generic Technical Specifications and Bases:

GTS 3.3.1, "Reactor Trip System (RTS) Instrumentation," is reformatted by VEGP LAR DOC A024 into seven Specifications; interim A024-modified TS (MTS) 3.3.1 through MTS 3.3.7. The AP1000 GTS 3.3.2, "Engineered Safety Feature Actuation System (ESFAS) Instrumentation," is reformatted by VEGP LAR DOC A028 into nine Specifications; MTS 3.3.8 through MTS 3.3.16. As a result of the reformatting, GTS 3.3.3, "Post Accident Monitoring (PAM) Instrumentation," is renumbered as MTS 3.3.17. The MTS format is depicted in Section XI of this GTST as the reference case in the markup of the GTST instrumentation requirements for post accident monitoring instrumentation.

References 2, 3, and 6 provide details showing the correspondence of GTS 3.3.3 Functions and STS 3.3.17 Functions.

MTS 3.3.17 Actions Table Note 1 is revised to include the word "is" to correct grammar. (DOC A005)

MTS 3.3.17 Required Action B.1 is revised to reference Specification 5.6.5 instead of 5.6.7. TS 5.6, Reporting Requirements have been changed prompting a renumbering within TS 5.6. (TSTF-369-A and DOC L02)

MTS Table 3.3.17-1, "Required Channels/Divisions" column is relabeled as "Required Channels." The PTS 3.3.3 Actions refer to "channels" in the entry Conditions and in the Required Actions. There is no reference to "divisions." (DOC A037)

MTS Table 3.3.17-1, Function 5 title is changed from "Pressurizer Pressure and RCS Subcooling Monitor" to "RCS Subcooling Monitor." Associated footnote (a) is relocated to the Bases discussion. Pressurizer Pressure is just one input to the RCS Subcooling Monitor. (DOC D02)

MTS Table 3.3.17-1, Function 12 title is changed from "Passive Residual Heat Removal (PRHR) Flow and PRHR Outlet Temperature" to "Passive Residual Heat Removal (PRHR)." The required channels column entry is revised from "2 flow and 1 temperature" to "2." PRHR more appropriately describes the Function. (DOC L13)

MTS Table 3.3.17-1, Function 17 title is changed from "Passive Containment Cooling System (PCS) Storage Tank Level and PCS Flow" to "Passive Containment Cooling System (PCS) Heat Removal." The required channels column entry is revised from "2 level and 1 flow" to "2." PCS more appropriately describes the Function. (DOC L13)

MTS Table 3.3.17-1, Function 18 title is changed from "Remotely Operated Containment Isolation Valve Position" to "Penetration Flow Path Remotely Operated Containment Isolation Valve Position." The required channels column entry is revised from "1/valve" to "2 per penetration flow path." PTS footnote (c) is relabeled as footnote (b) and a new footnote (c) is

added. The status of the containment isolation valve positions is to ensure that the status of each penetration is known. (DOC M03)

The “Background” section of the Bases is revised to include Category 1 PAM instrumentation discussion contained in NUREG-1431 for consistency. (APOG Comment)

VI. Traveler Information

Description of TSTF changes:

TSTF-369-A revises Action B.1 to reference Specification 5.6.5 instead of 5.6.7.

Rationale for TSTF changes:

TSTF-369-A reflects changes to the reporting requirements in TS 5.6, which require TS 5.6 subsection reference changes.

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.

As detailed in VEGP TSU LAR Enclosure 1, DOC A028 reformats PTS 3.3.2 into multiple Specifications as follows:

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

As a result, PTS 3.3.3 is renumbered as MTS 3.3.17.

VEGP LAR DOC A005 inserts the word “is” in the first Action Note.

VEGP LAR DOC A037 deletes “Divisions” from the “Required Channels/Divisions” column in MTS table 3.3.17-1.

VEGP LAR DOC M03 revises the Function 18 title and required channels. A new footnote (c) is added.

VEGP LAR DOC L02 revises the reference to TS 5.6.7 in Required Action B.1 to 5.6.5.

VEGP LAR DOC L13 revises the Function 12 and 17 titles and required channels.

VEGP LAR DOC D02 revises the Function 5 title and the associated footnote (a) is relocated to the Bases discussion.

A more detailed description of the changes by each of the above DOCs can be found in Reference 2, VEGP TSU LAR in Enclosure 1; the NRC staff safety evaluation can be found in Reference 3, VEGP LAR SER. The VEGP TSU LAR was modified in response to NRC staff RAIs (Reference 5) by Southern Nuclear Operating Company’s RAI Response in Reference 6.

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

The reformatting per VEGP LAR DOCs A024 and A028, except where addressed in other DOCs, addresses inconsistencies in formatting and approach between PTS 3.3.1 and PTS 3.3.2, respectively. Simplification and clarification are proposed for each Specification. In breaking down each PTS Specification into specific subsets of the Protection and Safety Monitoring System (PMS) function, improved human factored operator usability results.

VEGP LAR DOC A005 corrects grammar.

VEGP LAR DOC A037 provides clarity to MTS Table 3.3.17-1. GTS 3.3.3 Actions refer to “channels” in the entry Conditions and in the Required Actions. There is no reference to “divisions.”

VEGP LAR DOC M03 provides added clarity such that the status of the containment isolation valve positions is to ensure that the status of each penetration is known.

VEGP LAR DOC L02 provides for the modifications allowed by TSTF-369-A, which changes the TS 5.6, Reporting Requirements. This necessitates a reference change based on a renumbering within TS 5.6.

VEGP LAR DOC L13 recognizes that Passive Residual Heat Removal (PRHR) Heat Removal more appropriately describes Function 12 and Passive Containment Cooling System (PCS) Heat Removal more appropriately describes Function 17.

VEGP LAR DOC D02 recognizes that Pressurizer Pressure is just one input to the RCS Subcooling Monitor.

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

The following text is added after the end of the “Background” section of the Bases:

> Category 1 variables are the key variables deemed risk significant because they are needed to:
>
> - Determine whether other systems important to safety are performing their intended functions; and
>
> - Provide information to the operators that will enable them to determine the likelihood of a gross breach of the barriers to radioactivity release.

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

Discussion of the Category 1 PAM instrumentation contained in NUREG-1431 is added to the “Background” section of the Bases to provide technical improvement to the Bases discussion. FSAR 7.5.2.2.1 supports the TS Bases addition.

VII. GTST Safety Evaluation

Technical Analysis:

VEGP LAR DOC M03 revises the Function 18 title from “Remotely Operated Containment Isolation Valve Position” to “Penetration Flow Path Remotely Operated Containment Isolation Valve Position.” The required channels column entry is revised from “1/valve” to “2 per penetration flow path.” PTS Footnote (c) is relabeled as Footnote (b) and new Footnote (c) is added. Regulatory Guide (RG) 1.97, Revision 3, PAM requirements include redundancy for required monitoring functions. The GTS 3.3.3 Actions are constructed based on loss of redundancy (Action A, one channel inoperable) and loss of parameter monitoring (Action C, two channels inoperable). GTS Table 3.3.3-1, Function 18 requires one channel of valve position indication to be Operable for each active Containment Isolation Valve (CIV).

The intent of the requirement is to support the ability to monitor the Containment operability. The status of the containment isolation valve positions is to ensure that the status of each penetration is known. With respect to CIV position indication, the function being monitored is the status of the containment penetrations. However, the PTS presentation of “1/valve” is not consistent with specifying the redundancy requirement related to each containment penetration flow path. With the PTS presentation, the Function is interpreted to be valve position; with only one required channel for each valve position Function. As such, only Action A and Action B would ever apply. Because there are not “two required channels” as this PTS Function is presented, Actions C, D, and E would never apply.

The proposed change requires one position indicator for each active CIV in a penetration flow path (i.e., two Operable indications per flow path). This is sufficient to redundantly verify the isolation status of each isolable penetration.

For containment penetrations with only one active CIV having control room indication, footnote (c) is added to clarify that, for penetrations with only one active CIV, a single channel of valve position indication is required to be Operable. This is sufficient to redundantly verify the isolation status of each isolable penetration either via indicated status of the active valve, as applicable, and prior knowledge of a passive valve, or via system boundary status.

This change clarifies that there are two required channels for each penetration flow path Function, such that Action C would be required when two CIV position indications are not Operable for any one penetration flow path and it allows for separate Condition entry for each penetration flow path. This change is consistent with NUREG-1431, STS 3.3.3, Table 3.3.3-1, Function 9 requirements, and with TSTF-295-A, “Modify Note 2 to Actions of PAM Table to Allow Separate Condition Entry for Each Penetration.”

VEGP LAR DOC L13 revises the Function 12 title from “Passive Residual Heat Removal (PRHR) Flow and PRHR Outlet Temperature” to “Passive Residual Heat Removal (PRHR) Heat Removal.” The required channels column entry is revised from “2 flow and 1 temperature” to “2.” DOC L13 also revises the Function 17 title from “Passive Containment Cooling System (PCS) Storage Tank Level and PCS Flow” to “Passive Containment Cooling System (PCS) Heat Removal.” The required channels column entry is revised from “2 level and 1 flow” to “2.” RG 1.97, Revision 3, PAM requirements include redundancy for required monitoring functions. GTS 3.3.3 Actions are constructed based on loss of redundancy (Action A, one channel inoperable) and loss of parameter monitoring (Action C, two channels inoperable). GTS Table 3.3.3-1, Functions 12 and 17 require a total of three channels each, which exceeds the

minimum necessary to meet the Standard TS requirements that only require minimum of two channels per Function for redundancy.

GTS Function 12 is designated as “Passive Residual Heat Removal (PRHR) Flow and PRHR Outlet Temperature.” As stated in the associated Bases, PRHR flow is provided to monitor primary system heat removal. Likewise, PRHR outlet temperature is provided to monitor primary system heat removal. The function that is being monitored is related to PRHR heat removal. Therefore, the appropriate Function designation is revised to “Passive Residual Heat Removal (PRHR) Heat Removal.” Details related to the parameters used to monitor the Function are more appropriately described in the associated Bases.

GTS Table 3.3.3-1 requires a total of three channels to be Operable for Function 12; two flow instrument channels and one temperature instrument channel. The proposed change requires that two channels of PRHR heat removal instrumentation are Operable. The details of which instrumentation can satisfy this requirement are more appropriately described in the associated Bases. Final Safety Analysis Report (FSAR) Table 7.5-1, “Post Accident Monitoring System,” indicates that PRHR outlet temperature is a diverse variable for PRHR flow. As such, the PRHR outlet temperature channel can be used to satisfy one of the two required channels when the PRHR Flow channel in the same electrical division is inoperable. The specific channels designed to satisfy the PAM requirements are more appropriately described in the associated Bases.

GTS Function 17 is designated as “Passive Containment Cooling System (PCS) Storage Tank Level and PCS Flow.” The associated Bases state that the tank level instruments provide indication that sufficient water is available to meet this requirement, and that the flow instrument provides a diverse indication of the PCS heat removal capability. The function that is being monitored is related to PCS heat removal. Therefore, the appropriate Function designation is revised to “Passive Containment Cooling System (PCS) Heat Removal.” The specific channels designed to satisfy the PAM requirements are more appropriately described the associated Bases.

GTS Table 3.3.3-1 requires that a total of three channels to be Operable for Function 17; two level instrument channels and one PCS flow instrument channel. The proposed change requires that two channels of PRHR heat removal instrumentation are Operable. The details of which instrumentation can satisfy this requirement are more appropriately described in the associated Bases. The associated Bases indicate that the PCS flow instrument provides a diverse indication of PCS heat removal capability. As such, the PCS flow channel can be used to satisfy one of the two required channels when the PCS level channel in the same electrical division is inoperable. The specific channels designed to satisfy the PAM requirements are more appropriately described in the associated Bases.

These changes reduce the number of required channels from three to two, consistent with NUREG-1431 requirements for meeting RG 1.97 PAM redundancy requirements. The change also relocates the details of the specific channels designed to satisfy the PAM requirements to the associated Bases. The removal of the third channel that can optionally be utilized to meet redundancy requirements continues to assure the TS to provide adequate protection of public health and safety. STS 3.3.17 retains the necessary requirements to ensure the required RG 1.97 PAM redundancy requirements are met.

Discussion of the Category 1 PAM instrumentation contained in NUREG-1431 is added to the “Background” section of the Bases to provide technical improvement to the Bases discussion. FSAR 7.5.2.2.1 supports the TS Bases addition for the first two bullets from the NUREG. The third bullet included in NUREG-1431 is not included in the Bases because that bullet is descriptive of Type E variables which are not required to be designed Category 1 to meet the

AP1000 COL licensing basis. The proposed change clarifies the intent of the current requirement and is, therefore, acceptable.

The remaining changes are editorial, clarifying, grammatical, or otherwise considered administrative. These changes do not affect the technical content, but improve the readability, implementation, and understanding of the requirements, and are therefore acceptable.

Having found that this GTST's proposed changes to the GTS and Bases are acceptable, the NRC staff concludes that AP1000 STS Subsection 3.3.17 is an acceptable model Specification for the AP1000 standard reactor design.

References to Previous NRC Safety Evaluation Reports (SERs):

None

VIII. Review Information

Evaluator Comments:

None

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

Review Information:

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

APOG Comments (Ref. 7) and Resolutions:

1. (Internal # 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.

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

4. (Internal # 11) The GTST incorporates TSTF-359-A, Rev. 9. The justification for TSTF-359 was based on vendor-specific evaluations. For Westinghouse plants, that evaluation was in MUHP-3015, "Qualitative Risk Assessment Supporting Increased Flexibility in Mode Restraints," January 2002. This report evaluated "the key plant changes that occur during the Mode changes so it is possible to identify the initiating events that can occur and systems available for event detection, actuation, and mitigation." It also considered initiating events and equipment available to mitigate those events. Based on that evaluation, Notes were proposed for several systems to prohibit the use of LCO 3.0.4.b. These Notes were applied to LTOP, ECCS-Shutdown, AFW, and AC Sources - Operating. TSTF-359-A also removed existing Notes from the ISTS and revised SR 3.0.4. There is no technical basis for concluding that the analysis performed in support of TSTF-359-A and the high-risk configurations addressed by the Notes are applicable to AP1000 plants. Remove TSTF-359-A from the GTST. Include TSTF-359-A in the reference disposition tables, as "TSTF deferred for future consideration"

   Note: also reinstate LCO 3.0.4 "not applicable" Notes deleted in various Specifications as a result of incorporating TSTF-359. This is resolved by reversing all changes implemented by the initial application of TSTF-359-A to this GTST.

4. (Internal # 208) In GTST for Subsection 3.3.17, Section V, under the heading “Changes to the Generic Technical Specifications and Bases,” the seventh paragraph discussion of the MTS Table 3.3.17-1 Function 12 title change under “Changes to the Generic Technical Specifications and Bases” states that the title is changed to “Passive Residual Heat Removal (PRHR).” However, the title is actually changed to “Passive Residual Heat Removal (PRHR) Heat Removal.” Revise the title to add “Heat Removal.” This is resolved by making the recommended change.

5. (Internal # 209) In GTST for Subsection 3.3.17, Section V, under the heading “Changes to the Generic Technical Specifications and Bases,” the eighth paragraph discussion of the MTS Table 3.3.17-1 Function 17 title change under “Changes to the Generic Technical Specifications and Bases” states that the title is changed to “Passive Containment Cooling System (PCS).” However, the title is actually changed to “Passive Containment Cooling System (PCS) Heat Removal.” Revise the title to add “Heat Removal.” This is resolved by making the recommended change.

6. (Internal # 210) In GTST for Subsection 3.3.17, Section VI, under the heading “Rationale for changes in RCOL Std. Dep., RCOL COL Item(s), and RCOL PTS Changes,” the fifth paragraph refers to “Passive Residual Heat Removal” where it should refer to “Passive Residual Heat Removal (PRHR) Heat Removal” as more appropriately describing Function 12. Revise “Passive Residual Heat Removal” to “Passive Residual Heat Removal (PRHR) Heat Removal.” This is resolved by making the recommended change.

7. (Internal # 211) In GTST for Subsection 3.3.17, Section VI, under the heading “Rationale for changes in RCOL Std. Dep., RCOL COL Item(s), and RCOL PTS Changes,” the fifth paragraph refers to “Passive Containment Cooling System” where it should refer to “Passive Containment Cooling System (PCS) Heat Removal” as more appropriately describing Function 17. Revise “Passive Containment Cooling System” to “Passive Containment Cooling System (PCS) Heat Removal.” This is resolved by making the recommended change.

8. (Internal # 212) In GTST for Subsection 3.3.17, Section VII, under the heading “Technical Analysis,” the thirteenth paragraph describing changes resulting from LAR DOC L13 provides incorrect titles for Function 12 and Function 17 title revision. Revise titles to “Passive Residual Heat Removal (PRHR) Heat Removal” and to “Passive Containment Cooling System (PCS) Heat Removal.” This is resolved by making the recommended change.

9. (Internal # 213) The “Background” section of the Bases for STS Subsection 3.3.17 is missing the NUREG-1431 discussion on basis for including Category 1 PAM instrumentation in the TS. FSAR 7.5.2.2.1 supports the TS Bases addition for the first two bullets from the NUREG. The third bullet found in NUREG-1431 is descriptive of Type E variables which are not required to be designed Category 1 to meet the VEGP licensing basis. Add the following after the end of the “Background” section of the Bases:

   Category 1 variables are the key variables deemed risk significant because they are needed to:

   - Determine whether other systems important to safety are performing their intended functions; and

   - Provide information to the operators that will enable them to determine the likelihood of a gross breach of the barriers to radioactivity release.

NRC Final Approval Date: 5/12/15

NRC Contact:

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

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

None

X. References Used in GTST

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

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

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

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

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

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

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

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

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

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

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

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

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

3.3 INSTRUMENTATION

3.3.17 Post Accident Monitoring (PAM) Instrumentation

LCO 3.3.17 PAM Instrumentation for each Function in Table 3.3.17.1 shall be OPERABLE:

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

----------NOTES----------

1. LCO 3.0.4 **is** not applicable.

2. Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions within one required channel inoperable.	A.1 Restore required channel to OPERABLE status.	30 days
B. Required Action and associated Completion Time of Condition A not met.	B.1 Initiate action in accordance with Specification 5.6.**5**~~7~~.	Immediately
C. One or more Functions with two required channels inoperable.	C.1 Restore one channel to OPERABLE status.	7 days
D. Required Action and associated Completion Time of Condition C not met.	D.1 Enter the Condition referenced in Table 3.3.17-1 for the channel.	Immediately

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. As required by Required Action D.1 and referenced in Table 3.3.17-1.	E.1 Be in MODE 3. AND E.2 Be in MODE 4.	6 hours 12 hours

SURVEILLANCE REQUIREMENTS

----------NOTE----------
SR 3.3.17.1 and SR 3.3.17.2 apply to each PAM instrumentation Function in Table 3.3.17-1.

SURVEILLANCE		FREQUENCY
SR 3.3.17.1	Perform CHANNEL CHECK for each required instrumentation channel that is normally energized.	31 days
SR 3.3.17.2	----------NOTE---------- Neutron detectors are excluded from CHANNEL CALIBRATION. --- Perform CHANNEL CALIBRATION.	 24 months

Table 3.3.17-1 (page 1 of 1)
Post-Accident Monitoring Instrumentation

FUNCTION	REQUIRED CHANNELS~~/ DIVISIONS~~	CONDITION REFERENCED FROM REQUIRED ACTION D.1
1. Neutron Flux (Intermediate Range)	2	E
2. Reactor Coolant System (RCS) Hot Leg Temperature (Wide Range)	2	E
3. RCS Cold Leg Temperature (Wide Range)	2	E
4. RCS Pressure (Wide Range)	2	E
5. ~~Pressurizer Pressure and~~ RCS Subcooling Monitor~~(a)~~	2	E
6. Containment Water Level	2	E
7. Containment Pressure	2	E
8. Containment Pressure (Extended Range)	2	E
9. Containment Area Radiation (High Range)	2	E
10. Pressurizer Level and Associated Reference Leg Temperature	2	E
11. In-Containment Refueling Water Storage Tank (IRWST) Water Level	2	E
12. Passive Residual Heat Removal (PRHR) **Heat Removal** ~~Flow and PRHR Outlet Temperature~~	2 ~~flow & 1 temperature~~	E
13. Core Exit Temperature -- Quadrant 1	2(**a**~~b~~)	E
14. Core Exit Temperature -- Quadrant 2	2(**a**~~b~~)	E
15. Core Exit Temperature -- Quadrant 3	2(**a**~~b~~)	E
16. Core Exit Temperature -- Quadrant 4	2(**a**~~b~~)	E
17. Passive Containment Cooling System (PCS) **Heat Removal** ~~Storage Tank Level and PCS Flow~~	2 ~~level & 1 flow~~	E
18. **Penetration Flow Path** Remotely Operated Containment Isolation Valve Position	**2 per penetration flow path** ~~1/valve~~**(b)**(c)	E
19. IRWST to Normal Residual Heat Removal System (RNS) Suction Valve Status	2	E

~~(a) RCS Subcooling calculated from pressurizer pressure and RCS hot leg temperature.~~

(**a**~~b~~) A channel consists of two thermocouples within a single division. Each quadrant contains two divisions. The minimum requirement is two OPERABLE thermocouples in each of the two divisions.

(**b**~~c~~) Not required for isolation valves whose associated penetration is isolated by at least one closed and deactivated automatic valve, closed manual valve, blind flange, or check valve with flow through the valve secured.

(c) Only one position indication channel is required for penetration flow paths with only one installed control room indication channel.

B 3.3 INSTRUMENTATION

B 3.3.17 Post Accident Monitoring (PAM) Instrumentation

BASES

BACKGROUND

The primary purpose of the PAM Instrumentation is to display unit variables that provide information required by the main control room operators during accident situations. These plant variables provide the necessary information to assess the process of accomplishing or maintaining critical safety functions. The instruments which monitor these variables are designated in accordance with Reference 1.

The OPERABILITY of the PAM Instrumentation ensures that there is sufficient information available on selected plant parameters to monitor and assess plant status and behavior following an accident. This capability is consistent with the recommendations of Reference 1.

A PAM CHANNEL shall extend from the sensor up to the display device, and shall include the sensor (or sensors), the signal conditioning, any associated datalinks, the display device, any signal gathering or processing subsystems, and any data processing subsystems. Note that for digital PAM CHANNELs, the information may be displayed on multiple display devices. For this case, the PAM CHANNEL shall extend to any available qualified display device.

The instrument channels required to be OPERABLE by this LCO include two classes of parameters identified during unit specific implementation of Regulatory Guide 1.97 as Type A and Category 1 variables. The unit specific implementation of Regulatory Guide 1.97 has not identified any Type A variables, therefore, only Category 1 variables are specified.

Category 1 variables are the key variables deemed risk significant because they are needed to:

- **Determine whether other systems important to safety are performing their intended functions; and**
- **Provide information to the operators that will enable them to determine the likelihood of a gross breach of the barriers to radioactivity release.**

BASES

APPLICABLE SAFETY ANALYSES

The PAM Instrumentation ensures that the main control room operating staff can:

- Determine whether systems important to safety are performing their intended functions;
- Determine the likelihood of a gross breach of the barriers to radioactivity release;
- Determine if a gross breach of a barrier has occurred; and
- Initiate action necessary to protect the public and to estimate the magnitude of any impending threat.

PAM Instrumentation that is required in accordance with Regulatory Guide 1.97 satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The PAM instrumentation LCO provides OPERABILITY requirements for those monitors which provide information required by the control room operators to assess the process of accomplishing or maintaining critical safety functions. This LCO addresses those Regulatory Guide 1.97 instruments which are listed in Table 3.3.17-1.

The OPERABILITY of the PAM Instrumentation ensures there is sufficient information available on selected plant parameters to monitor and assess plant status following an accident. This capability is consistent with the recommendations of Reference 1.

Category 1 non-type A variables are required to meet Regulatory Guide 1.97 Category 1 (Ref. 1) design and qualification requirements for seismic and environmental qualification, single-failure criterion, utilization of emergency standby power, immediately accessible display, continuous readout, and recording of display.

Listed below are discussions of the specified instrument functions listed in Table 3.3.17-1. Each of these is a Category 1 variable.

BASES

LCO (continued)

1. Intermediate Range Neutron Flux

   Neutron Flux indication is provided to verify reactor shutdown. The neutron flux intermediate range is sufficient to cover the full range of flux that may occur post accident.

   Neutron flux is used for accident diagnosis, verification of subcriticality, and diagnosis of positive reactivity insertion.

2, 3. Reactor Coolant System (RCS) Wide Range Hot and Cold Leg Temperature

   RCS Hot and Cold Leg Temperatures are provided for verification of core cooling and long-term surveillance. The channels provide indication over a range of 50°F to 700°F.

   In addition to this, RCS cold leg temperature is used in conjunction with RCS hot leg temperature to verify the plant conditions necessary to establish natural circulation in the RCS.

4. RCS Pressure

   RCS wide range pressure is provided for verification of core cooling and RCS integrity long term surveillance.

5. ~~Pressurizer Pressure and~~ RCS Subcooling Monitor

   RCS Subcooling is calculated from pressurizer pressure and RCS hot leg temperature. ~~Pressurizer Pressure is used to determine RCS Subcooling.~~ The RCS Subcooling Monitor is provided for verification of core cooling. Subcooling margin is available when the RCS pressure is greater than the saturation pressure corresponding to the core exit temperature. Inputs to the Subcooling Monitor are pressurizer pressure and RCS hot leg temperature.

BASES

LCO (continued)

6. Containment Water Level

Containment Water Level is used to monitor the containment environment during accident conditions. The containment water level can also provide information to the operators that the various stages of safety injection along with system depressurization are progressing.

7. Containment Pressure

The containment pressure transmitters monitor the containment pressure over the range of -5 to 10 psig. This provides information on post accident containment pressure and containment integrity.

8. Containment Pressure (Extended Range)

The extended range containment pressure transmitters are instruments that operators use for monitoring the potential for breach of containment, a fission product barrier. The extended range sensors monitor containment pressure over the range of 0 to 240 psig.

9. Containment Area Radiation (High Range)

Containment Area Radiation is provided to monitor for the potential of significant radiation releases and to provide release assessment for use by operators in determining the need to invoke site emergency plans.

10. Pressurizer Level and Associated Reference Leg Temperature

Pressurizer level is provided to monitor the RCS coolant inventory. During an accident, operation of the safeguards systems can be verified based on coolant inventory indicators.

The reference leg temperature is included in the Technical Specification since it is used to compensate the level signal.

BASES

LCO (continued)

11. In-Containment Refueling Water Storage Tank (IRWST) Water Level

The IRWST provides a long term heat sink for non-LOCA events and is a source of injection flow for LOCA events. When the IRWST is a heat sink, the level will change due to increased volume associated with the temperature increase. When saturation temperature is reached, the IRWST will begin steaming and initially lose mass to the containment atmosphere until condensation occurs on the steel containment shell which is cooled by the passive containment cooling system. The condensate is returned to the IRWST via a gutter.

During a LOCA, the IRWST is available for injection. Depending on the severity of the event, when a fully depressurized RCS has been achieved, the IRWST will inject by gravity flow.

12. Passive Residual Heat Removal (PRHR) **Heat Removal** ~~Flow and PRHR Outlet Temperature~~

Two channels of PRHR Flow **are** ~~is~~ provided to monitor primary system heat removal during accident conditions when the steam generators are not available. PRHR **Heat Removal** provides primary protection for non-LOCA events when the normal heat sink is lost.

One channel of PRHR outlet temperature is provided to monitor primary system heat removal during accident conditions when the steam generators are not available. **The PRHR outlet temperature channel can be used to satisfy one of the two required channels when the PRHR Flow channel in the same electrical division is inoperable.** PRHR **Heat Removal** provides primary protection for non-LOCA events when the normal heat sink is lost.

13, 14, 15, 16. Core Exit Temperature

Core Exit Temperature is provided for verification and long term surveillance of core cooling.

BASES

LCO (continued)

An evaluation was made of the minimum number of valid core exit thermocouples necessary for In-Core Cooling (ICC) detection. The evaluation determined the reduced complement of core exit thermocouples necessary to detect initial core recovery and trend the ensuing core heatup. The evaluations account for core nonuniformities including incore effects of the radial decay power distribution and excore effects of condensate runback in the hot legs and nonuniform inlet temperatures. Based on these evaluations, adequate ICC detection is assured with two valid core exit thermocouples per quadrant. Core Exit Temperature is also used for plant stabilization and cooldown monitoring.

Two OPERABLE channels of Core Exit Temperature are required in each quadrant to provide indication of radial distribution of the coolant temperature rise across representative regions of the core. Power distribution symmetry was considered in determining the specific number and locations provided for diagnosis of local core problems. Two thermocouples in each of the two divisions ensure a single failure will not disable the ability to determine the temperature at two locations within a quadrant.

17. Passive Containment Cooling System (PCS) **Heat Removal** ~~Storage Tank Level and PCS Flow~~

The PCS **Heat Removal** must be capable of removing the heat from the containment following a postulated LOCA or steam line break (SLB). **Two** tank level instruments provide indication that sufficient water is available to meet this requirement. The PCS flow instrument provides a diverse indication of the PCS heat removal capability. **The PCS flow instrument can be used to satisfy one of the two required channels when the PCS level channel in the same electrical division is inoperable.**

18. **Penetration Flow Path** Remotely Operated Containment Isolation Valve Position

The **Penetration Flow Path** Remotely Operated Containment Isolation Valve Position is provided for verification of containment OPERABILITY. **The LCO requires one channel of valve position indication in the control room to be OPERABLE for each valve in a containment penetration flow path actuated on a containment isolation signal, i.e., two total channels of valve**

BASES

LCO (continued)

position indication for a penetration flow path with two active valves. For containment penetrations with only one active valve having post-accident monitoring control room indication, Note (c) requires a single channel of valve position indication to be OPERABLE. This is sufficient to redundantly verify the isolation status of each isolable penetration either via indicated status of the active valve, as applicable, and prior knowledge of a passive valve, or via system boundary status. If a normally active valve is known to be closed and deactivated, position indication is not needed to determine status. Therefore, the position indication for valves in this state is not required to be OPERABLE. Note (b) to the Required Channels states that the Function is not required for isolation valves whose associated penetration is isolated by at least one closed and deactivated automatic valve, closed manual valve, blind flange, or check valve with flow through the valve secured. Each penetration is treated separately and each penetration flow path is considered a separate function. Therefore, separate Condition entry is allowed for each penetration flow path with one or more inoperable position indicators.

19. IRWST to RNS Suction Valve Status

The position of the motor-operated valve in the line from the IRWST to the pump suction header is monitored to verify that the valve is closed following postulated events. The valve must be closed to prevent loss of IRWST inventory into the RNS.

APPLICABILITY The PAM instrumentation LCO is applicable in MODES 1, 2, and 3. These variables provide the information necessary to assess the process of accomplishing or maintaining critical safety functions following Design Basis Accidents (DBAs). The applicable DBAs are assumed to occur in MODES 1, 2, and 3. In MODES 4, 5, and 6, plant conditions are such that the likelihood of an event that would require PAM instrumentation is low; therefore, the PAM instrumentation is not required to be OPERABLE in these MODES.

BASES

ACTIONS

The ACTIONS Table has been modified by **a** ~~two~~ Note~~s~~. ~~The first Note excludes the MODE change restriction of LCO 3.0.4. This exception allows entry into an applicable MODE while relying on the ACTIONS even though the ACTIONS may eventually require a plant shutdown. This exception is acceptable due to the passive function of the instruments, the operator's ability to respond to an accident using alternate instruments and methods, and low probability of an event requiring these instruments.~~

The ~~second~~ Note in the ACTIONS clarifies the application of Completion Time rules. The Conditions of this Specification may be entered independently for each Function listed on Table 3.3.17-1. The Completion Time(s) of the inoperable channel(s) of a Function will be tracked separately for each Function starting from the time the Condition was entered for that **Function** ~~function~~.

A.1

When one or more Functions have one required channel which is inoperable, the required inoperable channel must be restored to OPERABLE status within 30 days. The 30 day Completion Time is based on operating experience and takes into account the remaining OPERABLE channel (or in the case of a Function that has only one required channel, other non-Regulatory Guide 1.97 instrument channels to monitor the Function), the passive nature of the instrument (no critical automatic action is assumed to occur from these instruments), and the low probability of an event requiring PAM instrumentation during this interval.

B.1

The Required Action directs actions to be taken in accordance with Specification 5.6.**5**~~7~~ immediately. Each time an inoperable channel has not met Required Action A.1, and the associated Completion Time has expired, Condition B is entered.

C.1

When one or more Functions have two required channels which are inoperable, (two channels inoperable in the same Function), one channel in the Function should be restored to OPERABLE status within 7 days. The Completion Time of 7 days is based on the relatively low probability of an event requiring PAM instrument operation and the availability of alternate means to obtain the required information.

BASES

ACTIONS (continued)

Continuous operation with two required channels inoperable in a Function is not acceptable because the alternate indications may not fully meet all performance qualification requirements applied to the PAM instrumentation. Therefore, requiring restoration of one inoperable channel of the Function limits the risk that the PAM function will be in a degraded condition should an accident occur.

D.1

This Required Action directs entry into the appropriate Condition referenced in Table 3.3.17-1. The applicable Condition referenced in the Table is Function dependent.

Each time an inoperable channel has not met any Required Action of Condition C, and the associated Completion Time has expired, Condition D is entered for that channel and provides for transfer to the appropriate subsequent Condition.

E.1 and E.2

If the Required Action and associated Completion Time of Condition C are not met for the Functions in Table 3.3.17-1, the plant must be placed in a MODE in which the LCO does not apply. This is done by placing the plant in at least MODE 3 within 6 hours and MODE 4 within 12 hours.

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

SURVEILLANCE REQUIREMENTS

The following SRs apply to each PAM instrumentation function in Table 3.3.17-1:

SR 3.3.17.1

Performance of the CHANNEL CHECK once every 31 days verifies that a gross instrumentation failure has not occurred. A CHANNEL CHECK is a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the two instrument channels could be an indication of excessive instrument drift

BASES

SURVEILLANCE REQUIREMENTS (continued)

in one of the channels or of something even more serious. CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying that the instrumentation continues to operate properly between each CHANNEL CALIBRATION. The high radiation instrumentation should be compared to similar plant instruments located throughout the plant.

Agreement criteria are determined by the unit staff, based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the match criteria, it may be an indication that the sensor or the signal-processing equipment has drifted outside its limit. If the channels are within the match criteria, it is an indication that the channels are OPERABLE.

As specified in the SR, a CHANNEL CHECK is only required for those channels that are normally energized.

The Frequency of 31 days is based on operating experience with regard to channel OPERABILITY and drift, which demonstrates that failure of more than one channel of a given function in any 31 day interval is rare. The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of those displays associated with the required channels of this LCO.

SR 3.3.17.2

A CHANNEL CALIBRATION is performed every 24 months, or approximately at every refueling. CHANNEL CALIBRATION is a complete check of the instrument loop including the sensor. The test verifies that the channel responds to the measured parameter with the necessary range and accuracy. This SR is modified by a Note that excludes neutron detectors. The calibration method for neutron detectors is specified in the Bases of LCO 3.3.1, “Reactor Trip System (RTS) Instrumentation.” RTD and Thermocouple channels are to be calibrated in place using cross-calibration techniques. The Frequency is based on operating experience and consistency with the typical industry refueling cycle.

REFERENCES

1. Regulatory Guide 1.97, Rev. 3, “Instrumentation for Light-Water Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident,” U.S. Nuclear Regulatory Commission.

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

3.3.17 Post Accident Monitoring (PAM) Instrumentation

LCO 3.3.17 PAM Instrumentation for each Function in Table 3.3.17.1 shall be OPERABLE:

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

----------NOTES----------

1. LCO 3.0.4 is not applicable.

2. Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions within one required channel inoperable.	A.1 Restore required channel to OPERABLE status.	30 days
B. Required Action and associated Completion Time of Condition A not met.	B.1 Initiate action in accordance with Specification 5.6.5.	Immediately
C. One or more Functions with two required channels inoperable.	C.1 Restore one channel to OPERABLE status.	7 days
D. Required Action and associated Completion Time of Condition C not met.	D.1 Enter the Condition referenced in Table 3.3.17-1 for the channel.	Immediately

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. As required by Required Action D.1 and referenced in Table 3.3.17-1.	E.1 Be in MODE 3. AND E.2 Be in MODE 4.	6 hours 12 hours

SURVEILLANCE REQUIREMENTS

----------NOTE----------
SR 3.3.17.1 and SR 3.3.17.2 apply to each PAM instrumentation Function in Table 3.3.17-1.

SURVEILLANCE		FREQUENCY
SR 3.3.17.1	Perform CHANNEL CHECK for each required instrumentation channel that is normally energized.	31 days
SR 3.3.17.2	----------NOTE---------- Neutron detectors are excluded from CHANNEL CALIBRATION. ---------- Perform CHANNEL CALIBRATION.	 24 months

Table 3.3.17-1 (page 0 of 1)
Post-Accident Monitoring Instrumentation

FUNCTION	REQUIRED CHANNELS	CONDITION REFERENCED FROM REQUIRED ACTION D.1
1. Neutron Flux (Intermediate Range)	2	E
2. Reactor Coolant System (RCS) Hot Leg Temperature (Wide Range)	2	E
3. RCS Cold Leg Temperature (Wide Range)	2	E
4. RCS Pressure (Wide Range)	2	E
5. RCS Subcooling Monitor	2	E
6. Containment Water Level	2	E
7. Containment Pressure	2	E
8. Containment Pressure (Extended Range)	2	E
9. Containment Area Radiation (High Range)	2	E
10. Pressurizer Level and Associated Reference Leg Temperature	2	E
11. In-Containment Refueling Water Storage Tank (IRWST) Water Level	2	E
12. Passive Residual Heat Removal (PRHR) Heat Removal	2	E
13. Core Exit Temperature -- Quadrant 1	2[(a)]	E
14. Core Exit Temperature -- Quadrant 2	2[(a)]	E
15. Core Exit Temperature -- Quadrant 3	2[(a)]	E
16. Core Exit Temperature -- Quadrant 4	2[(a)]	E
17. Passive Containment Cooling System (PCS) Heat Removal	2	E
18. Penetration Flow Path Remotely Operated Containment Isolation Valve Position	2 per penetration flow path [(b)(c)]	E
19. IRWST to Normal Residual Heat Removal System (RNS) Suction Valve Status	2	E

(a) A channel consists of two thermocouples within a single division. Each quadrant contains two divisions. The minimum requirement is two OPERABLE thermocouples in each of the two divisions.

(b) Not required for isolation valves whose associated penetration is isolated by at least one closed and deactivated automatic valve, closed manual valve, blind flange, or check valve with flow through the valve secured.

(c) Only one position indication channel is required for penetration flow paths with only one installed control room indication channel.

B 3.3 INSTRUMENTATION

B 3.3.17 Post Accident Monitoring (PAM) Instrumentation

BASES

BACKGROUND

The primary purpose of the PAM Instrumentation is to display unit variables that provide information required by the main control room operators during accident situations. These plant variables provide the necessary information to assess the process of accomplishing or maintaining critical safety functions. The instruments which monitor these variables are designated in accordance with Reference 1.

The OPERABILITY of the PAM Instrumentation ensures that there is sufficient information available on selected plant parameters to monitor and assess plant status and behavior following an accident. This capability is consistent with the recommendations of Reference 1.

A PAM CHANNEL shall extend from the sensor up to the display device, and shall include the sensor (or sensors), the signal conditioning, any associated datalinks, the display device, any signal gathering or processing subsystems, and any data processing subsystems. Note that for digital PAM CHANNELs, the information may be displayed on multiple display devices. For this case, the PAM CHANNEL shall extend to any available qualified display device.

The instrument channels required to be OPERABLE by this LCO include two classes of parameters identified during unit specific implementation of Regulatory Guide 1.97 as Type A and Category 1 variables. The unit specific implementation of Regulatory Guide 1.97 has not identified any Type A variables, therefore, only Category 1 variables are specified.

Category 1 variables are the key variables deemed risk significant because they are needed to:

- Determine whether other systems important to safety are performing their intended functions; and
- Provide information to the operators that will enable them to determine the likelihood of a gross breach of the barriers to radioactivity release.

BASES

APPLICABLE SAFETY ANALYSES

The PAM Instrumentation ensures that the main control room operating staff can:

- Determine whether systems important to safety are performing their intended functions;
- Determine the likelihood of a gross breach of the barriers to radioactivity release;
- Determine if a gross breach of a barrier has occurred; and
- Initiate action necessary to protect the public and to estimate the magnitude of any impending threat.

PAM Instrumentation that is required in accordance with Regulatory Guide 1.97 satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The PAM instrumentation LCO provides OPERABILITY requirements for those monitors which provide information required by the control room operators to assess the process of accomplishing or maintaining critical safety functions. This LCO addresses those Regulatory Guide 1.97 instruments which are listed in Table 3.3.17-1.

The OPERABILITY of the PAM Instrumentation ensures there is sufficient information available on selected plant parameters to monitor and assess plant status following an accident. This capability is consistent with the recommendations of Reference 1.

Category 1 non-type A variables are required to meet Regulatory Guide 1.97 Category 1 (Ref. 1) design and qualification requirements for seismic and environmental qualification, single-failure criterion, utilization of emergency standby power, immediately accessible display, continuous readout, and recording of display.

Listed below are discussions of the specified instrument functions listed in Table 3.3.17-1. Each of these is a Category 1 variable.

BASES

LCO (continued)

1. Intermediate Range Neutron Flux

   Neutron Flux indication is provided to verify reactor shutdown. The neutron flux intermediate range is sufficient to cover the full range of flux that may occur post accident.

   Neutron flux is used for accident diagnosis, verification of subcriticality, and diagnosis of positive reactivity insertion.

2, 3. Reactor Coolant System (RCS) Wide Range Hot and Cold Leg Temperature

   RCS Hot and Cold Leg Temperatures are provided for verification of core cooling and long-term surveillance. The channels provide indication over a range of 50°F to 700°F.

   In addition to this, RCS cold leg temperature is used in conjunction with RCS hot leg temperature to verify the plant conditions necessary to establish natural circulation in the RCS.

4. RCS Pressure

   RCS wide range pressure is provided for verification of core cooling and RCS integrity long term surveillance.

5. RCS Subcooling Monitor

   RCS Subcooling is calculated from pressurizer pressure and RCS hot leg temperature. The RCS Subcooling Monitor is provided for verification of core cooling. Subcooling margin is available when the RCS pressure is greater than the saturation pressure corresponding to the core exit temperature. Inputs to the Subcooling Monitor are pressurizer pressure and RCS hot leg temperature.

6. Containment Water Level

   Containment Water Level is used to monitor the containment environment during accident conditions. The containment water level can also provide information to the operators that the various stages of safety injection along with system depressurization are progressing.

BASES

LCO (continued)

7. Containment Pressure

The containment pressure transmitters monitor the containment pressure over the range of -5 to 10 psig. This provides information on post accident containment pressure and containment integrity.

8. Containment Pressure (Extended Range)

The extended range containment pressure transmitters are instruments that operators use for monitoring the potential for breach of containment, a fission product barrier. The extended range sensors monitor containment pressure over the range of 0 to 240 psig.

9. Containment Area Radiation (High Range)

Containment Area Radiation is provided to monitor for the potential of significant radiation releases and to provide release assessment for use by operators in determining the need to invoke site emergency plans.

10. Pressurizer Level and Associated Reference Leg Temperature

Pressurizer level is provided to monitor the RCS coolant inventory. During an accident, operation of the safeguards systems can be verified based on coolant inventory indicators.

The reference leg temperature is included in the Technical Specification since it is used to compensate the level signal.

11. In-Containment Refueling Water Storage Tank (IRWST) Water Level

The IRWST provides a long term heat sink for non-LOCA events and is a source of injection flow for LOCA events. When the IRWST is a heat sink, the level will change due to increased volume associated with the temperature increase. When saturation temperature is reached, the IRWST will begin steaming and initially lose mass to the containment atmosphere until condensation occurs on the steel containment shell which is cooled by the passive containment cooling system. The condensate is returned to the IRWST via a gutter.

LCO (continued)

During a LOCA, the IRWST is available for injection. Depending on the severity of the event, when a fully depressurized RCS has been achieved, the IRWST will inject by gravity flow.

12. Passive Residual Heat Removal (PRHR) Heat Removal

Two channels of PRHR Flow are provided to monitor primary system heat removal during accident conditions when the steam generators are not available. PRHR Heat Removal provides primary protection for non-LOCA events when the normal heat sink is lost.

One channel of PRHR outlet temperature is provided to monitor primary system heat removal during accident conditions when the steam generators are not available. The PRHR outlet temperature channel can be used to satisfy one of the two required channels when the PRHR Flow channel in the same electrical division is inoperable. PRHR Heat Removal provides primary protection for non-LOCA events when the normal heat sink is lost.

13, 14, 15, 16. Core Exit Temperature

Core Exit Temperature is provided for verification and long term surveillance of core cooling.

An evaluation was made of the minimum number of valid core exit thermocouples necessary for In-Core Cooling (ICC) detection. The evaluation determined the reduced complement of core exit thermocouples necessary to detect initial core recovery and trend the ensuing core heatup. The evaluations account for core nonuniformities including incore effects of the radial decay power distribution and excore effects of condensate runback in the hot legs and nonuniform inlet temperatures. Based on these evaluations, adequate ICC detection is assured with two valid core exit thermocouples per quadrant. Core Exit Temperature is also used for plant stabilization and cooldown monitoring.

Two OPERABLE channels of Core Exit Temperature are required in each quadrant to provide indication of radial distribution of the coolant temperature rise across representative regions of the core. Power distribution symmetry was considered in determining the specific number and locations provided for diagnosis of local core

LCO (continued)

problems. Two thermocouples in each of the two divisions ensure a single failure will not disable the ability to determine the temperature at two locations within a quadrant.

17. Passive Containment Cooling System (PCS) Heat Removal

The PCS Heat Removal must be capable of removing the heat from the containment following a postulated LOCA or steam line break (SLB). Two tank level instruments provide indication that sufficient water is available to meet this requirement. The PCS flow instrument provides a diverse indication of the PCS heat removal capability. The PCS flow instrument can be used to satisfy one of the two required channels when the PCS level channel in the same electrical division is inoperable.

18. Penetration Flow Path Remotely Operated Containment Isolation Valve Position

The Penetration Flow Path Remotely Operated Containment Isolation Valve Position is provided for verification of containment OPERABILITY. The LCO requires one channel of valve position indication in the control room to be OPERABLE for each valve in a containment penetration flow path actuated on a containment isolation signal, i.e., two total channels of valve position indication for a penetration flow path with two active valves. For containment penetrations with only one active valve having post-accident monitoring control room indication, Note (c) requires a single channel of valve position indication to be OPERABLE. This is sufficient to redundantly verify the isolation status of each isolable penetration either via indicated status of the active valve, as applicable, and prior knowledge of a passive valve, or via system boundary status. If a normally active valve is known to be closed and deactivated, position indication is not needed to determine status. Therefore, the position indication for valves in this state is not required to be OPERABLE. Note (b) to the Required Channels states that the Function is not required for isolation valves whose associated penetration is isolated by at least one closed and deactivated automatic valve, closed manual valve, blind flange, or check valve with flow through the valve secured. Each penetration is treated separately and each penetration flow path is considered a separate function. Therefore, separate Condition entry is allowed

BASES

LCO (continued)

for each penetration flow path with one or more inoperable position indicators.

19. IRWST to RNS Suction Valve Status

The position of the motor-operated valve in the line from the IRWST to the pump suction header is monitored to verify that the valve is closed following postulated events. The valve must be closed to prevent loss of IRWST inventory into the RNS.

APPLICABILITY

The PAM instrumentation LCO is applicable in MODES 1, 2, and 3. These variables provide the information necessary to assess the process of accomplishing or maintaining critical safety functions following Design Basis Accidents (DBAs). The applicable DBAs are assumed to occur in MODES 1, 2, and 3. In MODES 4, 5, and 6, plant conditions are such that the likelihood of an event that would require PAM instrumentation is low; therefore, the PAM instrumentation is not required to be OPERABLE in these MODES.

ACTIONS

The ACTIONS Table has been modified by a Note. The Note in the ACTIONS clarifies the application of Completion Time rules. The Conditions of this Specification may be entered independently for each Function listed on Table 3.3.17-1. The Completion Time(s) of the inoperable channel(s) of a Function will be tracked separately for each Function starting from the time the Condition was entered for that Function.

A.1

When one or more Functions have one required channel which is inoperable, the required inoperable channel must be restored to OPERABLE status within 30 days. The 30 day Completion Time is based on operating experience and takes into account the remaining OPERABLE channel (or in the case of a Function that has only one required channel, other non-Regulatory Guide 1.97 instrument channels to monitor the Function), the passive nature of the instrument (no critical automatic action is assumed to occur from these instruments), and the low probability of an event requiring PAM instrumentation during this interval.

ACTIONS (continued)

B.1

The Required Action directs actions to be taken in accordance with Specification 5.6.5 immediately. Each time an inoperable channel has not met Required Action A.1, and the associated Completion Time has expired, Condition B is entered.

C.1

When one or more Functions have two required channels which are inoperable, (two channels inoperable in the same Function), one channel in the Function should be restored to OPERABLE status within 7 days. The Completion Time of 7 days is based on the relatively low probability of an event requiring PAM instrument operation and the availability of alternate means to obtain the required information.

Continuous operation with two required channels inoperable in a Function is not acceptable because the alternate indications may not fully meet all performance qualification requirements applied to the PAM instrumentation. Therefore, requiring restoration of one inoperable channel of the Function limits the risk that the PAM function will be in a degraded condition should an accident occur.

D.1

This Required Action directs entry into the appropriate Condition referenced in Table 3.3.17-1. The applicable Condition referenced in the Table is Function dependent.

Each time an inoperable channel has not met any Required Action of Condition C, and the associated Completion Time has expired, Condition D is entered for that channel and provides for transfer to the appropriate subsequent Condition.

E.1 and E.2

If the Required Action and associated Completion Time of Condition C are not met for the Functions in Table 3.3.17-1, the plant must be placed in a MODE in which the LCO does not apply. This is done by placing the plant in at least MODE 3 within 6 hours and MODE 4 within 12 hours.

BASES

ACTIONS (continued)

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

SURVEILLANCE REQUIREMENTS

The following SRs apply to each PAM instrumentation function in Table 3.3.17-1:

SR 3.3.17.1

Performance of the CHANNEL CHECK once every 31 days verifies that a gross instrumentation failure has not occurred. A CHANNEL CHECK is a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the two instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying that the instrumentation continues to operate properly between each CHANNEL CALIBRATION. The high radiation instrumentation should be compared to similar plant instruments located throughout the plant.

Agreement criteria are determined by the unit staff, based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the match criteria, it may be an indication that the sensor or the signal-processing equipment has drifted outside its limit. If the channels are within the match criteria, it is an indication that the channels are OPERABLE.

As specified in the SR, a CHANNEL CHECK is only required for those channels that are normally energized.

The Frequency of 31 days is based on operating experience with regard to channel OPERABILITY and drift, which demonstrates that failure of more than one channel of a given function in any 31 day interval is rare. The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of those displays associated with the required channels of this LCO.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.17.2

A CHANNEL CALIBRATION is performed every 24 months, or approximately at every refueling. CHANNEL CALIBRATION is a complete check of the instrument loop including the sensor. The test verifies that the channel responds to the measured parameter with the necessary range and accuracy. This SR is modified by a Note that excludes neutron detectors. The calibration method for neutron detectors is specified in the Bases of LCO 3.3.1, "Reactor Trip System (RTS) Instrumentation." RTD and Thermocouple channels are to be calibrated in place using cross-calibration techniques. The Frequency is based on operating experience and consistency with the typical industry refueling cycle.

REFERENCES

1. Regulatory Guide 1.97, Rev. 3, "Instrumentation for Light-Water Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident," U.S. Nuclear Regulatory Commission.