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

Title: Changes Related to LCO 3.5.5, Passive Residual Heat Removal Heat Exchanger (PRHR HX) – Shutdown, Reactor Coolant System (RCS) Intact

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

TSTF Number and Title:

TSTF-425, Rev. 3,	Relocate Surveillance Frequencies to Licensee Control - RITSTF Initiative 5b
TSTF-523, Rev. 2,	Generic Letter 2008-01, Managing Gas Accumulation

STS NUREGs Affected:

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

NRC Approval Date:

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

TSTF Classification:

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

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

RCOL Std. Dep. Number and Title:

None

RCOL COL Item Number and Title:

None

RCOL PTS Change Number and Title:

VEGP LAR DOC A073: Editorial revision to add system name “PRHR HX” to valve description
VEGP LAR DOC A075: TS 3.5.5 Condition E deletion of second entry condition
VEGP LAR DOC A076: TS 3.5.5 Required Action E.1 revision
VEGP LAR DOC M10: PRHR HX LCO Note replaced with SR
VEGP LAR DOC L17: Revisions to Actions and SRs associated with noncondensible gases

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

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(1) applicable to operating reactor designs, but not to the AP1000 design; (2) already incorporated in the GTS; or (3) superseded by another change.

TSTF-425 is deferred for future consideration.

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

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

Applicability statement is revised to correct the punctuation after "...Removal System (RNS)." from a period to a comma.

APOG Recommended Changes to Improve the Bases

An editorial change is made to the "Actions" section of the Bases under the heading "C.1" by changing the word "revise" to "remove".

V. Applicability

Affected Generic Technical Specifications and Bases:

Section 3.5.5, Passive Residual Heat Removal Heat Exchanger (PRHR HX) – Shutdown, Reactor Coolant System (RCS) Intact

Changes to the Generic Technical Specifications and Bases:

LCO 3.5.5 Note is replaced with a SR to verify PRHR HX OPERABILITY when one or more RCPs are in operation and the associated “LCO” section of the Bases is revised to reflect deletion of the Note. The associated “SR” section of the Bases is revised to reflect addition of the new SR. (DOC M10)

Applicability statement is revised to correct punctuation. (NRC staff proposed change)

Condition A entry statement and Required Action A.1 of TS 3.5.5, the system name “PRHR HX” is added to identify the valves. (DOC A073)

Condition C entry statement of TS 3.5.5 is changed from “Presence of non-condensible gases in the high point vent.” to “PRHR HX inlet line noncondensible gas volume not within limit.” Required Action C.1 of TS 3.5.5 is changed from “Vent noncondensible gases.” to “Restore PRHR HX inlet line noncondensible gas volume to within limit.” The associated “LCO” section of the Bases is also revised. (DOC L17)

Condition E second entry statement of TS 3.5.5 is deleted. The associated “Actions” section of the Bases is also revised. (DOC A075)

Required Action E.1 of TS 3.5.5 is revised by deleting the statement “and > 20% pressurizer level.” The associated “Actions” section of the Bases is also revised. (A076)

In the “Actions” section of the Bases under the heading “C.1” an editorial correction is made by changing the word “revise” to “remove”. (APOG Comment)

VI. Traveler Information

Description of TSTF changes:

None

Rationale for TSTF changes:

None

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

VEGP LAR DOC A073 adds the system name “PRHR HX” to the valve description for TS 3.5.5 Condition A entry statement and Required Action A.1.

VEGP LAR DOC A075 deletes the second entry statement of Condition E.

VEGP LAR DOC A076 deletes the requirement of a “> 20% pressurizer level.” Required Action E.1 is revised to “Initiate action to be in MODE 5 with RCS pressure boundary open.”

VEGP LAR DOC M10 replaces LCO 3.5.5 Note, which states “When any reactor coolant pumps (RCPs) are operating, at least one RCP must be operating in the loop with the PRHR HX, Loop 1,” with a SR to verify PRHR HX OPERABILITY when one or more RCPs are in operation.

VEGP LAR DOC L17 revises the TS 3.5.5 Condition C entry statement to change “Presence of non-condensible gases in the high point vent.” to “PRHR HX inlet line noncondensible gas volume not within limit.” Required Action C.1 is revised to reflect the change to the revised Condition C statement.

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

VEGP LAR DOC A073 changes to TS 3.5.5 Condition A entry statement and Required Action A.1 provide clarity in citing the full name of the valve, “PRHR HX”.

VEGP LAR DOC A075 removes the second entry condition of Condition E, which states “LCO not met for reasons other than A, B, C, or D. Condition D is required to be entered if there are PRHR HX inoperabilities other than those described by Condition A, B, or C. If the PRHR HX is not restored to Operable status within 8 hours of entering Condition D, Condition E is required to be entered.

VEGP LAR DOC A076 Change to Required Action E.1 and associated Bases does not change the intent of the Required Action. Once MODE 5 is entered with the RCS pressure boundary open the requirement for > 20% pressurizer level is no longer applicable.

VEGP LAR DOC M10 replacement of LCO 3.5.5 Note with a SR to verify PRHR HX OPERABILITY when one or more RCPs are in operation.

VEGP LAR DOC L17 changes TS 3.5.5 Condition C entry statement and “LCO” section of the Bases for consistency with “LCO” section of the Bases of TS 3.5.4. The changes to TS 3.5.5 Required Action C.1 are for consistency with changes made to Condition C entry statement.

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

The Applicability statement is revised by changing the period after “...Removal System (RNS).” to a comma.

In the “Actions” section of the Bases under the heading “C.1” the last sentence is corrected from “...available to revise heat...” to “available to remove heat...”. (APOG Comment)

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

The change to the Applicability statement is a correction to the punctuation.

changing the word “revise” to “remove” is an editorial correction.

VII. GTST Safety Evaluation

Technical Analysis:

VEGP LAR DOC M10:

GTS 3.5.4, “Passive Residual Heat Removal Heat Exchanger (PRHR HX) - Operating,” and GTS 3.5.5, “Passive Residual Heat Removal Heat Exchanger (PRHR HX) - Shutdown, Reactor Coolant System (RCS) Intact,” are revised to delete the LCO Note.

GTS LCO 3.5.5 requires that the PRHR HX shall be Operable. The LCO has a Note which states, “When any reactor coolant pumps (RCPs) are operating, at least one RCP must be operating in the loop with the PRHR HX, Loop 1.” The Bases for LCO 3.5.5 state that the Note “requires a reactor coolant pump (RCP) to be operating in the loop with the PRHR HX, Loop 1, if any RCPs are operating. If RCPs are only operating in Loop 2 and no RCPs are operating in Loop 1, there is a possibility there may be reverse flow in the PRHR HX.” An operational condition such as this should be surveillance tested to ensure that it is met. Accordingly, the Note requirements are replaced by a new SR 3.5.4.4 to periodically verify one Loop 1 RCP is in operation, but which is only required to be met when one or more RCPs are in operation.

A corresponding SR is not explicitly stated in Specification 3.5.5 because SR 3.5.5.1 states that the SRs of Specification 3.5.4 are applicable. Thus, the new SR added to Specification 3.5.4 will also be applicable to Specification 3.5.5.

VEGP LAR DOC L17: As stated in the associated Bases for the GTS 3.5.5 Actions, the presence of some noncondensible gases does not mean that the CMT is immediately inoperable, but that gases are collecting and should be vented. TS 3.5.5, Condition C is revised for consistency.

GTS 3.5.5, Required Action C.1 is revised to replace a specific method of restoration with a more general action to restore the parameter, in this case noncondensible gas volume, to within its limit. This change is made for consistency with the revised entry conditions associated with the Required Action. Only the specific method is deleted from the action. The associated Bases, both GTS and revised, describe an appropriate method for restoration. The revised Action continue to provide assurance that operation with a noncondensible gas volume that can affect the associated flow path is allowed for only a limited period of time. These changes are designated as less restrictive because the specific method of restoration is deleted and replaced with a more general requirement to restore within the limit.

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

Having found that this GTST’s proposed changes to the GTS and Bases are acceptable, the NRC staff concludes that AP1000 STS Subsection 3.5.5 is an acceptable model Specification for the AP1000 standard reactor design.

References to Previous NRC Safety Evaluation Reports (SERs):

None

VIII. Review Information

Evaluator Comments:

None

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Review Information:

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

APOG Comments (Ref. 7) and Resolutions:

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

2. (Internal #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 #306) Fifth item under "Changes to the Generic Technical Specifications and Bases" describing changes to Condition E second entry statement as attributed to DOC A076. However, this change is actually discussed in DOC A075. Replace the reference to "DOC A076" with "DOC A075". This is resolved by making the recommended correction to the GTST.

5. (Internal #307) Sixth item under "Changes to the Generic Technical Specifications and Bases" describing changes to Required Action E.1 as attributed to DOC A075. However, this change is actually discussed in DOC A076. Replace the reference to "DOC A075" with "DOC A076". This is resolved by making the recommended correction to the GTST.

6. (Internal #308) Editorial change for clarity - These changes are made for consistency with the TS requirement(s) being discussed in the TS Bases. Make the following changes to LCO Bases:

   "**A** reactor coolant pump (RCP) is required to be operating in the loop with the PRHR HX, Loop..."

   The markup error is corrected by removing the strikethrough from the added "A".

7. (Internal #309) Editorial change is recommended. These non-technical changes provide improved clarity, consistency, and operator usability. Make the following changes in the C.1 Actions Bases discussion:

   "A Completion Time of 24 hours is acceptable, considering that passive feed and bleed cooling is available to ~~revise~~**remove** heat from the RCS."

   This is resolved by making the recommended correction.

NRC Final Approval Date: 12/15/2015

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

None

X. References Used in GTST

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

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

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

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

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

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

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

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

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

7. APOG-2014-008, APOG (AP1000 Utilities) Comments on AP1000 Standardized Technical Specifications (STS) Generic Technical Specification Travelers (GTSTs), Docket ID NRC-2014-0147, September 22, 2014 (ML 14265A493).

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

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

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

3.5 PASSIVE CORE COOLING SYSTEM (PXS)

3.5.5 Passive Residual Heat Removal Heat Exchanger (PRHR HX) – Shutdown, Reactor Coolant System (RCS) Intact

LCO 3.5.5 The PRHR HX shall be OPERABLE.

~~----------NOTE----------~~
~~When any reactor coolant pumps (RCPs) are operating, at least one RCP must be operating in the loop with the PRHR HX, Loop 1.~~
~~----------~~

APPLICABILITY: MODE 4 with the RCS cooling provided by the Normal Residual Heat Removal System (RNS)~~.~~**,**
MODE 5 with the RCS pressure boundary intact and pressurizer level ≥ 20%.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One air operated **PRHR HX** outlet isolation valve inoperable.	A.1 Restore air operated **PRHR HX** outlet valve to OPERABLE status.	72 hours
B. One air operated In-Containment Refueling Water Storage Tank (IRWST) gutter isolation valve inoperable.	B.1 Restore air operated IRWST gutter isolation valve to OPERABLE status.	72 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. ~~Presence of non-condensible gases in the high point vent~~**PRHR HX inlet line noncondensible gas volume not within limit**.	C.1 ~~Vent noncondensible gases~~**Restore PRHR HX inlet line noncondensible gas volume to within limit**.	24 hours
D. PRHR HX inoperable for reasons other than Condition A, B, or C.	D.1 Restore PRHR HX to OPERABLE status.	8 hours
E. Required Action and associated Completion Time not met. ~~OR~~ ~~LCO not met for reasons other than A, B, C, or D.~~	E.1 Initiate action to be in MODE 5 with the RCS pressure boundary open ~~and > 20% pressurizer level~~.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.5.1	The SRs of Specification 3.5.4, “Passive Residual Heat Removal Heat Exchanger (PRHR HX) – Operating,” ~~–~~are applicable.	In accordance with applicable SRs

B 3.5 PASSIVE CORE COOLING SYSTEM (PXS)

B 3.5.5 Passive Residual Heat Removal Heat Exchanger (PRHR HX) – Shutdown, Reactor Coolant System (RCS) Intact

BASES

BACKGROUND

A description of the PRHR HX is provided in the Bases for LCO 3.5.4, "Passive Residual Heat Removal Heat Exchanger (PRHR HX) – Operating."

APPLICABLE SAFETY ANALYSES

In the event of a loss of normal decay heat removal capability during shutdown with the Reactor Coolant System (RCS) pressure boundary intact, the PRHR HX provides the preferred safety related heat removal path. When required, the PRHR HX is manually actuated and can maintain the RCS < 420°F. Alternatively, the heat removal function can be provided by depressurizing the RCS with the Automatic Depressurization System (ADS) and injection of the In-containment Refueling Water Storage Tank (IRWST) with containment closure capability provided. The PRHR HX is preferred because the RCS pressure boundary remains intact, thus preserving a barrier to fission product release.

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

LCO

This LCO requires the PRHR HX to be OPERABLE so that it can be placed in service in the event normal decay heat removal capability is lost. Since this a passive component, it does not require the actuation of active components such as pumps for its OPERABILITY and will be OPERABLE if the inlet valves are in their normally open position, and the normally closed, fail open outlet valves open on receipt of an actuation signal.

~~In addition to the appropriate valve configuration, OPERABILITY may be impaired by flow blockage caused by noncondensible gases collecting in the system. Thus the absence of non-condensible gases in the high point is necessary for system OPERABILITY.~~**OPERABILITY is not expected to be challenged due to small gas accumulations in the high point, and rapid gas accumulations are not expected during plant operation. However, a relatively small gas volume was incorporated into the design for alerting operators to provide sufficient time to initiate venting operations before the gas volume would be expected to increase to a sufficient volume that might**

BASES

LCO (continued)

potentially challenge the OPERABILITY of passive safety injection flow. Therefore, noncondensible gas accumulation in the injection line high point that causes the water level to drop below the sensor will require operator action to investigate the cause of the gas accumulation and to vent the associated high point(s).

~~The note requires a~~**A** reactor coolant pump (RCP) **is required** to be operating in the loop with the PRHR HX, Loop 1, if any RCPs are operating. If RCPs are only operating in loop 2 and no RCPs are operating in loop 1, there is a possibility there may be reverse flow in the PRHR HX.

APPLICABILITY

The PRHR HX must be OPERABLE in MODE 4 with RCS cooling provided by the Normal Residual Heat Removal System (RNS) and in MODE 5 with the RCS pressure boundary intact and pressurizer level ≥ 20% to provide decay heat removal in the event the normal residual heat removal system is not available.

The PRHR HX requirements in MODES 1, 2, 3, and 4 with RCS cooling not provided by the RNS are specified in LCO 3.5.4, “Passive Residual Heat Removal Heat Exchanger (PRHR HX) – Operating.”

The PRHR HX is not capable of natural circulation cooling of the RCS in MODE 5 with either the RCS pressure boundary open or with the RCS intact when pressurizer level ≤ 20%, or in MODE 6.

ACTIONS

A.1

The outlet line from the PRHR HX is isolated by a pair of normally closed, fail open, air operated valves, arranged in parallel. They are redundant, and if either valve is OPERABLE the system can function at 100% capacity, assuming other OPERABILITY conditions are met.

Since these valves are redundant, if one valve is inoperable, a Completion Time of 72 hours has been allowed to restore the inoperable valve to OPERABLE status. This Completion Time is consistent with the Completion Times specified for other parallel redundant safety related systems.

BASES

ACTIONS (continued)

B.1

With one air operated IRWST gutter isolation valve inoperable, the remaining isolation valve can function to drain the gutter to the IRWST. Action must be taken to restore the inoperable gutter isolation valve to OPERABLE status within 72 hours. The 72 hour Completion Time is acceptable based on the capability of the remaining valve to perform 100% of the required safety function assumed in the safety analyses.

C.1

At the inlet piping high point there is a vertical chamber which serves as a collection point for noncondensible gases. This collection point is provided with detectors which alarm to indicate when gases have collected in this area. The presence of an alarm does not mean that PRHR HX is immediately inoperable, but that gases are collecting and should be vented. A Completion Time of 24 hours is acceptable, considering that passive feed and bleed cooling is available to ~~revise~~**remove** heat from the RCS.

D.1

With the LCO not met for reasons other than Condition A, B, or C, the PRHR HX must be restored within 8 hours. The 8 hour Completion Time is acceptable based on the availability of passive feed and bleed cooling to provide RCS heat removal. The effectiveness of feed and bleed cooling is discussed in the bases for LCO 3.5.4, Action E.1.

E.1

If any of the above Required Actions ha**s**~~ve~~ not been accomplished in the required Completion Time, ~~or the LCO is not met for reasons other than Conditions A, B, C, or D,~~ action must be initiated, immediately, to be in MODE 5 with the RCS pressure boundary open~~ and pressurizer level ≥ 20%~~. ~~The time to RCS boiling is maximized in the event of loss of normal decay heat removal capability, by maintaining a visible level in the pressurizer. Additionally, in~~**In** this MODE **with** the RCS ~~must be~~ opened, ~~such that~~ safety related decay heat removal can be immediately initiated by actuation of the IRWST injection valve(s).

BASES

SURVEILLANCE REQUIREMENTS

SR 3.5.5.1

The LCO 3.5.4 Surveillance Requirements are applicable to the PRHR HX required to be OPERABLE. The Frequencies associated with each specified SR are applicable. Refer to the corresponding Bases for LCO 3.5.4 for a discussion of each SR.

REFERENCES None.

XII. Applicable STS Subsection After Incorporation of this GTST's Modifications

The entire subsection of the Specifications and the Bases associated with this GTST, following incorporation of the modifications, is presented next.

3.5 PASSIVE CORE COOLING SYSTEM (PXS)

3.5.5 Passive Residual Heat Removal Heat Exchanger (PRHR HX) – Shutdown, Reactor Coolant System (RCS) Intact

LCO 3.5.5 The PRHR HX shall be OPERABLE.

APPLICABILITY: MODE 4 with the RCS cooling provided by the Normal Residual Heat Removal System (RNS),
MODE 5 with the RCS pressure boundary intact and pressurizer level ≥ 20%.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One air operated PRHR HX outlet isolation valve inoperable.	A.1 Restore air operated PRHR HX outlet valve to OPERABLE status.	72 hours
B. One air operated In-Containment Refueling Water Storage Tank (IRWST) gutter isolation valve inoperable.	B.1 Restore air operated IRWST gutter isolation valve to OPERABLE status.	72 hours
C. PRHR HX inlet line noncondensible gas volume not within limit.	C.1 Restore PRHR HX inlet line noncondensible gas volume to within limit.	24 hours
D. PRHR HX inoperable for reasons other than Condition A, B, or C.	D.1 Restore PRHR HX to OPERABLE status.	8 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. Required Action and associated Completion Time not met.	E.1 Initiate action to be in MODE 5 with the RCS pressure boundary open.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.5.1	The SRs of Specification 3.5.4, “Passive Residual Heat Removal Heat Exchanger (PRHR HX) – Operating,” are applicable.	In accordance with applicable SRs

B 3.5 PASSIVE CORE COOLING SYSTEM (PXS)

B 3.5.5 Passive Residual Heat Removal Heat Exchanger (PRHR HX) – Shutdown, Reactor Coolant System (RCS) Intact

BASES

BACKGROUND

A description of the PRHR HX is provided in the Bases for LCO 3.5.4, "Passive Residual Heat Removal Heat Exchanger (PRHR HX) – Operating."

APPLICABLE SAFETY ANALYSES

In the event of a loss of normal decay heat removal capability during shutdown with the Reactor Coolant System (RCS) pressure boundary intact, the PRHR HX provides the preferred safety related heat removal path. When required, the PRHR HX is manually actuated and can maintain the RCS < 420°F. Alternatively, the heat removal function can be provided by depressurizing the RCS with the Automatic Depressurization System (ADS) and injection of the In-containment Refueling Water Storage Tank (IRWST) with containment closure capability provided. The PRHR HX is preferred because the RCS pressure boundary remains intact, thus preserving a barrier to fission product release.

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

LCO

This LCO requires the PRHR HX to be OPERABLE so that it can be placed in service in the event normal decay heat removal capability is lost. Since this a passive component, it does not require the actuation of active components such as pumps for its OPERABILITY and will be OPERABLE if the inlet valves are in their normally open position, and the normally closed, fail open outlet valves open on receipt of an actuation signal.

OPERABILITY is not expected to be challenged due to small gas accumulations in the high point, and rapid gas accumulations are not expected during plant operation. However, a relatively small gas volume was incorporated into the design for alerting operators to provide sufficient time to initiate venting operations before the gas volume would be expected to increase to a sufficient volume that might potentially challenge the OPERABILITY of passive safety injection flow. Therefore, noncondensible gas accumulation in the injection line high point that causes the water level to drop below the sensor will require operator

BASES

LCO (continued)

action to investigate the cause of the gas accumulation and to vent the associated high point(s).

A reactor coolant pump (RCP) is required to be operating in the loop with the PRHR HX, Loop 1, if any RCPs are operating. If RCPs are only operating in loop 2 and no RCPs are operating in loop 1, there is a possibility there may be reverse flow in the PRHR HX.

APPLICABILITY

The PRHR HX must be OPERABLE in MODE 4 with RCS cooling provided by the Normal Residual Heat Removal System (RNS) and in MODE 5 with the RCS pressure boundary intact and pressurizer level ≥ 20% to provide decay heat removal in the event the normal residual heat removal system is not available.

The PRHR HX requirements in MODES 1, 2, 3, and 4 with RCS cooling not provided by the RNS are specified in LCO 3.5.4, “Passive Residual Heat Removal Heat Exchanger (PRHR HX) – Operating.”

The PRHR HX is not capable of natural circulation cooling of the RCS in MODE 5 with either the RCS pressure boundary open or with the RCS intact when pressurizer level ≤ 20%, or in MODE 6.

ACTIONS

A.1

The outlet line from the PRHR HX is isolated by a pair of normally closed, fail open, air operated valves, arranged in parallel. They are redundant, and if either valve is OPERABLE the system can function at 100% capacity, assuming other OPERABILITY conditions are met.

Since these valves are redundant, if one valve is inoperable, a Completion Time of 72 hours has been allowed to restore the inoperable valve to OPERABLE status. This Completion Time is consistent with the Completion Times specified for other parallel redundant safety related systems.

BASES

ACTIONS (continued)

B.1

With one air operated IRWST gutter isolation valve inoperable, the remaining isolation valve can function to drain the gutter to the IRWST. Action must be taken to restore the inoperable gutter isolation valve to OPERABLE status within 72 hours. The 72 hour Completion Time is acceptable based on the capability of the remaining valve to perform 100% of the required safety function assumed in the safety analyses.

C.1

At the inlet piping high point there is a vertical chamber which serves as a collection point for noncondensible gases. This collection point is provided with detectors which alarm to indicate when gases have collected in this area. The presence of an alarm does not mean that PRHR HX is immediately inoperable, but that gases are collecting and should be vented. A Completion Time of 24 hours is acceptable, considering that passive feed and bleed cooling is available to remove heat from the RCS.

D.1

With the LCO not met for reasons other than Condition A, B, or C, the PRHR HX must be restored within 8 hours. The 8 hour Completion Time is acceptable based on the availability of passive feed and bleed cooling to provide RCS heat removal. The effectiveness of feed and bleed cooling is discussed in the bases for LCO 3.5.4, Action E.1.

E.1

If any of the above Required Actions has not been accomplished in the required Completion Time, action must be initiated, immediately, to be in MODE 5 with the RCS pressure boundary open. In this MODE with the RCS opened, safety related decay heat removal can be immediately initiated by actuation of the IRWST injection valve(s).

BASES

SURVEILLANCE REQUIREMENTS

SR 3.5.5.1

The LCO 3.5.4 Surveillance Requirements are applicable to the PRHR HX required to be OPERABLE. The Frequencies associated with each specified SR are applicable. Refer to the corresponding Bases for LCO 3.5.4 for a discussion of each SR.

REFERENCES None.