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

Title: Changes Related to LCO 3.6.6, Passive Containment Cooling System (PCS) - Operating

I. Technical Specifications Task Force (TSTF) Travelers, Approved Since Revision 2 of STS NUREG-1431, and Used to Develop this GTST

TSTF Number and Title:

TSTF-425, Rev. 3,	Relocate Surveillance Frequencies to Licensee Control - RITSTF Initiative 5b
TSTF-439-A, Rev. 2,	Eliminate Second Completion Times Limiting Time From Discovery of Failure To Meet an LCO.
TSTF-440-A, Rev. 0,	Eliminate Bases Requirement for Performing a System Walkdown.
TSTF-479-A, Rev. 0,	Changes to Reflect Revision of 10 CFR 50.55a

STS NUREGs Affected:

TSTF-425, Rev. 3:	NUREG-1430, 1431, 1432, 1433, 1434
TSTF-439-A, Rev. 2:	NUREG-1430, 1431, 1432, 1433, 1434
TSTF-440-A, Rev. 0:	NUREG-1430, 1431, 1432
TSTF-479-A, Rev. 0:	NUREG-1430, 1431, 1432, 1433, 1434

NRC Approval Date:

TSTF-425, Rev. 3:	06-Jul-09
TSTF-439-A, Rev. 2:	01-Dec-05
TSTF-440-A, Rev. 0:	11-Oct-02
TSTF-479-A, Rev. 0:	06-Dec-05

TSTF Classification:

TSTF-425, Rev. 3:	Technical Change
TSTF-439-A, Rev. 2:	Technical Change
TSTF-440-A, Rev. 0:	Bases Only Change
TSTF-479-A, Rev. 0:	Technical Change

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

RCOL Std. Dep. Number and Title:

None

RCOL COL Item Number and Title:

None

RCOL PTS Change Number and Title:

VEGP LAR DOC A085: TS 3.6.6 Condition D revision
VEGP LAR DOC A086: TS 3.6.6 Required Action B.1 revision
VEGP LAR DOC A087: TS 3.6.6 Condition C revision
VEGP LAR DOC M13: Combined TS 3.6.6 and TS 3.6.7
VEGP LAR DOC M14: SR 3.6.6.1 and SR 3.6.6.3 revision
VEGP LAR DOC D06: TS 3.6.6 LCO statement revision
VEGP LAR DOC L14: TS 3.6.6 Applicability statement revision

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(1) applicable to operating reactor designs, but not to the AP1000 design; (2) already incorporated in the GTS; or (3) superseded by another change.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

TSTF-439-A, Rev. 2 removes the second Completion Times from Required Actions A.1 and C.1 of the Westinghouse Owners Group (WOG) Specification 3.6.6A. The second Completion Time for Required Actions A.1 and C.1 precludes entry into and out of the ACTIONS for an indefinite period of time without meeting the LCO. The Required Actions for AP1000 Specification 3.6.6 does not include Required Actions that require a second Completion Time to preclude entry into and out of the ACTIONS for an indefinite period of time without meeting the LCO. The changes to WOG Specification 3.6.6A are not applicable and therefore are not incorporated into the AP1000 Specification 3.6.6.

TSTF-479-A has already been incorporated into the AP1000 GTS (DCD Revision 19). TSTF-479-A changes the reference to “ASME Boiler and Pressure Vessel Code” to “ASME OM Code” in the Inservice Testing Program. The AP1000 GTS (DCD Revision 19) includes theses changes in Section 5.5.3, Inservice Testing Program. TSTF-479-A removes reference to “Section XI” of the ASME Code from NUREG-1431 bases for Surveillance Requirement (SR) 3.6.6A.4, which is for testing of the containment spray pumps. The containment cooling system for the AP1000 is a passive design. The AP1000 Specification 3.6.6, Passive Containment Cooling System, does not include SRs that require testing of pumps or have Frequencies that refer to the Inservice Testing Program. The bases for the AP1000 Specification 3.6.6 does not refer to the ASME Code. Based on the differences of the bases discussion between NUREG-1431 and AP1000, TSTF-479-A changes are not incorporated into the AP1000 Specification 3.6.6.

VEGP LAR DOC M13 revises GTS 3.6.6 to incorporate GTS 3.6.7 and deletes the GTS 3.6.7. Changes applicable to GTS 3.6.7 are incorporated into TS 3.6.6. Changes VEGP LAR DOC A086, VEGP LAR DOC A087, and VEGP LAR DOC D06 are applicable to both GTS 3.6.7 and GTS 3.6.6. Change VEGP LAR DOC L14 is applicable to GTS 3.6.7 and is incorporated into TS 3.6.6 as part of change VEGP LAR DOC M13. Due to the change described above, GTS 3.6.8, GTS 3.6.9, and GTS 3.6.10 are renumbered as TS 3.6.7, TS 3.6.8, and TS 3.6.9, respectively. In addition, the NRC staff propose editorial changes to the “Actions” section of the Bases, under heading “E.1 and E.2” and “F.1 and F.2”.

IV. Additional Changes Proposed as Part of this GTST (modifications proposed by NRC staff and/or clear editorial changes or deviations identified by preparer of GTST)

The Bases for Surveillance Requirement (SR) 3.6.6.3 is revised to align with TSTF-440-A changes. The statement "control room instrumentation or" is also deleted from the sentence "Rather, it involves verification, through control room instrumentation or a system walkdown, that valves capable of potentially being mispositioned are in the correct position." as part of the TSTF-440-A changes.

Throughout the Bases, reference to passive containment cooling system is changed to "PCS".

The "Actions" section of the Bases, under heading "E.1 and E.2" and "F.1 and F.2" are revised. The following are editorial changes made to the "Actions" section of the Bases:

E.1 and E.2

Action must be initiated if any of the Required Actions and associated Completion Times of Condition A, B, or C are not met in MODE 5, or if the LCO is not met for reasons other than Condition A, B, or C when in MODE 5. With the RCS pressure boundary open ~~and/~~or pressurizer level < 20%, action must be initiated, immediately, to increase ~~the~~ RCS **inventory** ~~level to~~**by establishing** a pressurizer level ≥ 20% and to close the RCS **pressure boundary** so that ~~the~~ Passive Residual Heat Removal Heat Exchanger (PRHR HX) operation is available. In this **condition**~~case~~, the time to RCS boiling is maximized by maximizing the RCS inventory and maintaining RCS temperature as low as practical. Additionally, action to **immediately** suspend positive reactivity additions is required to ensure that the SDM is maintained. Sources of positive reactivity addition include boron dilution, withdrawal of ~~reactivity~~ control ~~assemblies~~ rods, and excessive cooling of the RCS.

These Actions place the plant in a condition which **maximizes**~~maximize~~ the time to actuation of the **PCS**~~Passive Containment Cooling System~~, thus providing time for repairs or application of **alternate**~~alternative~~ cooling capabilities.

F.1 and F.2

Action must be initiated if any of the Required Actions and associated Completion Times of Condition A, B, or C are not met in MODE 6, or if the LCO is not met for reasons other than Condition A, B, or C when in MODE 6. Action must be initiated, immediately, to increase **RCS inventory by establishing a**~~the~~ refueling cavity water level ≥ 23 feet above the top of the reactor vessel flange. In this **condition**~~case~~, the time to RCS boiling is maximized by maximizing ~~the~~ RCS inventory and maintaining RCS temperature as low as practical. Additionally, action to **immediately** suspend positive reactivity additions is required to ensure that the SDM is maintained. Sources of positive reactivity addition include boron dilution, withdrawal of ~~reactivity~~ control ~~assemblies~~**rods**, and excessive cooling of the RCS.

These Actions place the plant in a condition which maximize**s** the time to actuation of the **PCS**~~Passive Containment Cooling System~~, thus providing time for repairs or application of **alternate**~~alternative~~ cooling capabilities.

The “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.3” is revised. The second sentence is revised by adding a comma after “...secured in position**,**...”. In the fourth sentence the word “potentially” is deleted. In the fifth sentence the acronym “PCS” is added before “...flow path.”

The “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.4” is revised. The sentence “The ACTUATION LOGIC TEST overlaps this Surveillance to provide complete testing of the assumed safety function.” is added.

The “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.6” is revised by including the number of standpipes.

<u>APOG Recommended Changes to Improve the Bases</u>

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

Revise the “Background” section of the Bases naming convention for the Passive Containment Cooling Water Storage Tank. Change reference to the PCS water storage tank to “PCCWST”.

Revise the “Background” section of the Bases, second paragraph, first sentence to define the three sets of isolation valves as the three flow paths and simply use “headers” in reference to the two discharge piping routes. Make the following changes in the “Background” section of the Bases:

> ...and two separate full capacity discharge ~~flow paths~~**headers** to the containment vessel with 3 sets of isolation valves **(i.e., 3 flow paths)**, each **flow path** capable of meeting the design bases.

Revise the “Background” section of the Bases, third paragraph by deleting the word “required” from the second sentence.

Revise the “Background” section of the Bases, third paragraph by deleting the sentence regarding the Reliability Assurance Program:

> ...~~The monitoring of the containment surface through the Reliability Assurance Program (RAP) and the Inservice Testing Program assures containment surface does not unacceptably degrade containment heat removal performance.~~...

Revise the “Background” section of the Bases, third paragraph by deleting the last three sentences regarding the initial test program:

> ~~During the initial test program, the containment coverage will be measured at the base of the upper annulus in addition to the coverage at the spring line for the full flow case and a lower flow case with PCS recirculation pumps delivering to the containment shell. These benchmark values at the base of the upper annulus will be used to develop acceptance criteria for technical specifications. Contamination can be removed by PCS actuation and by using coating vendor cleaning procedures.~~

Revise “Background” section of the Bases, fourth paragraph as follows:

...As the air heats up and water evaporates into the air, it becomes less dense than the cooler air in the air inlet annulus. This differential causes an increase in the natural circulation of the air upward along the containment surface, with heated air/water vapor exiting the top/center**top center** of...

Revise the “Background” section of the Bases, sixth and seventh paragraphs. In the sixth paragraph the comma after “environment,” is deleted and in the seventh paragraph the first use of the acronym “ESF” is corrected by including the full phrase “engineered safety feature”.

Revise the “Applicable Safety Analyses” section of the Bases, second paragraph, by replacing “a unit specific power level of 3400 MWt” with “100% RTP”.

Revise the “LCO” section of the Bases naming convention for the Passive Containment Cooling Water Storage Tank. Change reference to the PCS water storage tank to “PCCWST”.

Revise the “Actions” section of the Bases, under heading “C.1” to match wording of the TS requirement for PCCWST.

Revise the “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.1” by using “PCCWST” when referring to the PCS water storage tank.

Revise the “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.3” by changing the first sentence to “...excluding check valves, in the Passive Containment Cooling System**PCS flow paths** provides assurance...” and second sentence to “...positions prior...”

Revise the “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.4” by deleting “(and confirmed by operating experience)” from the fourth sentence.

Revise the “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.5”, third sentence to “...outage, on the need to have access to the locations, and because of the...”

Revise the “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.6”, third sentence to “...The System Operability**OPERABILITY** Testing Program provides...”

V. Applicability

Affected Generic Technical Specifications and Bases:

Section 3.6.6, Passive Containment Cooling System (PCS) - Operating

Changes to the Generic Technical Specifications and Bases:

TS 3.6.6 header subsection name is revised from “PCS - Operating” to “PCS”. (DOC M13)

TS 3.6.6 title is revised from “Passive Containment Cooling System (PCS) - Operating” to “Passive Containment Cooling System (PCS)”. (DOC M13)

LCO 3.6.6 is revised from “The passive containment cooling system shall be OPERABLE, with all three water flow paths OPERABLE.” to “The passive containment cooling system shall be OPERABLE.” (DOC D06)

TS 3.6.6 “Applicability” statement is revised to include MODES 5 and 6 with the reactor decay heat > 6.0 MWt. (DOC M13 and L14)

Required Action B.1 is revised to indicate one flow path is restored to OPERABLE status. (DOC A086)

Condition C is revised by removing the specific parameters in parentheses. (DOC A087)

The first condition of Condition D and associated Bases is revised to specifically identify which Condition and MODE. (DOC M13)

The second condition of Condition D and associated Bases is revised to add the word “Condition” and specify the MODE. (DOC M13 and A085)

New Condition E and associated Bases is added. (DOC M13)

New Condition F and associated Bases is added. (DOC M13)

SR 3.6.6.1 Frequency and associated Bases is revised to just 24 hours. The “7 days” and conditions for when the Frequency is required to be 24 hours is deleted. (DOC M14)

SR 3.6.6.3 and associated Bases is revised to identify manual valves are verified to be in the correct position if not locked, sealed, or otherwise secured in position. (DOC M14)

The “Applicable Safety Analyses” section of the Bases is revised to include discussion of shutdown. (DOC M13)

The “Applicability” section of the Bases is revised to include OPERABILITY of the PCS is MODE 5 or 6 and delete the paragraph that references LCO 3.6.7 for requirements in MODES 5 or 6. (DOC M13)

The Bases for SR 3.6.6.3 is revised by TSTF-440-A. The specified actions required to verify valve alignment have been removed.

The Bases for SR 3.6.6.3 is revised to align with TSTF-440-A changes. The statement “control room instrumentation or” is also deleted from the sentence “Rather, it involves verification, through control room instrumentation or a system walkdown, that valves capable of potentially being mispositioned are in the correct position.” (NRC staff proposed change)

The Bases is revised to use “PCS” when referring to passive containment cooling system. (NRC staff proposed change)

The “Actions” section of the Bases is revised under headings “E.1 and E.2” and “F.1 and F.2” for clarity. (NRC staff proposed change)

The “Surveillance Requirements” section of the Bases under heading “SR 3.6.6.3” is revised for clarity. (NRC staff proposed change)

The “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.4” is revised by adding the sentence “The ACTUATION LOGIC TEST overlaps this Surveillance to provide complete testing of the assumed safety function.” after the first sentence. (NRC staff proposed change)

The “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.6” is revised by indicating the number of standpipes, “...via each **of the four** standpipe**s**...” (NRC staff proposed change)

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

The “Background” section of the Bases the second, third, and fifth paragraphs are revised to use “PCCWST” when referring to the Passive Containment Cooling Water Storage Tank. (APOG Comment)

The “Background” section of the Bases, second paragraph, first sentence is revised to define the three sets of isolation valves as the three flow paths and simply use “headers” in reference to the two discharge piping routes. (APOG Comment)

The “Background” section of the Bases, third paragraph, second sentence is revised by deleting the word “required”. (APOG Comment)

The “Background” section of the Bases, third paragraph, delete the last four sentences. (APOG Comment)

The “Background” section of the Bases, fourth paragraph is revised by deleting the phrase “into the air” from “...water evaporates into the air....” and changing “top/center” to “top center”. (APOG Comment)

The “Background” section of the Bases, sixth and seventh paragraph are revised by deleting the comma after “environment,” in the sixth paragraph and including “engineered safety feature” before “ESF” in the seventh paragraph. (APOG Comment)

The “Applicable Safety Analyses” section of the Bases, second paragraph, first sentence is revised from “...assume a unit specific power level of 3400 MWt.” to “...assume 100% RTP.” (APOG Comment)

The “LCO” section of the Bases the third and fourth paragraphs are revised to use “PCCWST” when referring to the Passive Containment Cooling Water Storage Tank. (APOG Comment)

The “Actions” section of the Bases, under heading “C.1” is revised to match wording of the TS requirement for PCCWST. (APOG Comment)

The “Surveillance Requirements” section of the Bases under heading “SR 3.6.6.1” is revised to use “PCCWST” when referring to the Passive Containment Cooling Water Storage Tank. (APOG Comment)

The “Surveillance Requirements” section of the Bases under heading “SR 3.6.6.3” is revised by replacing “Passive Containment Cooling System” with “PCS flow paths” and changing “...positions prior...” to “...position prior...”. (APOG Comment)

The “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.4” is revised by deleting “(and confirmed by operating experience)” from the fourth sentence. (APOG Comment)

The “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.5”, third sentence is revised to “...outage, ~~on~~ the need to have access to the locations, and ~~because of~~ the...” (APOG Comment)

The “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.6”, third sentence is revised to “...The System ~~Operability~~**OPERABILITY** Testing Program provides...” (APOG Comment)

VI. Traveler Information

Description of TSTF changes:

TSTF-440-A revises the Bases to remove specific requirements to perform a system walkdown when verifying that a flow path is isolated or that valves are in the correct position. The change deletes the specified action of a system walkdown to verify valve alignment from SR 3.6.6.3 of the Bases for Specification 3.6.6. This changes along with the proposed additional change deletes the phrase ", through control room instrumentation or a system walkdown,".

Rationale for TSTF changes:

TSTF-440-A: Deleting the specified action to verify valve alignment, aligns the Bases of this specification with other specifications. Other similar Actions and Surveillances which require verification that a flow path is isolated or that valves are in the correct position do not specify in the Bases how this verification must be accomplished.

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

VEGP LAR DOC A085 adds the word "Condition" to specify that the phrase "A, B, or C" in Condition D refers to Condition A, B, or C.

VEGP LAR DOC A086 revises Required Action B.1 to clarify only one flow path is required to be restored within 72 hours.

VEGP LAR DOC A087 revises Condition C by removing the parenthetical statement "(temperature and volume)".

VEGP LAR DOC M13 revises TS 3.6.6 to incorporate TS 3.6.7 and deletes TS 3.6.7. The Applicability for TS 3.6.6 is revised to include a new Applicability of "MODES 5 and 6 with the reactor decay heat > 6.0 MWt." TS 3.6.6 Condition D, first Condition, is revised to include the phrases "of Condition A, B, or C," and "in MODE 1, 2, 3, or 4." TS 3.6.6 Condition D, second Condition, is revised to include the phrase "in MODE 1, 2, 3, or 4." TS 3.6.6 Actions E and F are added.

VEGP LAR DOC M14 revises SR 3.6.6.1 deleting the 7 day Frequency and conditions for when the Frequency is required to be 24 hours. The Frequency for SR 3.6.6.1 is revised to 24 hours. SR 3.6.6.3 is revised to include verification that each passive containment cooling system manual valve in each flow path that is not locked, sealed, or otherwise secured in position, is in the correct position.

VEGP LAR DOC D06 revises the LCO 3.6.6 statement from "The passive containment cooling system shall be OPERABLE, with all three water flow paths OPERABLE." to "The passive containment cooling system shall be OPERABLE."

VEGP LAR DOC L14 revises TS 3.6.7 "Applicability" statement for MODE 5 and 6 by deleting the word "calculated". This change is included in TS 3.6.6 due to incorporation of VEGP LAR DOC M13, which combines TS 3.6.6 and TS 3.6.7 into a new TS 3.6.6.

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

VEGP LAR DOC A085 by adding the word "Condition" clarifies that Condition D is referring to Condition A, B, or C in the Condition statement.

VEGP LAR DOC A086 change to clarify only one flow path is required to be restored provides consistency with the associated Bases. Also, Action A provides the requirements when one passive containment cooling water flow path is inoperable.

VEGP LAR DOC A087 change to remove "(temperature and volume)" from Condition C removes overuse of parenthesis. The specified parameters for the water storage tank, temperature and volume, are addressed in SR 3.6.6.1 and SR 3.6.6.2. This change is also consistent with TSTF-GG-05-01 guidance to avoid overuse of parenthesis.

VEGP LAR DOC M13 change to incorporate TS 3.6.7 into TS 3.6.6 results in a more restrictive TS since it eliminates the separate restoration times when in Mode 5 or 6. Also, TS 3.6.6 and TS 3.6.7 have identical LCO statements.

VEGP LAR DOC M14 change to revise SR 3.6.6.1 Frequency to 24 hours eliminates the current Frequency of every 7 days and 24 hours if the water storage tank temperature is verified to be ≤ 50°F or ≥ 100°F. Revising the Frequency to 24 hours eliminates unnecessary tracking complexity. The change of adding manual valves to SR 3.6.6.3 ensures that any valve that could possibly be in the incorrect position to be periodically checked.

VEGP LAR DOC D06 change to the LCO 3.6.6 statement removes unnecessary information. The statement "with all three water flow paths OPERABLE" is not necessary since the "LCO" section of the Bases states that "three water flow paths must be OPERABLE."

VEGP LAR DOC L14 change to the TS "Applicability" statement removes information not required to be included in the TS to properly interpret the applicability requirement. The TS "Applicability" statement is revised by deleting the word "calculated".

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

Based on the TSTF-440-A change, it is proposed to delete the specified action to verify valve alignment through control room instrumentation in the Bases for SR 3.6.6.3. With the TSTF-440-A change and additional change, the following sentence is changed from "Rather, it involves verification, through control room instrumentation or a system walkdown, that valves capable of potentially being mispositioned are in the correct position." to "Rather, it involves verification that valves capable of potentially being mispositioned are in the correct position."

The Bases is revised to use "PCS" when referring to the passive containment cooling system.

The "Actions" section of the Bases is revised under headings "E.1 and E.2" and "F.1 and F.2" for clarity.

The "Surveillance Requirements" section of the Bases under heading "SR 3.6.6.3" is revised for clarity.

The “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.4” is revised by adding the sentence “The ACTUATION LOGIC TEST overlaps this Surveillance to provide complete testing of the assumed safety function.” after the first sentence.

The “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.6” is revised by indicating the number of standpipes, “...via each **of the four** standpipe**s**...”

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

The “Background” section of the Bases, second, third, and fifth paragraphs are revised to use “PCCWST” when referring to the Passive Containment Cooling Water Storage Tank. (APOG Comment)

The “Background” section of the Bases, second paragraph, first sentence is revised to define the three sets of isolation valves as the three flow paths and simply use “headers” in reference to the two discharge piping routes. (APOG Comment)

The “Background” section of the Bases, third paragraph, second sentence is revised by deleting the word “required”. (APOG Comment)

The “Background” section of the Bases, third paragraph, delete the seventh sentence. (APOG Comment)

The “Background” section of the Bases, third paragraph, delete the last three sentences. (APOG Comment)

The “Background” section of the Bases, fourth paragraph is revised by deleting the phrase “into the air” from “...water evaporates into the air....” and changing “top/center” to “top center”. (APOG Comment)

The “Background” section of the Bases, sixth and seventh paragraph are revised by deleting the comma after “environment,” in the sixth paragraph and including “engineered safety feature” before “ESF” in the seventh paragraph. (APOG Comment)

The “Applicable Safety Analyses” section of the Bases, second paragraph, first sentence is revised from “...assume a unit specific power level of 3400 MWt.” to “...assume 100% RTP.” (APOG Comment)

The “LCO” section of the Bases the third and fourth paragraphs are revised to use “PCCWST” when referring to the Passive Containment Cooling Water Storage Tank. (APOG Comment)

The “Actions” section of the Bases, under heading “C.1” is revised to match wording of the TS requirement for PCCWST. (APOG Comment)

The “Surveillance Requirements” section of the Bases under heading “SR 3.6.6.1” is revised to use “PCCWST” when referring to the Passive Containment Cooling Water Storage Tank. (APOG Comment)

The “Surveillance Requirements” section of the Bases under heading “SR 3.6.6.3” is revised by replacing “Passive Containment Cooling System” with “PCS flow paths” and changing “...positions prior...” to “...position prior...”. (APOG Comment)

The “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.4” is revised by deleting “(and confirmed by operating experience)” from the fourth sentence. (APOG Comment)

The “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.5”, third sentence is revised to “...outage, ~~on~~ the need to have access to the locations, and ~~because of~~ the...” (APOG Comment)

The “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.6”, third sentence is revised to “...The System ~~Operability~~**OPERABILITY** Testing Program provides...” (APOG Comment)

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

Deleting the specified action to verify valve alignment through control room instrumentation follows the intent of TSTF-440-A. Removing the specified actions to verify valve alignment restores flexibility in performance of the actions to meet SR 3.6.6.3.

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

Revising the Bases to use “PCS” when referring to the passive containment cooling system is an editorial change.

Revising the “Actions” section of the Bases under headings “E.1 and E.2” and “F.1 and F.2” provides clarity.

Revising the “Surveillance Requirements” section of the Bases under heading “SR 3.6.6.3” is consistent with other Bases improvements, which are editorial clarifications.

Revising the “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.4” by adding the sentence “The ACTUATION LOGIC TEST overlaps this Surveillance to provide complete testing of the assumed safety function.” provides consistency with the TS requirement being discussed in the Bases.

Revising the “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.6” by indicating the number of standpipes is an editorial clarification.

Revising the “Background” section of the Bases to use “PCCWST” when referring to the Passive Containment Cooling Water Storage Tank is consistent with AP1000 DCD nomenclature.

Defining the three sets of isolation valves as the three flow paths and simply use “headers” in reference to the two discharge piping routes clarifies the use of “flow path”.

Deleting the word “required” from the “Background” section of the Bases is an editorial clarification.

Deleting the seventh sentence in the third paragraph from the “Background” section of the Bases improves consistency with STS NUREG-1431.

Deleting the last three sentences in the third paragraph from the “Background” section of the Bases improves consistency with STS NUREG-1431.

Deleting the phrase “into the air” and changing “top/center” to “top center” are non-technical changes that provide improved clarity, consistency, and operator usability.

Deleting the comma after “environment,” and including “engineered safety feature” before “ESF” are non-technical changes that provide improved clarity, consistency, and operator usability.

Revising “...assume a unit specific power level of 3400 MWt.” to “...assume 100% RTP.” in the “Applicable Safety Analyses” section of the Bases is an editorial clarification.

Revising the “LCO” section of the Bases to use “PCCWST” when referring to the Passive Containment Cooling Water Storage Tank is consistent with AP1000 DCD nomenclature.

Revising the “Actions” section of the Bases, under heading “C.1” to match wording of the TS requirement for PCCWST is an editorial correction.

Revising the “Surveillance Requirements” section of the Bases to use “PCCWST” when referring to the Passive Containment Cooling Water Storage Tank is consistent with AP1000 DCD nomenclature.

Revising the “Surveillance Requirements” section of the Bases under heading “SR 3.6.6.3” by replacing “Passive Containment Cooling System” with “PCS flow paths” and changing “...positions prior...” to “...position prior...” are editorial clarifications.

Revising the “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.4” by deleting “(and confirmed by operating experience)” improves consistency with STS NUREG-1431.

Revising the “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.5”, third sentence to “...outage, ~~on~~ the need to have access to the locations, and ~~because of~~ the...” is an editorial clarification. (APOG Comment)

Revising the “Surveillance Requirements” section of the Bases, under heading “SR 3.6.6.6”, third sentence to “...The System ~~Operability~~**OPERABILITY** Testing Program provides...” is an editorial clarification. (APOG Comment)

VII. <u>GTST Safety Evaluation</u>

Technical Analysis:

TSTF-440-A: The Technical Specification contains many Surveillances and Required Actions which require periodic verification of the alignment or isolation of a system. Specification 3.6.6 states that a system walkdown must be performed. This level of detail eliminates flexibility in performance of the actions. While a system walkdown may still be utilized to meet the requirement, other methods, such as the use of remote valve position indication, will still meet the intent of the Specifications without unintended consequences, such as increased personnel dose.

To align the Bases for SR 3.6.6.3 with TSTF-440-A changes, the statement of using control room instrumentation to verify valve alignment is deleted. This level of detail eliminates flexibility in performance of the actions. While control room instrumentation may still be utilized to meet the requirement, other methods will still meet the intent of the Specifications without unintended consequences, such as increased personnel dose.

VEGP LAR DOC M13: GTS 3.6.6, Passive Containment Cooling System (PCS) - Operating and GTS 3.6.7, Passive Containment Cooling System (PCS) - Shutdown have the identical LCO statements. Thus, the two Specifications are combined into a single Specification. For Shutdown the “Applicability” statement is revised to include MODES 5 and 6 with the reactor decay heat > 6.0 MWt. GTS 3.6.7 Actions A, B, and C are identical to GTS 3.6.6 Actions A, B, and C. GTS 3.6.6 Condition D, is revised to specify the applicable Conditions and Modes by including the phrases “of Condition A, B, or C,” and “in MODE 1, 2, 3, or 4.” GTS 3.6.6 Condition D, second Condition, is revised to specify the applicable Modes by including the phrase “in MODE 1, 2, 3, or 4.” Action D of GTS 3.6.7 is separated into two individual Actions E and F in TS 3.6.6. The Surveillance Requirements for current GTS 3.6.7 refers to the GTS 3.6.6 SRs as being applicable. Combining the GTS 3.6.6 and GTS 3.6.7 into a single new TS 3.6.6 is more restrictive due to the elimination of the separate restoration times when in Mode 5 or 6. This potential reduction in restoration time is acceptable, since the Passive Containment Cooling System has already been inoperable for at least 72 hours prior to entering Mode 5.

VEGP LAR DOC M14: Revising the Frequency of SR 3.6.6.1 to 24 hours eliminates the current Frequency of every 7 days and 24 hours if the water storage tank temperature is verified to be ≤ 50°F or ≥ 100°F. Revising the Frequency to just a 24 hour Frequency eliminates unnecessary tracking complexity. Therefore, this change is acceptable, since it requires plant personnel to more frequently document performance of the SR.

SR 3.6.6.3 ensures that the proper flow paths exist for passive containment cooling system operation. This verification currently does not require manual valves in the flow path to be verified. Adding manual valves to the SR ensures that any valve that could possibly be in the incorrect position to be periodically checked. This change is acceptable since it requires additional valves that could impact the flow paths to be periodically verified in their correct position, and is consistent with similar Surveillances for system valve lineup verifications.

VEGP LAR DOC D06: Revising LCO 3.6.6 statement removes details that are not necessary. Removing the statement “with all three water flow paths OPERABLE” from the LCO 3.6.6 statement is acceptable because this type of information is not necessary to be included in the TS in order to provide adequate protection of public health and safety. Also, the “LCO” section of the Bases states that “three water flow paths must be OPERABLE.” LCO 3.6.6 continues to require the PCS to be Operable, and SR 3.6.6.3 continues to require verification to ensure that the proper flow paths exist for passive containment cooling system operation.

VEGP LAR DOC L14: The revision to the TS “Applicability” statement deletes the word “calculated”. The word “calculated” is not required to be included in the TS to properly interpret the applicability requirement. Specifying the reactor decay heat > 6.0 MWt is calculated is not necessary to be included in the TS to provide adequate protection of public health and safety. The TS retains the necessary requirements to ensure the required structures, systems, and components are operable.

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 3.6.6 is an acceptable model Specification for the AP1000 standard reactor design.

References to Previous NRC Safety Evaluation Reports (SERs):

None

VIII. Review Information

Evaluator Comments:

STS (NUREG-1431) 3.6.6A is equivalent to AP1000 GTS 3.6.6. NUREG-1431 SR 3.6.6A.1 is equivalent to AP1000 SR 3.6.6.3.

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Review Information:

Availability for public review and comment on Revision 0 of this traveler approved by NRC staff on 5/23/2014.

APOG Comments (Ref. 7) and Resolutions:

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

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. This is resolved by making the APOG recommended changes to the GTST.

3. (Internal #13) The NRC approval of TSTF-425, and model safety evaluation provided in the CLIIP for TSTF-425, are generically applicable to any design’s Technical Specifications. As such, the replacement of certain Frequencies with a Surveillance Frequency Control Program should be included in the GTST for AP1000 STS NUREG.

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

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

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

4. (Internal #356) Editorial change for clarity. These changes are made for consistency with the TS requirement(s) being discussed in the TS Bases. In the "Actions" section of the Bases, under heading "F.1 and F.2", make the last sentence a separate paragraph. This is resolved by making the APOG recommended correction to the Bases and a similar correction is made in the "Actions" section of the Bases under heading "E.1 and E.2".

5. (Internal #357) Fourth paragraph of the Changes to the Generic TS and Bases section states that the Applicability is revised to include "MODES 5 and 6." The change is actually "MODES 5 and 6 with the reactor decay heat > 6.0 MWt." Add in the phrase "with the reactor decay heat > 6.0 MWt". This is resolved by making the APOG recommended correction to Section V of the GTST.

6. (Internal #358 and #359) Discussion of VEGP LAR DOC A085 says it adds the word "Conditions." This should be "Condition" (two locations in the paragraph). Change "Conditions" to "Condition" in both locations. This is resolved by making the APOG recommended corrections to Section VI of the GTST.

7. (Internal #360, #361, and #363) Revise TS 3.6.6 Bases naming convention for the PCCWST to be consistent with AP1000 DCD nomenclature and define the three sets of isolation valves as the three flow paths and simply use "headers" in reference to the two discharge piping routes. This is resolved by making the APOG recommended changes to the "Background" section of the Bases, second, third, and fifth paragraphs. In addition, the NRC staff propose including "(standpipes)" as an alternate name of "PCCWST discharge lines".

> The PCS consists of a 800,000 gal (nominal) ~~cooling water tank~~ **Passive Containment Cooling Water Storage Tank (PCCWST)**, four headered ~~tank~~ **PCCWST** discharge lines **(standpipes)** with flow restricting orifices, and two separate full capacity discharge **headers** ~~flow paths~~ to the containment vessel with 3 sets of isolation valves **(i.e., 3 flow paths)**, each **flow path** capable of meeting the design bases. Algae growth is not expected within the ~~Passive Containment Cooling Water Storage Tank~~ ~~(~~PCCWST~~)~~; however, to assure water clarity is maintained, a prevailing concentration of hydrogen peroxide is maintained at 50 ppm. The recirculation pumps and heater provide freeze protection for the **PCCWST** ~~passive containment cooling water storage tank~~. However, OPERABILITY of the **PCCWST** ~~tank~~ is assured by compliance with the temperature limits specified in SR 3.6.6.1 and not by the recirculation pumps and heater. In addition to the recirculation pumps and heater, the **PCCWST** ~~PCS water storage tank~~ temperature can be maintained within limits by the ambient temperature, the large thermal inertia of the **PCCWST** ~~tank~~, or heat from other sources. The PCS valve room temperature must not be below freezing for an extended period to assure the water flow path to the containment shell is available. The isolation valves on each flow path are powered from a separate Division.
>
> Upon actuation of the isolation valves, gravity flow of water from the **PCCWST** ~~cooling water tank~~ (contained…
>
> ...

> The change in flow rate is attained without active components in the system and is dependent only on the decreasing water level in the elevated ~~storage tank~~**PCCWST**....

Fifth paragraph

> ...Automatic actuation opens the ~~cooling water tank~~**PCCWST** discharge valve, allowing gravity flow of the cooling water...

8. (Internal #362) An editorial change to the “Background” section of the Bases is recommended. This non-technical changes provide improved clarity, consistency, and operator usability. This is resolved by making the APOG recommended changes to delete the word “required” from the “Background” section of the Bases, third paragraph, second sentence.

9. (Internal #364) Delete TS 3.6.6 Bases “Background” section detail regarding the Reliability Assurance Program since it is inconsistent with NUREG-1431 Bases detail. Furthermore, DCD 6.1.3.2 defines a COL Item for this monitoring / inspection, which does not discuss it as a “Reliability Assurance Program”. This is resolved by deleting the seventh sentence from the third paragraph in the “Background” section of the Bases.

10. (Internal #365) Delete TS 3.6.6 Bases “Background” section detail regarding the initial test program since it is inconsistent with NUREG-1431 Bases detail. This is not a TS surveillance or test and does not enhance the understanding of the TS requirements. This information is appropriately provided in AP1000 DCD 6.2.2.4. This is resolved by deleting the last three sentences from the third paragraph in the “Background” section of the Bases.

11. (Internal #366) Editorial change is recommended to the fourth paragraph of the “Background” section of the Bases. This is resolved by making the APOG recommended change as follows:

> ...As the air heats up and water evaporates~~ into the air~~, it becomes less dense than the cooler air in the air inlet annulus. This differential causes an increase in the natural circulation of the air upward along the containment surface, with heated air/water vapor exiting the ~~top/center~~**top center** of...

12. (Internal #367) Editorial changes are recommended to the sixth and seventh paragraphs of the “Background” section of the Bases. This is resolved by making the APOG recommended change as follows:

> …Reduction of containment pressure reduces the release of fission product radioactivity from containment to the environment~~,~~ in the event of a DBA.
>
> The PCS is an **engineered safety features (**ESF**)** system and is designed to ensure that the heat removal capability required during the post accident period can be attained.

13. (Internal #368) Editorial change is recommended to the second paragraph of the “Applicable Safety Analyses” section of the Bases. The recommended change is to clarify that the analyses and evaluations assume 100% RTP. This is resolved by making the APOG recommended change. In addition, the NRC staff proposed replacing references to passive containment cooling system with “PCS”.

14. (Internal #369) Revise TS 3.6.6 Bases naming convention for the PCCWST to be consistent with AP1000 DCD nomenclature. This is resolved by making the APOG recommended changes to the "LCO" section of the Bases, third and fourth paragraphs. In addition, the NRC staff propose editorial changes.

    During a DBA, one ~~passive containment cooling water~~**PCS** flow path is required to maintain the containment peak pressure and temperature below the design limits (Ref. 3). To ensure that this requirement is met, two ~~passive containment cooling water~~**PCS** flow paths are provided.

    Therefore, in the event of an accident, at least one **PCS** flow path operates, assuming the worst case single active failure occurs. A third PCS flow path is provided for protection against multiple failure scenarios modeled in the PRA. To ensure that these requirements are met, three PCS ~~water~~ flow paths must be OPERABLE.

    The PCS includes **the PCCWST**~~a cooling water tank~~, valves, piping, instruments and controls to ensure an OPERABLE flow path capable of delivering water from the **PCCWST**~~cooling water tank~~ upon an actuation signal. An OPERABLE **PCS** flow path consists of a normally closed valve capable of automatically opening in series with a normally open valve. **However, based on PRA insights** ~~F~~**f**or the two flow paths containing air-operated valves, it is preferred ~~because of PRA insights~~ that these valves be normally closed.

    The **PCCWST**~~PCS cooling water storage tank~~ ensures that an adequate supply of water is available to cool and depressurize the containment in the event of a ~~Design Basis Accident (~~DBA~~)~~. To be considered OPERABLE, the **PCCWST**~~PCS cooling water storage tank~~ must meet the water volume and temperature limits established in the SRs. To be considered OPERABLE, the air flow path from the shield building annulus inlet to the exit must be unobstructed, with unobstructed upper annulus safety-related drains providing a path for containment cooling water runoff to preclude blockage of the air flow path.

15. (Internal #370) Editorial change for clarity to the "Actions" section of the Bases under heading "E.1 and E.2" and "F.1 and F.2". These changes are made for consistency with the TS requirement(s) being discussed in the TS Bases. This is resolved by making the APOG recommended changes to the "Actions" section of the Bases. The last sentence under heading "E.1 and E.2" is corrected by making it a separate paragraph. The last sentence under heading "F.1 and F.2" is corrected by making it a separate paragraph. In addition, the NRC staff proposed editorial changes.

16. (Internal #371) Revise TS 3.6.6 Bases for Required Action C.1 wording to match the TS requirement for PCCWST water volume or temperature. This is resolved by making the APOG recommended changes to the "Actions" section of the Bases, under heading "C.1".

17. (Internal #372) Revise TS 3.6.6 Bases naming convention for the PCCWST to be consistent with AP1000 DCD nomenclature. This is resolved by making the APOG recommended changes to the "Surveillance Requirements" section of the Bases, under heading "SR 3.6.6.1".

18. (Internal #373) Revise SR 3.6.6.3 Bases to change from "Passive Containment Cooling System provides" to "PCS flow path provides" and change from "positions prior" to "position

prior" for editorial clarification. This is resolved by making the APOG recommended changes to the "Surveillance Requirements" section of the Bases, under heading "SR 3.6.6.3" and NRC staff proposed editorial changes.

19. (Internal #374) Excess detail is removed from the "Surveillance Requirements" section of the Bases under heading "SR 3.6.6.4". The detail is not consistent with general content reflected in NUREG-1431. Removal of this detail does not impact the information useful for compliance with the TS requirement. This is resolved by making the APOG recommended changes to the "Surveillance Requirements" section of the Bases under heading "SR 3.6.6.4" and NRC staff proposed editorial changes.

20. (Internal #375) Editorial change to the "Surveillance Requirements" section of the Bases under heading "SR 3.6.6.5" is recommended . These non-technical changes provide improved clarity, consistency, and operator usability. This is resolved by making the APOG recommended changes to the "Surveillance Requirements" section of the Bases under heading "SR 3.6.6.5".

21. (Internal #376) Editorial change to the "Surveillance Requirements" section of the Bases under heading "SR 3.6.6.6" is recommended. These non-technical changes provide improved clarity, consistency, and operator usability. This is resolved by making the APOG recommended changes and NRC staff proposed changes to the "Surveillance Requirements" section of the Bases under heading "SR 3.6.6.6".

NRC Final Approval Date: 5/12/2015

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

None

X. References Used in GTST

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

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

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

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

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

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

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

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

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

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

3.6 CONTAINMENT SYSTEMS

3.6.6 Passive Containment Cooling System (PCS) - Operating

LCO 3.6.6 The passive containment cooling system shall be OPERABLE, with all three water flow paths OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.,
MODES 5 and 6 with the reactor decay heat > 6.0 MWt.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One passive containment cooling water flow path inoperable.	A.1	Restore flow path to OPERABLE status.	7 days
B. Two passive containment cooling water flow paths inoperable.	B.1	Restore **one** flow paths to OPERABLE status.	72 hours
C. One or more water storage tank parameters (temperature and volume) not within limits.	C.1	Restore water storage tank to OPERABLE status.	8 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time **of Condition A, B, or C** not met **in MODE 1, 2, 3, or, 4**. <u>OR</u> LCO not met for reasons other than **Condition** A, B, or C **in MODE 1, 2, 3, or 4**.	D.1 Be in MODE 3. <u>AND</u> D.2 Be in MODE 5.	6 hours 84 hours
E. Required Action and associated Completion time of Condition A, B, or C not met in MODE 5. **<u>OR</u>** **LCO not met for reasons other than Condition A, B, or C in MODE 5.**	**E.1 Initiate action to establish pressurizer level ≥ 20% with the Reactor Coolant System (RCS) pressure boundary intact.** **<u>AND</u>** **E.2 Suspend positive reactivity additions.**	**Immediately** **Immediately**
F. Required Action and associated Completion Time of Condition A, B, or C not met in MODE 6. **<u>OR</u>** **LCO not met for reasons other than Condition A, B, or C in MODE 6.**	**F.1 Initiate action to establish water level ≥ 23 ft above the top of the reactor vessel flange.** **<u>AND</u>** **F.2 Suspend positive reactivity additions.**	**Immediately** **Immediately**

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.6.6.1	Verify the water storage tank temperature ≥ 40°F and ≤ 120°F.	~~7 days~~ ~~AND~~ 24 hours~~ when water storage tank temperature is verified ≤ 50°F or ≥ 100°F~~
SR 3.6.6.2	Verify the water storage tank volume ≥ 756,700 gallons.	7 days
SR 3.6.6.3	Verify each passive containment cooling system **manual**, power operated, and automatic valve in each flow path that is not locked, sealed, or otherwise secured in position, is in the correct position.	31 days
SR 3.6.6.4	Verify each passive containment cooling system automatic valve in each flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	24 months
SR 3.6.6.5	Verify the air flow path from the shield building annulus inlet to the exit is unobstructed and, that all air baffle sections are in place.	24 months
SR 3.6.6.6	Verify passive containment cooling system flow and water coverage performance in accordance with the System Level OPERABILITY Testing Program.	At first refueling <u>AND</u> 10 years

B 3.6 CONTAINMENT SYSTEMS

B 3.6.6 Passive Containment Cooling System (PCS)~~ - Operating~~

BASES

BACKGROUND

The PCS provides containment cooling to limit post accident pressure and temperature in containment to less than the design values. Reduction of containment pressure reduces the release of fission product radioactivity from containment to the environment, in the event of a Design Basis Accident (DBA). The ~~Passive Containment Cooling System~~**PCS** is designed to meet the requirements of 10 CFR 50 Appendix A GDC 38 “Containment Heat Removal” and GDC 40 “Testing of Containment Heat Removal Systems” (Ref. 1).

The PCS consists of a 800,000 gal (nominal) ~~cooling water tank~~**Passive Containment Cooling Water Storage Tank (PCCWST)**, four headered ~~tank~~**PCCWST** discharge lines **(standpipes)** with flow restricting orifices, and two separate full capacity discharge ~~flow paths~~**headers** to the containment vessel with 3 sets of isolation valves **(i.e., 3 flow paths)**, each **flow path** capable of meeting the design bases. Algae growth is not expected within the ~~Passive Containment Cooling Water Storage Tank (~~PCCWST~~)~~; however, to assure water clarity is maintained, a prevailing concentration of hydrogen peroxide is maintained at 50 ppm. The recirculation pumps and heater provide freeze protection for the ~~passive containment cooling water storage tank~~**PCCWST**. However, OPERABILITY of the ~~tank~~**PCCWST** is assured by compliance with the temperature limits specified in SR 3.6.6.1 and not by the recirculation pumps and heater. In addition to the recirculation pumps and heater, the ~~PCS water storage tank~~**PCCWST** temperature can be maintained within limits by the ambient temperature, the large thermal inertia of the ~~tank~~**PCCWST**, or heat from other sources. The PCS valve room temperature must not be below freezing for an extended period to assure the water flow path to the containment shell is available. The isolation valves on each flow path are powered from a separate Division.

Upon actuation of the isolation valves, gravity flow of water from the ~~cooling water tank~~**PCCWST** (contained in the shield building structure above the containment) onto the upper portion of the containment shell reduces the containment pressure and temperature following a DBA. The flow of water to the containment shell surface is initially established to assure that the ~~required~~ short term containment cooling requirements following the postulated worst case LOCA are achieved. As the decay heat from the core becomes less with time, the water flow to the containment shell is reduced in three steps. The change in flow rate is

BASES

BACKGROUND (continued)

attained without active components in the system and is dependent only on the decreasing water level in the elevated storage tank**PCCWST**. In order to ensure the containment surface is adequately and effectively wetted, the water is introduced at the center of the containment dome and flows outward. Weirs are placed on the dome surface to distribute the water and ensure effective wetting of the dome and vertical sides of the containment shell. The monitoring of the containment surface through the Reliability Assurance Program (RAP) and the Inservice Testing Program assures containment surface does not unacceptably degrade containment heat removal performance. During the initial test program, the containment coverage will be measured at the base of the upper annulus in addition to the coverage at the spring line for the full flow case and a lower flow case with PCS recirculation pumps delivering to the containment shell. These benchmark values at the base of the upper annulus will be used to develop acceptance criteria for technical specifications. Contamination can be removed by PCS actuation and by using coating vendor cleaning procedures.

The path for the natural circulation of air is from the air intakes in the shield building, down the outside of the baffle, up along the containment shell to the top, center exit in the shield building and is always open. The drains in the upper annulus region must be clear to prevent water from blocking the air flow path. Heat is removed from within the containment utilizing the steel containment shell as the heat transfer surface combining conductive heat transfer to the water film, convective heat transfer from the water film to the air, radiative heat transfer from the film to the air baffle, and mass transfer (evaporation) of the water film into the air. As the air heats up and water evaporates into the air, it becomes less dense than the cooler air in the air inlet annulus. This differential causes an increase in the natural circulation of the air upward along the containment surface, with heated air/water vapor exiting the top /center of the shield building. Additional system design details are provided in Reference 3.

The PCS is actuated either automatically, by a containment High-2 pressure signal, or manually. Automatic actuation opens the cooling water tank**PCCWST** discharge valves, allowing gravity flow of the cooling water onto the containment shell. The manual containment cooling actuation consists of four momentary controls, if two associated controls are operated simultaneously, actuation will occur in all divisions. The discharge continues for at least three days.

BACKGROUND (continued)

The PCS is designed to limit post-accident pressure and temperature in containment to less than the design values. Reduction of containment pressure reduces the release of fission product radioactivity from containment to the environment, in the event of a DBA.

The PCS is an **engineered safety features (**ESF**)** system and is designed to ensure that the heat removal capability required during the post accident period can be attained.

APPLICABLE SAFETY ANALYSES

The ~~Passive Containment Cooling System~~**PCS** limits the temperature and pressure that could be experienced following a DBA. The limiting DBAs considered are the loss of coolant accident (LOCA) and the steam line break (SLB). The LOCA and SLB are analyzed using computer codes designed to predict the resultant containment pressure and temperature transients. No DBAs are assumed to occur simultaneously or consecutively. The postulated DBAs are analyzed with regard to containment ESF system, assuming the loss of one Class 1E Engineered Safety Features Actuation Cabinet (ESFAC) Division, which is the worst case single active failure and results in one PCS flow path being inoperable.

The analyses and evaluations assume ~~a unit specific power level of 3400 MWt~~**100% RTP**, one ~~passive containment cooling~~**PCS** train operating, and initial (pre-accident) containment conditions of 120°F and 1.0 psig. The analyses also assume a response time delayed initiation to provide conservative peak calculated containment pressure and temperature responses.

For certain aspects of transient accident analyses, maximizing the calculated containment pressure is not conservative. In particular, the effectiveness of the Passive Core Cooling System during the core reflood phase of a LOCA analysis increases with increasing containment backpressure. For these calculations, the containment backpressure is calculated in a manner designed to conservatively minimize, rather than maximize, the calculated transient containment pressures in accordance with 10 CFR 50, Appendix K (Ref. 2).

Containment cooling system performance for post accident conditions is given in Reference 3. The result of the analysis is that each train can provide 100% of the required peak cooling capacity during the post accident condition.

BASES

APPLICABLE SAFETY ANALYSES (continued)

The modeled ~~Passive Containment Cooling System~~**PCS** actuation response time from the containment analysis is based upon a response time associated with exceeding the containment High-2 pressure setpoint to opening of isolation valves.

The PCS limits the temperature and pressure that could be experienced during shutdown following a loss of decay heat removal. For shutdown events, the Reactor Coolant System (RCS) sensible and decay heat removal requirements are reduced as compared to heat removal requirements for MODE 1, 2, 3, or 4 events. Therefore, the shutdown containment heat removal requirements are bounded by analyses of MODES 1, 2, 3, and 4 events.

The ~~Passive Containment Cooling System~~**PCS** satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

During a DBA, one ~~passive containment cooling water~~**PCS** flow path is required to maintain the containment peak pressure and temperature below the design limits (Ref. 3). To ensure that this requirement is met, two ~~passive containment cooling water~~**PCS** flow paths are provided.

Therefore, in the event of an accident, at least one **PCS** flow path operates, assuming the worst case single active failure occurs. A third PCS flow path is provided for protection against multiple failure scenarios modeled in the PRA. To ensure that these requirements are met, three PCS ~~water~~ flow paths must be OPERABLE.

The PCS includes **the PCCWST**~~a cooling water tank~~, valves, piping, instruments and controls to ensure an OPERABLE flow path capable of delivering water from the **PCCWST**~~cooling water tank~~ upon an actuation signal. An OPERABLE **PCS** flow path consists of a normally closed valve capable of automatically opening in series with a normally open valve. **However, based on PRA insights** ~~F~~for the two flow paths containing air-operated valves, it is preferred ~~because of PRA insights~~ that these valves be normally closed.

The **PCCWST**~~PCS cooling water storage tank~~ ensures that an adequate supply of water is available to cool and depressurize the containment in the event of a ~~Design Basis Accident (~~DBA~~)~~. To be considered OPERABLE, the **PCCWST**~~PCS cooling water storage tank~~ must meet

BASES

LCO (continued)

the water volume and temperature limits established in the SRs. To be considered OPERABLE, the air flow path from the shield building annulus inlet to the exit must be unobstructed, with unobstructed upper annulus safety-related drains providing a path for containment cooling water runoff to preclude blockage of the air flow path.

APPLICABILITY

In MODES 1, 2, 3, and 4, a DBA could cause a release of radioactive material to containment and an increase in containment pressure and temperature requiring the operation of the PCS.

~~During shutdown the PCS may be required to remove heat from containment. The requirements in MODES 5 and 6 are specified in LCO 3.6.7, Passive Containment Cooling System (PCS) - Shutdown.~~
OPERABILITY of the PCS is required in either MODE 5 or 6 with the reactor decay heat (normally determined by calculation) greater than 6 MWt for heat removal in the event of a loss of nonsafety decay heat removal capabilities. With the decay heat at or below 6.0 MWt, the decay heat can be removed from containment with air cooling alone. Confirmation of decay heat levels may be determined consistent with the assumptions and analysis basis of ANS 1979 plus 2 sigma or via an energy balance of the reactor coolant system.

ACTIONS

A.1

With one ~~passive containment cooling water~~**PCS** flow path inoperable, the affected flow path must be restored within 7 days. In this degraded condition, the remaining flow paths are capable of providing greater than 100% of the heat removal needs after an accident, even considering the worst single failure. The 7 day Completion Time was chosen in light of the remaining heat removal capability and the low probability of a DBA occurring during this period.

B.1

With two ~~passive containment cooling water~~**PCS** flow paths inoperable, at least one affected flow path must be restored to OPERABLE status within 72 hours. In this degraded condition, the remaining flow path is

BASES

ACTIONS (continued)

capable of providing greater than 100% of the heat removal needs after an accident. The 72 hour Completion Time was chosen in light of the remaining heat removal capability and the low probability of DBA occurring during this period.

C.1

If the **PCCWST water volume or temperature is not within limits**~~cooling water tank is inoperable~~, it must be restored to ~~OPERABLE status~~**within limits** within 8 hours.~~ The tank may be declared inoperable due to low water level or temperature out of limits.~~ The 8 hour Completion Time is reasonable based on the remaining heat removal capability of the system and the availability of cooling water from alternate sources.

D.1 and D.2

If any of the Required Actions and associated Completion Times are not met **in MODE 1, 2, 3, or 4**, or if the LCO is not met for reasons other than Condition A, B, or C **when in MODE 1, 2, 3, or 4**, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 84 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. The extended interval to reach MODE 5 allows additional time and is reasonable when considering that the driving force for a release of radioactive material from the Reactor Coolant System is reduced in MODE 3.

E.1 and E.2

Action must be initiated if any of the Required Actions and associated Completion Times of Condition A, B, or C are not met in MODE 5, or if the LCO is not met for reasons other than Condition A, B, or C when in MODE 5. With the RCS pressure boundary open ~~and/~~or pressurizer level < 20%, action must be initiated, immediately, to increase ~~the~~ RCS ~~level to~~inventory by establishing a pressurizer level ≥ 20% and to close the RCS pressure boundary so

ACTIONS (continued)

that the Passive Residual Heat Removal Heat Exchanger (PRHR HX) operation is available. In this casecondition, the time to RCS boiling is maximized by maximizing the RCS inventory and maintaining RCS temperature as low as practical. Additionally, action to immediately suspend positive reactivity additions is required to ensure that the SDM is maintained. Sources of positive reactivity addition include boron dilution, withdrawal of reactivity control assembliesrods, and excessive cooling of the RCS.

These Actions place the plant in a condition which maximizes the time to actuation of the Passive Containment Cooling SystemPCS, thus providing time for repairs or application of alternativealternate cooling capabilities.

F.1 and F.2

Action must be initiated if any of the Required Actions and associated Completion Times of Condition A, B, or C are not met in MODE 6, or if the LCO is not met for reasons other than Condition A, B, or C when in MODE 6. Action must be initiated, immediately, to increase RCS inventory by establishing athe refueling cavity water level ≥ 23 feet above the top of the reactor vessel flange. In this casecondition, the time to RCS boiling is maximized by maximizing the RCS inventory and maintaining RCS temperature as low as practical. Additionally, action to immediately suspend positive reactivity additions is required to ensure that the SDM is maintained. Sources of positive reactivity addition include boron dilution, withdrawal of reactivity control assembliesrods, and excessive cooling of the RCS.

These Actions place the plant in a condition which maximizes the time to actuation of the Passive Containment Cooling SystemPCS, thus providing time for repairs or application of alternativealternate cooling capabilities.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.6.6.1

This surveillance requires verification that the cooling waterPCCWST temperature is within the limits assumed in the accident analyses. The 7-day24 hour Frequency is adequate to identify a temperature change that would approach the temperature limits since the tankPCCWST is large and temperature variations are slow.

The surveillance Frequency is increased to 24 hours in the event that the tank temperature approaches its limits; i.e., once temperature increases either to ≥ 100°F, or decreases to ≤ 50°F. Since the maximum tank temperature variation during the normal surveillance Frequency of 7 days is only about 1°F, the tank temperature cannot exceed its limits before the increased surveillance Frequency takes effect.

SR 3.6.6.2

Verification that the cooling water volume is above the required minimum ensures that a sufficient supply is available for containment cooling. Since the cooling water volume is normally stable and low level is indicated by a main control room alarm, a 7 day Frequency is appropriate and has been shown to be acceptable in similar applications.

SR 3.6.6.3

Verifying the correct alignment of **manual,** power operated, and automatic valves, excluding check valves, in the Passive Containment Cooling SystemPCS flow paths provides assurance that the proper flow paths exist for system operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these were verified to be in the correct positions prior to being secured. This SR does not require any testing or valve manipulation. Rather, it involves verification, through control room instrumentation or a system walkdown, that valves capable of potentially being mispositioned are in the correct position. The 31 day Frequency is appropriate because the valves are operated under administrative control, and an improper valve position would only affect a single **PCS** flow path. This Frequency has been shown to be acceptable through operating experience.

SR 3.6.6.4

This SR requires verification that each automatic isolation valve actuates to its correct position upon receipt of an actual or simulated actuation

SURVEILLANCE REQUIREMENTS (continued)

signal. **The ACTUATION LOGIC TEST overlaps this Surveillance to provide complete testing of the assumed safety function.** This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. 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 Surveillances were performed with the reactor at power. The 24 month Frequency is also acceptable based on consideration of the design reliability ~~(and confirmed by operating experience)~~ of the equipment. Operating experience has shown that these components usually pass the Surveillances when performed at the 24 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

SR 3.6.6.5

Periodic inspections of the PCS air flow path from the shield building annulus inlet to the exit ensure that it is unobstructed, the baffle plates are properly installed, and the upper annulus safety-related drains are unobstructed. Although there are no anticipated mechanisms which would cause air flow path or annulus drain obstruction and the effect of a missing air baffle section is small, it is considered prudent to verify this capability every 24 months. Additionally, the 24 month Frequency is based on the desire to perform this Surveillance under conditions that apply during a plant outage, ~~on~~ the need to have access to the locations, and ~~because of~~ the potential for an unplanned transient if the Surveillance were performed with the reactor at power. This Frequency has been found to be sufficient to detect abnormal degradation in similar situations.

SR 3.6.6.6

This SR requires performance of a ~~Passive Containment Cooling System~~**PCS** test to verify system flow and water coverage capabilities. The system performance test demonstrates that the containment cooling capability assumed in accident analyses is maintained by verifying the flow rates via each **of the four** standpipe**s** and measurement of containment wetting coverage. The System Level ~~Operability~~ **OPERABILITY** Testing Program provides specific test

BASES

SURVEILLANCE REQUIREMENTS (continued)

requirements and acceptance criteria. Although the likelihood that system performance would degrade with time is low, it is considered prudent to periodically verify system performance. The first refueling and 10 year Frequency is based on the ability of the more frequent surveillances to verify the OPERABILITY of the active components and features which could degrade with time.

REFERENCES

1. 10 CFR 50, Appendix A, “General Design Criteria for Nuclear Power Plants.”

2. 10 CFR 50, Appendix K, “ECCS Evaluation Models.”

3. **FSAR Section**~~Chapter~~ 6.2, “Containment Systems.”

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.

3.6 CONTAINMENT SYSTEMS

3.6.6 Passive Containment Cooling System (PCS)

LCO 3.6.6 The passive containment cooling system shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4,
MODES 5 and 6 with the reactor decay heat > 6.0 MWt.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One passive containment cooling water flow path inoperable.	A.1 Restore flow path to OPERABLE status.	7 days
B. Two passive containment cooling water flow paths inoperable.	B.1 Restore one flow path to OPERABLE status.	72 hours
C. One or more water storage tank parameters not within limits.	C.1 Restore water storage tank to OPERABLE status.	8 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. Required Action and associated Completion Time of Condition A, B, or C not met in MODE 1, 2, 3, or, 4. OR LCO not met for reasons other than Condition A, B, or C in MODE 1, 2, 3, or 4.	D.1	Be in MODE 3.	6 hours
	AND		
	D.2	Be in MODE 5.	84 hours
E. Required Action and associated Completion time of Condition A, B, or C not met in MODE 5. OR LCO not met for reasons other than Condition A, B, or C in MODE 5.	E.1	Initiate action to establish pressurizer level ≥ 20% with the Reactor Coolant System (RCS) pressure boundary intact.	Immediately
	AND		
	E.2	Suspend positive reactivity additions.	Immediately
F. Required Action and associated Completion Time of Condition A, B, or C not met in MODE 6. OR LCO not met for reasons other than Condition A, B, or C in MODE 6.	F.1	Initiate action to establish water level ≥ 23 ft above the top of the reactor vessel flange.	Immediately
	AND		
	F.2	Suspend positive reactivity additions.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.6.1	Verify the water storage tank temperature ≥ 40°F and ≤ 120°F.	24 hours
SR 3.6.6.2	Verify the water storage tank volume ≥ 756,700 gallons.	7 days
SR 3.6.6.3	Verify each passive containment cooling system manual, power operated, and automatic valve in each flow path that is not locked, sealed, or otherwise secured in position, is in the correct position.	31 days
SR 3.6.6.4	Verify each passive containment cooling system automatic valve in each flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	24 months
SR 3.6.6.5	Verify the air flow path from the shield building annulus inlet to the exit is unobstructed and, that all air baffle sections are in place.	24 months
SR 3.6.6.6	Verify passive containment cooling system flow and water coverage performance in accordance with the System Level OPERABILITY Testing Program.	At first refueling AND 10 years

B 3.6 CONTAINMENT SYSTEMS

B 3.6.6 Passive Containment Cooling System (PCS)

BASES

BACKGROUND

The PCS provides containment cooling to limit post accident pressure and temperature in containment to less than the design values. Reduction of containment pressure reduces the release of fission product radioactivity from containment to the environment, in the event of a Design Basis Accident (DBA). The PCS is designed to meet the requirements of 10 CFR 50 Appendix A GDC 38 “Containment Heat Removal” and GDC 40 “Testing of Containment Heat Removal Systems” (Ref. 1).

The PCS consists of a 800,000 gal (nominal) Passive Containment Cooling Water Storage Tank (PCCWST), four headered PCCWST discharge lines (standpipes) with flow restricting orifices, and two separate full capacity discharge headers to the containment vessel with 3 sets of isolation valves (i.e., 3 flow paths), each flow path capable of meeting the design bases. Algae growth is not expected within the PCCWST; however, to assure water clarity is maintained, a prevailing concentration of hydrogen peroxide is maintained at 50 ppm. The recirculation pumps and heater provide freeze protection for the PCCWST. However, OPERABILITY of the PCCWST is assured by compliance with the temperature limits specified in SR 3.6.6.1 and not by the recirculation pumps and heater. In addition to the recirculation pumps and heater, the PCCWST temperature can be maintained within limits by the ambient temperature, the large thermal inertia of the PCCWST, or heat from other sources. The PCS valve room temperature must not be below freezing for an extended period to assure the water flow path to the containment shell is available. The isolation valves on each flow path are powered from a separate Division.

Upon actuation of the isolation valves, gravity flow of water from the PCCWST (contained in the shield building structure above the containment) onto the upper portion of the containment shell reduces the containment pressure and temperature following a DBA. The flow of water to the containment shell surface is initially established to assure that the short term containment cooling requirements following the postulated worst case LOCA are achieved. As the decay heat from the core becomes less with time, the water flow to the containment shell is reduced in three steps. The change in flow rate is attained without active components in the system and is dependent only on the decreasing water level in the elevated PCCWST. In order to ensure the containment

BASES

BACKGROUND (continued)

surface is adequately and effectively wetted, the water is introduced at the center of the containment dome and flows outward. Weirs are placed on the dome surface to distribute the water and ensure effective wetting of the dome and vertical sides of the containment shell.

The path for the natural circulation of air is from the air intakes in the shield building, down the outside of the baffle, up along the containment shell to the top, center exit in the shield building and is always open. The drains in the upper annulus region must be clear to prevent water from blocking the air flow path. Heat is removed from within the containment utilizing the steel containment shell as the heat transfer surface combining conductive heat transfer to the water film, convective heat transfer from the water film to the air, radiative heat transfer from the film to the air baffle, and mass transfer (evaporation) of the water film into the air. As the air heats up and water evaporates, it becomes less dense than the cooler air in the air inlet annulus. This differential causes an increase in the natural circulation of the air upward along the containment surface, with heated air/water vapor exiting the top center of the shield building. Additional system design details are provided in Reference 3.

The PCS is actuated either automatically, by a containment High-2 pressure signal, or manually. Automatic actuation opens the PCCWST discharge valves, allowing gravity flow of the cooling water onto the containment shell. The manual containment cooling actuation consists of four momentary controls, if two associated controls are operated simultaneously, actuation will occur in all divisions. The discharge continues for at least three days.

The PCS is designed to limit post-accident pressure and temperature in containment to less than the design values. Reduction of containment pressure reduces the release of fission product radioactivity from containment to the environment in the event of a DBA.

The PCS is an engineered safety features (ESF) system and is designed to ensure that the heat removal capability required during the post accident period can be attained.

APPLICABLE SAFETY ANALYSES

The PCS limits the temperature and pressure that could be experienced following a DBA. The limiting DBAs considered are the loss of coolant accident (LOCA) and the steam line break (SLB). The LOCA and SLB are analyzed using computer codes designed to predict the resultant

BASES

APPLICABLE SAFETY ANALYSES (continued)

containment pressure and temperature transients. No DBAs are assumed to occur simultaneously or consecutively. The postulated DBAs are analyzed with regard to containment ESF system, assuming the loss of one Class 1E Engineered Safety Features Actuation Cabinet (ESFAC) Division, which is the worst case single active failure and results in one PCS flow path being inoperable.

The analyses and evaluations assume 100% RTP, one PCS train operating, and initial (pre-accident) containment conditions of 120°F and 1.0 psig. The analyses also assume a response time delayed initiation to provide conservative peak calculated containment pressure and temperature responses.

For certain aspects of transient accident analyses, maximizing the calculated containment pressure is not conservative. In particular, the effectiveness of the Passive Core Cooling System during the core reflood phase of a LOCA analysis increases with increasing containment backpressure. For these calculations, the containment backpressure is calculated in a manner designed to conservatively minimize, rather than maximize, the calculated transient containment pressures in accordance with 10 CFR 50, Appendix K (Ref. 2).

Containment cooling system performance for post accident conditions is given in Reference 3. The result of the analysis is that each train can provide 100% of the required peak cooling capacity during the post accident condition.

The modeled PCS actuation response time from the containment analysis is based upon a response time associated with exceeding the containment High-2 pressure setpoint to opening of isolation valves.

The PCS limits the temperature and pressure that could be experienced during shutdown following a loss of decay heat removal. For shutdown events, the Reactor Coolant System (RCS) sensible and decay heat removal requirements are reduced as compared to heat removal requirements for MODE 1, 2, 3, or 4 events. Therefore, the shutdown containment heat removal requirements are bounded by analyses of MODES 1, 2, 3, and 4 events.

The PCS satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

BASES

LCO

During a DBA, one PCS flow path is required to maintain the containment peak pressure and temperature below the design limits (Ref. 3). To ensure that this requirement is met, two PCS flow paths are provided.

Therefore, in the event of an accident, at least one PCS flow path operates, assuming the worst case single active failure occurs. A third PCS flow path is provided for protection against multiple failure scenarios modeled in the PRA. To ensure that these requirements are met, three PCS flow paths must be OPERABLE.

The PCS includes the PCCWST, valves, piping, instruments and controls to ensure an OPERABLE flow path capable of delivering water from the PCCWST upon an actuation signal. An OPERABLE PCS flow path consists of a normally closed valve capable of automatically opening in series with a normally open valve. However, based on PRA insights for the two flow paths containing air-operated valves, it is preferred that these valves be normally closed.

The PCCWST ensures that an adequate supply of water is available to cool and depressurize the containment in the event of a DBA. To be considered OPERABLE, the PCCWST must meet the water volume and temperature limits established in the SRs. To be considered OPERABLE, the air flow path from the shield building annulus inlet to the exit must be unobstructed, with unobstructed upper annulus safety-related drains providing a path for containment cooling water runoff to preclude blockage of the air flow path.

APPLICABILITY

In MODES 1, 2, 3, and 4, a DBA could cause a release of radioactive material to containment and an increase in containment pressure and temperature requiring the operation of the PCS.

OPERABILITY of the PCS is required in either MODE 5 or 6 with the reactor decay heat (normally determined by calculation) greater than 6 MWt for heat removal in the event of a loss of nonsafety decay heat removal capabilities. With the decay heat at or below 6.0 MWt, the decay heat can be removed from containment with air cooling alone. Confirmation of decay heat levels may be determined consistent with the assumptions and analysis basis of ANS 1979 plus 2 sigma or via an energy balance of the reactor coolant system.

BASES

ACTIONS

A.1

With one PCS flow path inoperable, the affected flow path must be restored within 7 days. In this degraded condition, the remaining flow paths are capable of providing greater than 100% of the heat removal needs after an accident, even considering the worst single failure. The 7 day Completion Time was chosen in light of the remaining heat removal capability and the low probability of a DBA occurring during this period.

B.1

With two PCS flow paths inoperable, at least one affected flow path must be restored to OPERABLE status within 72 hours. In this degraded condition, the remaining flow path is capable of providing greater than 100% of the heat removal needs after an accident. The 72 hour Completion Time was chosen in light of the remaining heat removal capability and the low probability of DBA occurring during this period.

C.1

If the PCCWST water volume or temperature is not within limits, it must be restored to within limits within 8 hours. The 8 hour Completion Time is reasonable based on the remaining heat removal capability of the system and the availability of cooling water from alternate sources.

D.1 and D.2

If any of the Required Actions and associated Completion Times are not met in MODE 1, 2, 3, or 4, or if the LCO is not met for reasons other than Condition A, B, or C when in MODE 1, 2, 3, or 4, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 84 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. The extended interval to reach MODE 5 allows additional time and is reasonable when considering that the driving force for a release of radioactive material from the Reactor Coolant System is reduced in MODE 3.

ACTIONS (continued)

E.1 and E.2

Action must be initiated if any of the Required Actions and associated Completion Times of Condition A, B, or C are not met in MODE 5, or if the LCO is not met for reasons other than Condition A, B, or C when in MODE 5. With the RCS pressure boundary open or pressurizer level < 20%, action must be initiated, immediately, to increase RCS inventory by establishing a pressurizer level ≥ 20% and to close the RCS pressure boundary so that Passive Residual Heat Removal Heat Exchanger (PRHR HX) operation is available. In this condition, the time to RCS boiling is maximized by maximizing the RCS inventory and maintaining RCS temperature as low as practical. Additionally, action to immediately suspend positive reactivity additions is required to ensure that the SDM is maintained. Sources of positive reactivity addition include boron dilution, withdrawal of control rods, and excessive cooling of the RCS.

These Actions place the plant in a condition which maximizes the time to actuation of the PCS, thus providing time for repairs or application of alternate cooling capabilities.

F.1 and F.2

Action must be initiated if any of the Required Actions and associated Completion Times of Condition A, B, or C are not met in MODE 6, or if the LCO is not met for reasons other than Condition A, B, or C when in MODE 6. Action must be initiated, immediately, to increase RCS inventory by establishing a refueling cavity water level ≥ 23 feet above the top of the reactor vessel flange. In this condition, the time to RCS boiling is maximized by maximizing RCS inventory and maintaining RCS temperature as low as practical. Additionally, action to immediately suspend positive reactivity additions is required to ensure that the SDM is maintained. Sources of positive reactivity addition include boron dilution, withdrawal of control rods, and excessive cooling of the RCS.

These Actions place the plant in a condition which maximizes the time to actuation of the PCS, thus providing time for repairs or application of alternate cooling capabilities.

SURVEILLANCE REQUIREMENTS

SR 3.6.6.1

This surveillance requires verification that the PCCWST temperature is within the limits assumed in the accident analyses. The 24 hour Frequency is adequate to identify a temperature change that would approach the temperature limits since the PCCWST is large and temperature variations are slow.

SR 3.6.6.2

Verification that the cooling water volume is above the required minimum ensures that a sufficient supply is available for containment cooling. Since the cooling water volume is normally stable and low level is indicated by a main control room alarm, a 7 day Frequency is appropriate and has been shown to be acceptable in similar applications.

SR 3.6.6.3

Verifying the correct alignment of manual, power operated, and automatic valves, excluding check valves, in the PCS flow paths provides assurance that the proper flow paths exist for system operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these were verified to be in the correct position prior to being secured. This SR does not require any testing or valve manipulation. Rather, it involves verification that valves capable of being mispositioned are in the correct position. The 31 day Frequency is appropriate because the valves are operated under administrative control, and an improper valve position would only affect a single PCS flow path. This Frequency has been shown to be acceptable through operating experience.

SR 3.6.6.4

This SR requires verification that each automatic isolation valve actuates to its correct position upon receipt of an actual or simulated actuation signal. The ACTUATION LOGIC TEST overlaps this Surveillance to provide complete testing of the assumed safety function. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. 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 Surveillances were performed with the reactor at power. The 24 month Frequency is also acceptable based on consideration of the design reliability of the

BASES

SURVEILLANCE REQUIREMENTS (continued)

equipment. Operating experience has shown that these components usually pass the Surveillances when performed at the 24 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

SR 3.6.6.5

Periodic inspections of the PCS air flow path from the shield building annulus inlet to the exit ensure that it is unobstructed, the baffle plates are properly installed, and the upper annulus safety-related drains are unobstructed. Although there are no anticipated mechanisms which would cause air flow path or annulus drain obstruction and the effect of a missing air baffle section is small, it is considered prudent to verify this capability every 24 months. Additionally, the 24 month Frequency is based on the desire to perform this Surveillance under conditions that apply during a plant outage, the need to have access to the locations, and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. This Frequency has been found to be sufficient to detect abnormal degradation in similar situations.

SR 3.6.6.6

This SR requires performance of a PCS test to verify system flow and water coverage capabilities. The system performance test demonstrates that the containment cooling capability assumed in accident analyses is maintained by verifying the flow rates via each of the four standpipes and measurement of containment wetting coverage. The System Level OPERABILITY Testing Program provides specific test requirements and acceptance criteria. Although the likelihood that system performance would degrade with time is low, it is considered prudent to periodically verify system performance. The first refueling and 10 year Frequency is based on the ability of the more frequent surveillances to verify the OPERABILITY of the active components and features which could degrade with time.

REFERENCES

1. 10 CFR 50, Appendix A, “General Design Criteria for Nuclear Power Plants.”
2. 10 CFR 50, Appendix K, “ECCS Evaluation Models.”
3. FSAR Section 6.2, “Containment Systems.”