January 19, 2018

TSTF-17-18
PROJ0753

Attn: Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: Transmittal of TSTF-566, Revision 0, "Revise Actions for Inoperable RHR Shutdown Cooling Subsystems"

Enclosed for NRC review is TSTF-566, Revision 0, "Revise Actions for Inoperable RHR Shutdown Cooling Subsystems."

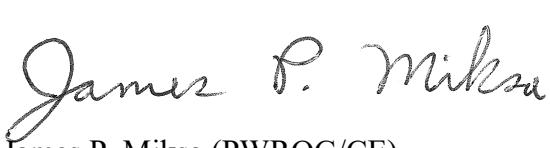
The following information is provided to assist the NRC staff in prioritizing their review of TSTF-566:

- Applicability: TSTF-566 is applicable to boiling water reactor plants.
- Classification: TSTF-566 will clarify the Technical Specification (TS) Actions for TS related to the Residual Heat Removal System.
- Specialized Resource Availability: The traveler addresses current inspection issues raised by the NRC. Therefore, the TSTF requests approval of the traveler within twelve months.

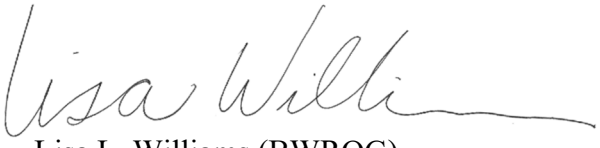
The Technical Specifications Task Force should be billed for the review of the traveler.

11921 Rockville Pike, Suite 100, Rockville, MD 20852
Phone: 301-984-4400, Fax: 301-984-7600
Administration by EXCEL Services Corporation

Should you have any questions, please do not hesitate to contact us.

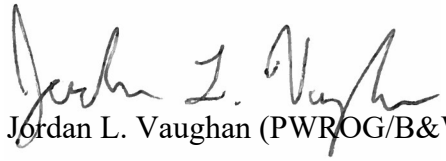


James P. Miksa (PWROG/CE)

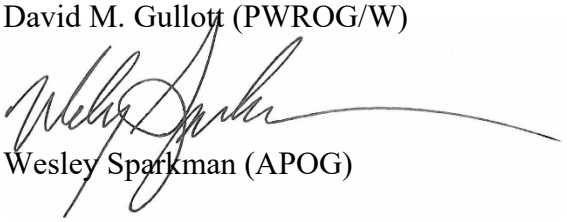


Lisa L. Williams (BWROG)

David M. Gullott (PWROG/W)



Jordan L. Vaughan (PWROG/B&W)



Wesley Sparkman (APOG)

Attachment

cc: Michelle Honcharik, Technical Specifications Branch
Robert Tjader, Technical Specifications Branch
Victor Cusumano, Technical Specifications Branch

Technical Specifications Task Force
Improved Standard Technical Specifications Change Traveler

Revise Actions for Inoperable RHR Shutdown Cooling Subsystems

NUREGs Affected: ☐ 1430 ☐ 1431 ☐ 1432 ☑ 1433 ☑ 1434 ☐ 2194

Classification: 1) Technical Change
Recommended for CLIIP?: Yes

Correction or Improvement: Correction
NRC Fee Status: Not Exempt

Changes Marked on ISTS Rev 4.0

See attached justification.

Revision History

OG Revision 0 Revision Status: Active

Revision Proposed by: BWROG

Revision Description:
Original Issue

Owners Group Review Information

Date Originated by OG: 19-Sep-17

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 06-Oct-17

TSTF Review Information

TSTF Received Date: 19-Dec-17 Date Distributed for Review 19-Dec-17

TSTF Comments:
(No Comments)

TSTF Resolution: Approved Date: 08-Jan-18

NRC Review Information

NRC Received Date: 19-Jan-18

Affected Technical Specifications

Action 3.9.8.A Bases	RHR - High Water Level	NUREG(s)- 1433 1434 Only

Action 3.9.9.A Bases	RHR - Low Water Level	NUREG(s)- 1433 1434 Only
Action 3.4.8.A	RHR Shutdown Cooling System - Hot Shutdown	NUREG(s)- 1433 Only
Action 3.4.8.A Bases	RHR Shutdown Cooling System - Hot Shutdown	NUREG(s)- 1433 Only
Action 3.4.8.B	RHR Shutdown Cooling System - Hot Shutdown	NUREG(s)- 1433 Only
	Change Description: New Action	
Action 3.4.8.B	RHR Shutdown Cooling System - Hot Shutdown	NUREG(s)- 1433 Only
	Change Description: Renamed C	
Action 3.4.8.B Bases	RHR Shutdown Cooling System - Hot Shutdown	NUREG(s)- 1433 Only
	Change Description: Renamed C	
Action 3.4.8.B Bases	RHR Shutdown Cooling System - Hot Shutdown	NUREG(s)- 1433 Only
	Change Description: New Action	
Action 3.4.9.B	RHR Shutdown Cooling System - Cold Shutdown	NUREG(s)- 1433 Only
	Change Description: New Action	
Action 3.4.9.B	RHR Shutdown Cooling System - Cold Shutdown	NUREG(s)- 1433 Only
	Change Description: Renamed C	
Action 3.4.9.B Bases	RHR Shutdown Cooling System - Cold Shutdown	NUREG(s)- 1433 Only
	Change Description: New Action	
Action 3.4.9.B Bases	RHR Shutdown Cooling System - Cold Shutdown	NUREG(s)- 1433 Only
	Change Description: Renamed C	
Action 3.4.9.A	RHR - High Water Level	NUREG(s)- 1434 Only
Action 3.4.9.A Bases	RHR - Low Water Level	NUREG(s)- 1434 Only
Action 3.4.9.B	RHR Shutdown Cooling System - Hot Shutdown	NUREG(s)- 1434 Only
	Change Description: New Action	
Action 3.4.9.B	RHR Shutdown Cooling System - Hot Shutdown	NUREG(s)- 1434 Only
	Change Description: Renamed C	
Action 3.4.9.B Bases	RHR Shutdown Cooling System - Hot Shutdown	NUREG(s)- 1434 Only
	Change Description: Renamed C	
Action 3.4.9.B Bases	RHR Shutdown Cooling System - Hot Shutdown	NUREG(s)- 1434 Only
	Change Description: New Action	
Action 3.4.10.B	RHR Shutdown Cooling System - Cold Shutdown	NUREG(s)- 1434 Only
	Change Description: New Action	
Action 3.4.10.B	RHR Shutdown Cooling System - Cold Shutdown	NUREG(s)- 1434 Only
	Change Description: Renamed C	
Action 3.4.10.B Bases	RHR Shutdown Cooling System - Cold Shutdown	NUREG(s)- 1434 Only
	Change Description: Renamed C	

Action 3.4.10.B Bases	RHR Shutdown Cooling System - Cold Shutdown	NUREG(s)- 1434 Only
	Change Description: New Action	

1. SUMMARY DESCRIPTIONS

The Technical Specification (TS) Actions for inoperable Residual Heat Removal (RHR) shutdown cooling subsystems are revised to reflect the plant design, to provide the needed operational flexibility, and to meet the regulatory requirements. The proposed change modifies NUREG-1433, "Standard Technical Specifications - General Electric BWR/4 Plants," and NUREG-1434, "Standard Technical Specifications, General Electric BWR/6 Plants."[1]

2. DETAILED DESCRIPTION

2.1. System Design and Operation

The RHR System in the shutdown cooling mode removes decay heat from the reactor core during shutdown. Irradiated fuel in the shutdown reactor core generates heat during the decay of fission products and increases the temperature of the reactor coolant. Removal of this decay heat by the RHR shutdown cooling system is an important safety function that must be accomplished or core damage could result. However, the RHR shutdown cooling system is not required for mitigation of any event or accident evaluated in the safety analysis.

The two redundant, manually controlled shutdown cooling subsystems of the RHR System provide decay heat removal. Each of the two shutdown cooling subsystems of the RHR System can provide the required decay heat removal. The RHR System design varies, but a typical subsystem design consists of one or two motor driven pumps, a heat exchanger, and associated piping and valves. Only one pump is required to support an operable subsystem. The RHR heat exchangers transfer heat to the RHR Service Water System. Some piping and heat exchangers that are passive components may be common to both subsystems. Each shutdown cooling subsystem is considered operable if it can be manually aligned (remote or local) in the shutdown cooling mode for removal of decay heat.

[1] NUREG 1433 is based on the BWR/4 plant design, but is also representative of the BWR/2, BWR/3, and, in this case, BWR/5 designs. NUREG 1434 is based on the BWR/6 plant design, and is representative, in some cases, of the BWR/5 design.

2.2. Current Technical Specifications Requirements

There are four TS with requirements on the RHR shutdown cooling subsystems:

NUREG-1433 TS Number	NUREG-1434 TS Number	Applicability	Title	Required Operable RHR Shutdown Cooling Subsystems
3.4.8	3.4.9	MODE 3, with reactor steam dome pressure < [the RHR cut in permissive pressure].	Residual Heat Removal (RHR) Shutdown Cooling System - Hot Shutdown	2
3.4.9	3.4.10	Mode 4	Residual Heat Removal (RHR) Shutdown Cooling System - Cold Shutdown	2
3.9.8	3.9.8	MODE 5 with irradiated fuel in the reactor pressure vessel (RPV) and the water level ≥ [23 ft/22 ft 8 inches] above the top of the [RPV flange].	Residual Heat Removal (RHR) - High Water Level	1
3.9.9	3.9.9	MODE 5 with irradiated fuel in the reactor pressure vessel (RPV) and the water level < [23 ft] above the top of the [RPV flange].	Residual Heat Removal (RHR) - Low Water Level	2

Values in brackets are plant-specific. In addition to the operability requirements for the RHR shutdown cooling subsystem(s), the TS applicable in Mode 3 or 4 require either a recirculation loop or an RHR shutdown cooling subsystem to be in operation circulating reactor coolant. The TS applicable in Mode 5 require an RHR shutdown cooling subsystem to be in operation circulating reactor coolant.

When one or more RHR shutdown cooling subsystems are inoperable in Mode 3 or 4, the TS require:

- If the plant is in Mode 3, immediately initiating action to restore the RHR shutdown cooling subsystem(s) to operable status;

- Verifying an alternate method of decay heat removal is available for each inoperable RHR shutdown cooling subsystem within 1 hour and, if in Mode 4, every 24 hours thereafter; and

- If the plant is in Mode 3, the plant must be in Mode 4 within 24 hours.

When there is no RHR shutdown cooling subsystem or recirculation pump in operation (i.e., no forced reactor coolant flow) in Mode 3 or 4, the TS require:

- If the plant is in Mode 3, immediately initiating action to restore an RHR shutdown cooling subsystem or recirculation pump to operation;

- Verifying reactor coolant circulation by an alternate method within 1 hour and once per 12 hours thereafter; and

- Monitoring reactor coolant temperature and pressure once per hour.

When one or more required RHR shutdown cooling subsystems are inoperable in Mode 5, the TS require:

- Verifying an alternate method of decay heat removal is available for each required inoperable RHR shutdown cooling subsystem within 1 hour and once per 24 hours thereafter; and

- Otherwise, immediately initiate action to suspend loading irradiated fuel assemblies in the RPV, to restore to operable status the [secondary[2]] containment and one standby gas treatment subsystem, and to restore isolation capability in each required [secondary] containment penetration whose flow path is not isolated.

When there is no RHR shutdown cooling subsystem in operation (i.e., no forced reactor coolant flow) in Mode 5, the TS require:

- Verifying reactor coolant circulation by an alternate method within 1 hour and once per 12 hours thereafter; and

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[2] In the ISTS, plant-specific differences are placed in brackets. At the majority of BWR plants, the refueling cavity or floor is enclosed by the secondary containment, but not the primary containment. However, at some plants, the refueling cavity or floor is enclosed within a plant-specific enclosure. At some BWR/6 plants the refueling cavity or floor is enclosed within the primary containment. These design differences are reflected in the ISTS by using the term "[secondary] containment" in the BWR/4 ISTS and "[secondary containment]" in the BWR/6 ISTS. In this justification, when the term "secondary" is in brackets as in "[secondary] containment" it is understood that the phrase refers to the plant-specific enclosure around the refueling cavity, including the BWR/6 designs. When the terms "secondary containment" or "primary containment" are used without brackets, they refer to the named structure.

- Monitoring reactor coolant temperature once per hour.

Several of the Required Actions must be taken "Immediately." Section 1.3 of the TS defines "immediately" as "the Required Action should be pursued without delay and in a controlled manner."

2.3. Reason for the Proposed Change

The current TS requirements on the RHR shutdown cooling System in Mode 3 are inconsistent with the BWR design.

1. If a required RHR shutdown cooling subsystem is inoperable in Mode 3, 4 or 5, the TS require an alternate method of decay heat removal to be available for each inoperable RHR shutdown cooling subsystem. The TS Bases state that the required cooling capacity of the alternate method should be ensured by verifying (by calculation or demonstration) its capability to maintain or reduce temperature. Alternate methods that can be used include (but are not limited to) the Spent Fuel Pool Cooling System and the Reactor Water Cleanup System. However, in a typical BWR design, the RHR shutdown cooling system has a heat rejection capability many times greater than the listed alternatives. Therefore, for periods in which there is high decay heat load, the BWR design does not include any system which can satisfy the Required Action.

2. In Mode 3 or 4, if there is no alternate method of decay heat removal for each inoperable RHR shutdown cooling subsystem, there is no TS Action to follow. While the situation would be infrequent given the redundancy and reliability of the RHR shutdown cooling system and the number of available alternates, this lack of a terminal action has raised questions from the NRC.

3. If one or more RHR shutdown cooling subsystems are inoperable in Mode 3, the plant must be brought to Mode 4 within 24 hours. However, if there is no operable RHR shutdown cooling subsystem and the plant is in a period of high decay heat load, it may not be possible to reduce the Reactor Coolant System (RCS) temperature to the Mode 4 entry condition (typically < 200 °F) within the Completion Time.

4. In Modes 3, 4 and 5, circumstances may exist where an RHR shutdown cooling system is inoperable (such as from a loss of seismic qualification or nonfunctional support systems), but still meets the Bases description of an alternate decay heat removal method. The TS Bases do not list the inoperable RHR shutdown cooling system as an alternate method of decay heat removal. The use of an inoperable but functional RHR shutdown cooling subsystem as an alternate method of decay heat removal has been questioned by the NRC.

Because of the redundancy and reliability of the RHR shutdown cooling system, these inconsistencies between the TS Actions and the BWR plant design have rarely presented a problem. However, the Nuclear Regulatory Commission has opened Unresolved Items (URIs) related to the inability to satisfy the Required Actions in all circumstances, and issued violations

related to crediting an inoperable RHR shutdown cooling subsystem as an alternate means of decay heat removal. The TSTF agreed to propose changes to the TS to address these issues.

2.4. Description of the Proposed Change

The proposed change revises the standard TS in NUREG-1433 and NUREG-1434 to be consistent with the BWR design:

- In Mode 3, when one or both required RHR shutdown cooling subsystems are inoperable, the Required Action is revised to require verification of an alternate method of decay heat removal for each inoperable RHR shutdown cooling subsystem within 1 hour and every 24 hours thereafter.

- In Modes 3 and 4, if an alternate method of decay heat removal cannot be established within the Completion Time, new Action B requires immediate initiation of action to restore the inoperable RHR shutdown cooling subsystem(s) to operable status.

- The Mode 3 requirement to transition to Mode 4 when an RHR shutdown cooling subsystem is inoperable is eliminated.

- The Bases for the Mode 3, 4, and 5 specifications are clarified to acknowledge that an inoperable RHR shutdown cooling subsystem can act as an alternate method of decay heat removal if it is functional and has the capability to maintain or reduce reactor coolant system temperature.

A model application is included. The model may be used by licensees desiring to adopt the traveler following its approval.

3. TECHNICAL EVALUATION

The following sections describe the proposed changes.

3.1. Revision of the TS Actions to Restore RHR Shutdown Cooling or Establish an Alternate Method of Decay Heat Removal

In NUREG-1433 TS 3.4.8, and in NUREG-1434 TS 3.4.9, the existing Required Actions to immediately initiate action to restore the inoperable RHR shutdown cooling subsystem(s) to operable status and verify within one hour that an alternate method of decay heat removal is available for each inoperable RHR shutdown cooling subsystem are reorganized. The revised Action A requires verification within one hour and every 24 hours thereafter that an alternate method of decay heat removal is available for each inoperable RHR shutdown cooling subsystem.

In NUREG-1433 TS 3.4.8 and TS 3.4.9, and in NUREG-1434 TS 3.4.9 and TS 3.4.10, if the required alternate method of decay heat removal for each inoperable RHR shutdown cooling subsystem cannot be verified, the new Action B requires immediate action to restore the inoperable RHR shutdown cooling.

Appendix A of 10 CFR 50, Criterion 34, requires that a system to remove residual heat be provided. Its safety function is to transfer fission product decay heat and other residual heat from the reactor core at a rate such that specified acceptable fuel design limits and the design conditions of the reactor coolant pressure boundary are not exceeded. The BWR design meets this through a combination of low pressure ECCS to maintain RPV level, steam release via the safety/relief valves to the Suppression Pool, and the Suppression Pool cooling mode of RHR. However, this configuration is reserved for use in the Emergency Operating Procedures. When steam dome pressure is above the RHR cut in permissive pressure, the normal method of removing decay heat is steaming via the steam bypass valves to the Main Condenser, with return to the RPV via the Feedwater and/or Condensate Booster Pumps. Only after reaching the RHR cut in permissive pressure does the preferred means of removing decay heat become the Shutdown Cooling mode of RHR. Due to these other means of decay heat removal, it is not critical that action be taken immediately to restore to operable status one or both RHR shutdown cooling subsystems. The BWR design also provides other ways of removing decay heat, such as natural circulation, the Spent Fuel Pool Cooling System, and the Reactor Water Cleanup System. The existing one-hour Completion Time to establish an alternate method of decay heat removal is sufficient to remove decay heat. However, in the unexpected circumstance that an alternate method is not available, the TS should provide an action for licensees to follow.

The reorganization of the Actions applies a logical progression of licensee actions and provides a terminal action applicable in all circumstances, as discussed below:

- The licensees first action when an RHR shutdown cooling subsystem is inoperable is to establish an alternate method of decay heat removal. The BWR design affords a number of alternate methods, although not all methods are capable of maintaining or reducing temperature, depending on the decay heat generation rate.

- If an alternate method cannot be established, the licensee must immediately initiate action to restore the inoperable RHR shutdown cooling subsystem(s) to operable status. This action is consistent with the Pressurized Water Reactor (PWR) standard Technical Specifications (STS) in NUREG-1430, NUREG-1431, and NUREG-1432. The PWR RHR STS require immediate action to restore an inoperable RHR train in the equivalent modes. The Completion Time "immediately" is defined in Section 1.3 of the TS as, "the Required Action should be pursued without delay and in a controlled manner." This Required Action continues to apply until the inoperable RHR shutdown cooling subsystems are restored to operable status, an alternate decay heat removal method is established, or the Applicability of the specification is exited. Therefore, the Required Action provides an appropriate terminal action for the condition.

3.2. Elimination of Requirement to Enter Mode 4

In NUREG-1433 TS 3.4.8 and in NUREG-1434 TS 3.4.9, the Required Action to transition from Mode 3 to MODE 4 within 24 hours is eliminated. Rather, the Actions will require either verifying an alternate method of decay heat removal is available within one hour and once per 24 hours thereafter or initiating action to restore RHR shutdown cooling subsystem(s) to operable status immediately.

There is no regulatory requirement that a BWR be capable of reducing temperature to Mode 4 (typically 200 °F or less) with no operable RHR shutdown cooling subsystems. Reducing temperature to less than the boiling point of water eliminates a potential heat-removal mechanism. Further, entering Mode 4 with an inoperable RHR shutdown cooling subsystem would result in immediately entering an Action in the applicable Specification and restarting the Completion Time for establishing an alternate decay heat removal mechanism. Entry into Mode 4 is always an option for the licensee if it is the prudent course of action, but it should not be dictated by the TS when RHR shutdown cooling is inoperable.

3.3. Bases Changes

In NUREG-1433 TS 3.4.8, 3.4.9, 3.9.8, and 3.9.9, and NUREG-1434, TS 3.4.9, 3.4.10, 3.9.8, and 3.9.9, the Bases are revised to acknowledge that an inoperable RHR shutdown cooling subsystem may act as an alternate method of decay heat removal provided it remains functional and has the capability to maintain or reduce reactor coolant system temperature. In addition, the Bases are revised to remove the statement that the capability of an alternate method of decay heat removal to maintain or reduce temperature be verified by calculation or demonstration.

An RHR shutdown cooling subsystem may be inoperable but still functional and capable of removing decay heat for many reasons, such as, but not limited to:

- Diversion of flow to the suppression pool or condenser to lower water level;
- Removed or broken snubbers, struts, or supports;
- Nonfunctional pump room cooler;
- Inoperable isolation instrumentation; or
- Nonfunctional or slow primary containment isolation valve.

The RHR shutdown cooling subsystem is still functional and remains as capable as the listed alternate methods of decay heat removal listed in the TS Bases. Further, removal of RCS decay heat is the primary function of the RHR shutdown cooling system, making it the preferred alternate versus other systems with significantly lower heat removal capability, such as Spent Fuel Pool Cooling and Reactor Water Cleanup Systems. Therefore, it is appropriate to utilize an inoperable but functional RHR shutdown cooling subsystem as an alternate method of decay heat removal as long as it has the capability to maintain or reduce reactor coolant system temperature.

The Bases statement that the effectiveness of an alternate method of decay heat removal to maintain or reduce temperature must be verified by calculation or demonstration is unnecessarily prescriptive. Licensees typically have decay heat generation curves which may be compared with the heat removal capability of an alternate decay heat removal method. The question as to whether this constitutes a "calculation" could be up to debate. In any event, the overriding criteria is that the alternate method of decay heat removal must be capable of maintaining or reducing reactor coolant temperature, which can be determined without an explicit calculation or

demonstration. Therefore, the proposed Bases change is considered to be an administrative reduction in level of detail.

4. REGULATORY EVALUATION

Section IV, "The Commission Policy," of the "Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors" (58 Federal Register 39132), dated July 22, 1993, states in part:

> The purpose of Technical Specifications is to impose those conditions or limitations upon reactor operation necessary to obviate the possibility of an abnormal situation or event giving rise to an immediate threat to the public health and safety by identifying those features that are of controlling importance to safety and establishing on them certain conditions of operation which cannot be changed without prior Commission approval.
>
> …[T]he Commission will also entertain requests to adopt portions of the improved STS, even if the licensee does not adopt all STS improvements.
>
> …The Commission encourages all licensees who submit Technical Specification related submittals based on this Policy Statement to emphasize human factors principles.
>
> …In accordance with this Policy Statement, improved STS have been developed and will be maintained for [BWR designs]. The Commission encourages licensees to use the improved STS as the basis for plant-specific Technical Specifications.
>
> …[I]t is the Commission intent that the wording and Bases of the improved STS be used … to the extent practicable.

As described in the Commission's "Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors," recommendations were made by NRC and industry task groups for new STS that include greater emphasis on human factors principles in order to add clarity and understanding to the text of the STS, and provide improvements to the Bases of STS, which provides the purpose for each requirement in the specification. Improved vendor-specific STS were developed and issued by the NRC in September 1992.

Additionally, 10 CFR 50.36(b) requires:

> Each license authorizing operation of a … utilization facility … will include technical specifications. The technical specifications will be derived from the analyses and evaluation included in the safety analysis report, and amendments thereto, submitted pursuant to [10 CFR] 50.34 ["Contents of applications; technical information"]. The Commission may include such additional technical specifications as the Commission finds appropriate.

The categories of items required to be in the TSs are provided in 10 CFR 50.36(c). As required by 10 CFR 50.36(c)(2)(i), the TSs will include LCOs, which are the lowest functional capability or performance levels of equipment required for safe operation of the facility. Per 10 CFR

50.36(c)(2)(i), when an LCO of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the TSs until the condition can be met.

Per 10 CFR 50.90, whenever a holder of a license desires to amend the license, application for an amendment must be filed with the Commission, fully describing the changes desired, and following as far as applicable, the form prescribed for original applications.

Per 10 CFR 50.92(a), in determining whether an amendment to a license will be issued to the applicant, the Commission will be guided by the considerations which govern the issuance of initial licenses to the extent applicable and appropriate.

The NRC staff's guidance for the review of TSs is in Chapter 16, "Technical Specifications," of NUREG-0800, Revision 3, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants" (SRP), dated March 2010 (ADAMS Accession No. ML100351425). As described therein, as part of the regulatory standardization effort, the NRC staff has prepared STS for each of the light-water reactor nuclear designs.

In conclusion, based on the considerations discussed above, the proposed revision does not alter the current manner of operation and (1) there is reasonable assurance that the health and safety of the public will not be endangered by continued operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the approval of the proposed change will not be inimical to the common defense and security or to the health and safety of the public.

5. REFERENCES

1. None

Model Application

[DATE] 10 CFR 50.90

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

DOCKET NO.PLANT NAME
50-[xxx]
SUBJECT: Application to Revise Technical Specifications to Adopt TSTF-566, "Revise Actions for Inoperable RHR Shutdown Cooling Subsystems" using the Consolidated Line Item Improvement Process

Pursuant to 10 CFR 50.90, [LICENSEE] is submitting a request for an amendment to the Technical Specifications (TS) for [PLANT NAME, UNIT NOS.].

[LICENSEE] requests adoption of TSTF-566, "Revise Actions for Inoperable RHR Shutdown Cooling Subsystems," which is an approved change to the Improved Standard Technical Specifications (ISTS), into the [PLANT NAME, UNIT NOS] Technical Specifications (TS). The proposed amendment revises the TS actions applicable when a residual heat removal (RHR) shutdown cooling subsystem is inoperable.

The enclosure provides a description and assessment of the proposed changes. Attachment 1 provides the existing TS pages marked to show the proposed changes. Attachment 2 provides revised (clean) TS pages. Attachment 3 provides existing TS Bases pages marked to show the proposed changes for information only.

Approval of the proposed amendment is requested by [date]. Once approved, the amendment shall be implemented within [ ] days.

There are no regulatory commitments made in this submittal.

In accordance with 10 CFR 50.91, a copy of this application, with attachments, is being provided to the designated [STATE] Official.

[In accordance with 10 CFR 50.30(b), a license amendment request must be executed in a signed original under oath or affirmation. This can be accomplished by attaching a notarized affidavit confirming the signature authority of the signatory, or by including the following statement in the cover letter: "I declare under penalty of perjury that the foregoing is true and correct. Executed on (date)." The alternative statement is pursuant to 28 USC 1746. It does not require notarization.]

If you should have any questions regarding this submittal, please contact [NAME, TELEPHONE NUMBER].

Sincerely,

[Name, Title]

Enclosure: Description and Assessment

Attachments:
1. Proposed Technical Specification Changes (Mark-Up)
2. Revised Technical Specification Pages
3. Proposed Technical Specification Bases Changes (Mark-Up) for Information Only

[The attachments are to be provided by the licensee and are not included in the model application.]

cc: NRC Project Manager
NRC Regional Office
NRC Resident Inspector
State Contact

ENCLOSURE

DESCRIPTION AND ASSESSMENT

1.0 DESCRIPTION

[LICENSEE] requests adoption of TSTF-566, "Revise Actions for Inoperable RHR-Shutdown Cooling Subsystems," which is an approved change to the Improved Standard Technical Specifications (ISTS), into the [PLANT NAME, UNIT NOS] Technical Specifications (TS). The proposed amendment revises the TS actions applicable when a residual heat removal (RHR) shutdown cooling subsystem is inoperable.

2.0 ASSESSMENT

2.1 Applicability of Safety Evaluation

[LICENSEE] has reviewed the safety evaluation for TSTF-566 provided to the Technical Specifications Task Force in a letter dated [DATE]. This review included a review of the NRC staff's evaluation, as well as the information provided in TSTF-566. [As described herein,] [LICENSEE] has concluded that the justifications presented in TSTF-566 and the safety evaluation prepared by the NRC staff are applicable to [PLANT, UNIT NOS.] and justify this amendment for the incorporation of the changes to the [PLANT] TS.

2.2 Variations

[LICENSEE is not proposing any variations from the TS changes described in TSTF-566 or the applicable parts of the NRC staff's safety evaluation dated [DATE].] [LICENSEE is proposing the following variations from the TS changes described in TSTF-566 or the applicable parts of the NRC staff's safety evaluation: describe the variations]

[The [PLANT] TS utilize different [numbering][and][titles] than the Standard Technical Specifications on which TSTF-566 was based. Specifically, [describe differences between the plant-specific TS numbering and/or titles and TSTF-566 numbering and titles.] These differences are administrative and do not affect the applicability of TSTF-566 to the [PLANT] TS.]

[The [PLANT] TS contain requirements that differ from the Standard Technical Specifications on which TSTF-566 was based, but these differences do not affect the applicability of the TSTF-566 justification. [Describe differences and why TSTF-566 is still applicable.]

3.0 REGULATORY ANALYSIS

3.1 No Significant Hazards Consideration Analysis

[LICENSEE] requests adoption of TSTF-566, "Revise Actions for Inoperable RHR Shutdown Cooling Subsystems," which is an approved change to the Improved Standard Technical Specifications (ISTS), into the [PLANT NAME, UNIT NOS] Technical Specifications (TS).

The proposed amendment revises the TS actions applicable when a residual heat removal (RHR) shutdown cooling subsystem is inoperable.

[LICENSEE] has evaluated whether or not a significant hazards consideration is involved with the proposed amendment(s) by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No

   The proposed change revises the actions to be taken when a RHR shutdown cooling subsystem is inoperable. The RHR System in the shutdown cooling mode performs the important safety function of removing decay heat from the reactor coolant system during shutdown. The RHR System in the shutdown cooling mode is not an initiator of any accident previously evaluated or assumed to mitigate any accident previously evaluated. The design and function of the RHR System are not affected by the proposed change.

   Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No

   The proposed change revises the actions to be taken when a RHR shutdown cooling subsystem is inoperable. The proposed change does not affect the design function or operation of the RHR shutdown cooling subsystems. No new equipment is being installed as a result of the proposed change. The proposed change only affects the actions taken when an RHR shutdown cooling subsystem is inoperable, so no new failure mechanisms are created.

   Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the proposed amendment involve a significant reduction in a margin of safety?

   Response: No

   The proposed change revises the actions to be taken when a RHR shutdown cooling subsystem is inoperable. The proposed change does not change any specific values or controlling parameters that define margin in the design or licensing basis. No safety limits are affected by the proposed change. The RHR System in the shutdown cooling mode removes decay heat from the reactor coolant system during shutdown. The proposed change does not affect any design or safety limits associated with the RHR System.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, [LICENSEE] concludes that the proposed change presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

4.3 Conclusion

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

6. ENVIRONMENTAL CONSIDERATION

The proposed change would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed change does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed change meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed change.

Technical Specifications and Bases Proposed Changes

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.8 Residual Heat Removal (RHR) Shutdown Cooling System - Hot Shutdown

LCO 3.4.8 Two RHR shutdown cooling subsystems shall be OPERABLE, and, with no recirculation pump in operation, at least one RHR shutdown cooling subsystem shall be in operation.

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

1. Both RHR shutdown cooling subsystems and recirculation pumps may be removed from operation for up to 2 hours per 8 hour period.

2. One RHR shutdown cooling subsystem may be inoperable for up to 2 hours for the performance of Surveillances.

APPLICABILITY: MODE 3, with reactor steam dome pressure < [the RHR cut in permissive pressure].

ACTIONS

----------NOTE----------

Separate Condition entry is allowed for each RHR shutdown cooling subsystem.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or two RHR shutdown cooling subsystems inoperable.	~~A.1 Initiate action to restore RHR shutdown cooling subsystem(s) to OPERABLE status.~~ ~~AND~~ A.~~2~~1 Verify an alternate method of decay heat removal is available for each inoperable RHR shutdown cooling subsystem. ~~AND~~ ~~A.3 Be in MODE 4.~~	~~Immediately~~ 1 hour AND Once per 24 hours thereafter ~~24 hours~~

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action and associated Completion Time of Condition A not met.	B.1 Initiate action to restore RHR shutdown cooling subsystem(s) to OPERABLE status.	Immediately
~~C~~B. No RHR shutdown cooling subsystem in operation. AND No recirculation pump in operation.	~~C~~B.1 Initiate action to restore one RHR shutdown cooling subsystem or one recirculation pump to operation. AND ~~C~~B.2 Verify reactor coolant circulation by an alternate method. AND ~~C~~B.3 Monitor reactor coolant temperature and pressure.	Immediately 1 hour from discovery of no reactor coolant circulation AND Once per 12 hours thereafter Once per hour

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.9 Residual Heat Removal (RHR) Shutdown Cooling System - Cold Shutdown

LCO 3.4.9 Two RHR shutdown cooling subsystems shall be OPERABLE, and, with no recirculation pump in operation, at least one RHR shutdown cooling subsystem shall be in operation.

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

1. Both RHR shutdown cooling subsystems and recirculation pumps may be removed from operation for up to 2 hours per 8 hour period.

2. One RHR shutdown cooling subsystem may be inoperable for up to 2 hours for the performance of Surveillances.

APPLICABILITY: MODE 4.

ACTIONS

----------NOTE----------

Separate Condition entry is allowed for each shutdown cooling subsystem.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or two RHR shutdown cooling subsystems inoperable.	A.1 Verify an alternate method of decay heat removal is available for each inoperable RHR shutdown cooling subsystem.	1 hour AND Once per 24 hours thereafter
B. Required Action and associated Completion Time of Condition A not met.	*B.1 Initiate action to restore RHR shutdown cooling subsystem(s) to OPERABLE status.*	*Immediately*
C~~B~~. No RHR shutdown cooling subsystem in operation. AND	*C~~B~~.*1 Verify reactor coolant circulating by an alternate method.	1 hour from discovery of no reactor coolant circulation AND

CONDITION	REQUIRED ACTION	COMPLETION TIME
No recirculation pump in operation.	AND	Once per 12 hours thereafter

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	C~~B~~.2 Monitor reactor coolant temperature.	Once per hour

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.9.1	Verify one RHR shutdown cooling subsystem or recirculation pump is operating.	[12 hours OR In accordance with the Surveillance Frequency Control Program]

BASES

ACTIONS (continued)

inoperable shutdown cooling subsystems provide appropriate compensatory measures for separate inoperable shutdown cooling subsystems. As such, a Note has been provided that allows separate Condition entry for each inoperable RHR shutdown cooling subsystem.

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

With one required RHR shutdown cooling subsystem inoperable for decay heat removal, except as permitted by LCO Note 2, ~~the inoperable subsystem must be restored to OPERABLE status without delay. In this condition, the remaining OPERABLE subsystem can provide the necessary decay heat removal. T~~the overall reliability is reduced~~, however,~~ because a single failure in the OPERABLE subsystem could result in reduced RHR shutdown cooling capability. Therefore, an alternate method of decay heat removal must be provided.

With both RHR shutdown cooling subsystems inoperable, an alternate method of decay heat removal must be provided in addition to that provided for the initial RHR shutdown cooling subsystem inoperability. This re-establishes backup decay heat removal capabilities, similar to the requirements of the LCO. The 1 hour Completion Time is based on the decay heat removal function and the probability of a loss of the available decay heat removal capabilities. Furthermore, verification of the functional availability of these alternate method(s) must be reconfirmed every 24 hours thereafter. This will provide assurance of continued heat removal capability.

The required cooling capacity of the alternate method should be sufficient to ~~ensured by verifying (by calculation or demonstration) its capability to~~ maintain or reduce temperature. Decay heat removal by ambient losses can be considered as, or contributing to, the alternate method capability. Alternate methods that can be used include (but are not limited to) the Spent Fuel Pool Cooling System, ~~and~~ the Reactor Water Cleanup System, or an inoperable but functional RHR shutdown cooling subsystem.

~~However, due to the potentially reduced reliability of the alternate methods of decay heat removal, it is also required to reduce the reactor coolant temperature to the point where MODE 4 is entered.~~

B.1

If the required alternate method(s) of decay heat removal cannot be verified within one hour, immediate action must be taken to restore the

inoperable RHR shutdown cooling subsystem(s) to operable status. The Required Action will restore redundant decay heat removal paths. The immediate Completion Time reflects the importance of maintaining the availability of two paths for heat removal.

CB.1, CB.2, and CB.3

With no RHR shutdown cooling subsystem and no recirculation pump in operation, except as permitted by LCO Note 1, reactor coolant circulation by the RHR shutdown cooling subsystem or recirculation pump must be restored without delay.

BASES

ACTIONS (continued)

continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable shutdown cooling subsystems provide appropriate compensatory measures for separate inoperable shutdown cooling subsystems. As such, a Note has been provided that allows separate Condition entry for each inoperable RHR shutdown cooling subsystem.

A.1

With one of the two required RHR shutdown cooling subsystems inoperable, except as permitted by LCO Note 2, the remaining subsystem is capable of providing the required decay heat removal. However, the overall reliability is reduced. Therefore, an alternate method of decay heat removal must be provided. With both RHR shutdown cooling subsystems inoperable, an alternate method of decay heat removal must be provided in addition to that provided for the initial RHR shutdown cooling subsystem inoperability. This re-establishes backup decay heat removal capabilities, similar to the requirements of the LCO. The 1 hour Completion Time is based on the decay heat removal function and the probability of a loss of the available decay heat removal capabilities. Furthermore, verification of the functional availability of these alternate method(s) must be reconfirmed every 24 hours thereafter. This will provide assurance of continued heat removal capability.

The required cooling capacity of the alternate method should be *sufficient* ~~ensured by verifying (by calculation or demonstration) its capability~~ to maintain or reduce temperature. Decay heat removal by ambient losses can be considered as, or contributing to, the alternate method capability. Alternate methods that can be used include (but are not limited to) the Spent Fuel Pool Cooling System ~~and~~ the Reactor Water Cleanup System*, or an inoperable but functional RHR shutdown cooling subsystem*.

B.1

If the required alternate method(s) of decay heat removal cannot be verified within one hour, immediate action must be taken to restore the inoperable RHR shutdown cooling subsystem(s) to operable status. The Required Action will restore redundant decay heat removal paths. The immediate Completion Time reflects the importance of maintaining the availability of two paths for heat removal.

C~~B~~.1 and *C*~~B~~.2

With no RHR shutdown cooling subsystem and no recirculation pump in operation, except as permitted by LCO Note 1, and until RHR or recirculation pump operation is re-established, an alternate method of reactor coolant circulation must be placed into service. This will provide the necessary circulation for monitoring coolant temperature. The 1 hour Completion Time is based on the coolant circulation function and is modified such that the 1 hour is applicable separately for each occurrence involving a loss of coolant circulation. Furthermore, verification of the functioning of the alternate method must be reconfirmed every 12 hours thereafter. This will provide assurance of continued temperature monitoring capability.

BASES

ACTIONS (continued)

During the period when the reactor coolant is being circulated by an alternate method (other than by the required RHR Shutdown Cooling System or recirculation pump), the reactor coolant temperature and pressure must be periodically monitored to ensure proper function of the alternate method. The once per hour Completion Time is deemed appropriate.

SURVEILLANCE REQUIREMENTS

SR 3.4.9.1

This Surveillance verifies that one RHR shutdown cooling subsystem or recirculation pump is in operation and circulating reactor coolant. The required flow rate is determined by the flow rate necessary to provide sufficient decay heat removal capability. [The Frequency of 12 hours is sufficient in view of other visual and audible indications available to the operator for monitoring the RHR subsystem in the control room.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------REVIEWER'S NOTE----------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
----------]

REFERENCES None.

BASES

LCO (continued)

core flow to allow for accurate average reactor coolant temperature monitoring, nearly continuous operation is required. A Note is provided to allow a 2 hour exception for the operating subsystem to be removed from operation every 8 hours.

APPLICABILITY

One RHR shutdown cooling subsystem must be OPERABLE and in operation in MODE 5, with irradiated fuel in the reactor pressure vessel and with the water level ≥ [23] feet above the top of the RPV flange, to provide decay heat removal. RHR System requirements in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS); Section 3.5, Emergency Core Cooling Systems (ECCS) and Reactor Core Isolation Cooling (RCIC) System; and Section 3.6, Containment Systems. RHR Shutdown Cooling System requirements in MODE 5 with irradiated fuel in the reactor pressure vessel and with the water level < [23] ft above the RPV flange are given in LCO 3.9.9.

ACTIONS

A.1

With no RHR shutdown cooling subsystem OPERABLE, an alternate method of decay heat removal must be established within 1 hour. In this condition, the volume of water above the RPV flange provides adequate capability to remove decay heat from the reactor core. However, the overall reliability is reduced because loss of water level could result in reduced decay heat removal capability. The 1 hour Completion Time is based on decay heat removal function and the probability of a loss of the available decay heat removal capabilities. Furthermore, verification of the functional availability of these alternate method(s) must be reconfirmed every 24 hours thereafter. This will ensure continued heat removal capability.

Alternate decay heat removal methods are available to the operators for review and preplanning in the unit's Operating Procedures. *The required cooling capacity of the alternate method should be sufficient to maintain or reduce temperature. Decay heat removal by ambient losses can be considered as, or contributing to, the alternate method capability. Alternate methods that can be used include (but are not limited to) the Spent Fuel Pool Cooling System, the Reactor Water Cleanup System, or an inoperable but functional RHR shutdown cooling subsystem.* ~~For example, this may include the use of the Reactor Water Cleanup System, operating with the regenerative heat exchanger bypassed.~~ The method used to remove the decay heat should be the most prudent choice based on unit conditions.

B.1, B.2, B.3, and B.4

BASES

APPLICABILITY

Two RHR shutdown cooling subsystems are required to be OPERABLE, and one must be in operation in MODE 5, with irradiated fuel in the RPV and with the water level < [23] ft above the top of the RPV flange, to provide decay heat removal. RHR System requirements in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS); Section 3.5, Emergency Core Cooling Systems (ECCS) and Reactor Core Isolation Cooling (RCIC) System; and Section 3.6, Containment Systems. RHR Shutdown Cooling System requirements in MODE 5 with irradiated fuel in the RPV and with the water level ≥ [23] ft above the RPV flange are given in LCO 3.9.8, "Residual Heat Removal (RHR) - High Water Level."

ACTIONS

A.1

With one of the two required RHR shutdown cooling subsystems inoperable, the remaining subsystem is capable of providing the required decay heat removal. However, the overall reliability is reduced. Therefore an alternate method of decay heat removal must be provided. With both required RHR shutdown cooling subsystems inoperable, an alternate method of decay heat removal must be provided in addition to that provided for the initial RHR shutdown cooling subsystem inoperability. This re-establishes backup decay heat removal capabilities, similar to the requirements of the LCO. The 1 hour Completion Time is based on the decay heat removal function and the probability of a loss of the available decay heat removal capabilities. Furthermore, verification of the functional availability of this alternate method(s) must be reconfirmed every 24 hours thereafter. This will ensure continued heat removal capability.

Alternate decay heat removal methods are available to the operators for review and preplanning in the unit's Operating Procedures. *The required cooling capacity of the alternate method should be sufficient to maintain or reduce temperature. Decay heat removal by ambient losses can be considered as, or contributing to, the alternate method capability. Alternate methods that can be used include (but are not limited to) the Spent Fuel Pool Cooling System, the Reactor Water Cleanup System, or an inoperable but functional RHR shutdown cooling subsystem.* ~~For example, this may include the use of the Reactor Water Cleanup System, operating with the regenerative heat exchanger bypassed.~~ The method used to remove decay heat should be the most prudent choice based on unit conditions.

B.1, B.2, and B.3

With the required decay heat removal subsystem(s) inoperable and the required alternate method(s) of decay heat removal not available in accordance with Required Action A.1, additional actions are required to

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.9 Residual Heat Removal (RHR) Shutdown Cooling System - Hot Shutdown

LCO 3.4.9 Two RHR shutdown cooling subsystems shall be OPERABLE, and, with no recirculation pump in operation, at least one RHR shutdown cooling subsystem shall be in operation.

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

1. Both RHR shutdown cooling subsystems and recirculation pumps may be removed from operation for up to 2 hours per 8 hour period.

2. One RHR shutdown cooling subsystem may be inoperable for up to 2 hours for performance of Surveillances.

APPLICABILITY: MODE 3 with reactor steam dome pressure < [the RHR cut in permissive pressure].

ACTIONS

----------NOTE----------

Separate Condition entry is allowed for each RHR shutdown cooling subsystem.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or two RHR shutdown cooling subsystems inoperable.	~~A.1 Initiate action to restore RHR shutdown cooling subsystem to OPERABLE status.~~ ~~AND~~	~~Immediately~~

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	A.~~1~~2 Verify an alternate method of decay heat removal is available for each inoperable RHR shutdown cooling subsystem. ~~AND~~ ~~A.3 Be in MODE 4.~~	1 hour AND Once per 24 hours thereafter ~~24 hours~~
B. Required Action and associated Completion Time of Condition A not met.	B.1 Initiate action to restore RHR shutdown cooling subsystem(s) to OPERABLE status.	Immediately
~~C~~B. No RHR shutdown cooling subsystem in operation. AND No recirculation pump in operation.	~~C~~B.1 Initiate action to restore one RHR shutdown cooling subsystem or one recirculation pump to operation. AND ~~C~~B.2 Verify reactor coolant circulation by an alternate method. AND ~~C~~B.3 Monitor reactor coolant temperature and pressure.	Immediately 1 hour from discovery of no reactor coolant circulation AND Once per 12 hours thereafter Once per hour

SURVEILLANCE REQUIREMENTS

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.10 Residual Heat Removal (RHR) Shutdown Cooling System - Cold Shutdown

LCO 3.4.10 Two RHR shutdown cooling subsystems shall be OPERABLE, and, with no recirculation pump in operation, at least one RHR shutdown cooling subsystem shall be in operation.

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

1. Both RHR shutdown cooling subsystems and recirculation pumps may be removed from operation for up to 2 hours per 8 hour period.

2. One RHR shutdown cooling subsystem may be inoperable for up to 2 hours for the performance of Surveillances.

APPLICABILITY: MODE 4.

ACTIONS

----------NOTE----------

Separate Condition entry is allowed for each RHR shutdown cooling subsystem.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or two RHR shutdown cooling subsystems inoperable.	A.1 Verify an alternate method of decay heat removal is available for each inoperable RHR shutdown cooling subsystem.	1 hour AND Once per 24 hours thereafter

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required Action and associated Completion Time of Condition A not met.	*B.1 Initiate action to restore RHR shutdown cooling subsystem(s) to OPERABLE status.*	*Immediately*
~~C~~B. No RHR shutdown cooling subsystem in operation. AND No recirculation pump in operation.	~~C~~B.1 Verify reactor coolant circulating by an alternate method. AND ~~C~~B.2 Monitor reactor coolant temperature and pressure.	1 hour from discovery of no reactor coolant circulation AND Once per 12 hours thereafter Once per hour

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.10.1	Verify one RHR shutdown cooling subsystem or recirculation pump is operating.	[12 hours OR In accordance with the Surveillance Frequency Control Program]

BASES

ACTIONS (continued)

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

With one required RHR shutdown cooling subsystem inoperable for decay heat removal, except as permitted by LCO Note 2, ~~the inoperable subsystem must be restored to OPERABLE status without delay. In this condition, the remaining OPERABLE subsystem can provide the necessary decay heat removal. T~~the overall reliability is reduced~~, however,~~ because a single failure in the OPERABLE subsystem could result in reduced RHR shutdown cooling capability. Therefore, an alternate method of decay heat removal must be provided.

With both RHR shutdown cooling subsystems inoperable, an alternate method of decay heat removal must be provided in addition to that provided for the initial RHR shutdown cooling subsystem inoperability. This re-establishes backup decay heat removal capabilities, similar to the requirements of the LCO. The 1 hour Completion Time is based on the decay heat removal function and the probability of a loss of the available decay heat removal capabilities. Furthermore, verification of the functional availability of these alternate method(s) must be reconfirmed every 24 hours thereafter. This will provide assurance of continued heat removal capability.

The required cooling capacity of the alternate method should be sufficient to ~~ensured by verifying (by calculation or demonstration) its capability to~~ maintain or reduce temperature. Decay heat removal by ambient losses can be considered as, or contributing to, the alternate method capability. Alternate methods that can be used include (but are not limited to) the Spent Fuel Pool Cooling System, ~~or~~ the Reactor Water Cleanup System, or an inoperable but functional RHR shutdown cooling subsystem.

~~However, due to the potentially reduced reliability of the alternate methods of decay heat removal, it is also required to reduce the reactor coolant temperature to the point where MODE 4 is entered.~~

B.1

If the required alternate method(s) of decay heat removal cannot be verified within one hour, immediate action must be taken to restore the inoperable RHR shutdown cooling subsystem(s) to operable status. The Required Action will restore redundant decay heat removal paths. The immediate Completion Time reflects the importance of maintaining the availability of two paths for heat removal.

C~~B~~.1, C~~B~~.2, and C~~B~~.3

With no RHR shutdown cooling subsystem and no recirculation pump in operation, except as is permitted by LCO Note 1, reactor coolant circulation by the RHR shutdown cooling subsystem or one recirculation pump must be restored without delay.

Until RHR or recirculation pump operation is re-established, an alternate method of reactor coolant circulation must be placed into service. This will provide the necessary circulation for monitoring coolant temperature. The 1 hour Completion Time is based on the coolant circulation function and is modified such that the 1 hour is applicable separately for each occurrence involving a loss of coolant circulation. Furthermore,

BASES

ACTIONS (continued)

A.1

With one of the two required RHR shutdown cooling subsystems inoperable except as permitted by LCO Note 2, the remaining subsystem is capable of providing the required decay heat removal. However, the overall reliability is reduced. Therefore, an alternate method of decay heat removal must be provided. With both RHR shutdown cooling subsystems inoperable, an alternate method of decay heat removal must be provided in addition to that provided for the initial RHR shutdown cooling subsystem inoperability. This re-establishes backup decay heat removal capabilities, similar to the requirements of the LCO. The 1 hour Completion Time is based on the decay heat removal function and the probability of a loss of the available decay heat removal capabilities. Furthermore, verification of the functional availability of these alternate method(s) must be reconfirmed every 24 hours thereafter. This will provide assurance of continued heat removal capability.

The required cooling capacity of the alternate method should be *sufficient* ~~ensured by verifying (by calculation or demonstration) its capability~~ to maintain or reduce temperature. Decay heat removal by ambient losses can be considered as, or contributing to, the alternate method capability. Alternate methods that can be used include (but are not limited to) the Spent Fuel Pool Cooling System, ~~or~~ the Reactor Water Cleanup System, *or an inoperable but functional RHR shutdown cooling subsystem*.

B.1

If the required alternate method(s) of decay heat removal cannot be verified within one hour, immediate action must be taken to restore the inoperable RHR shutdown cooling subsystem(s) to operable status. The Required Action will restore redundant decay heat removal paths. The immediate Completion Time reflects the importance of maintaining the availability of two paths for heat removal.

C~~B~~.1 and *C*~~B~~.2

With no RHR shutdown cooling subsystem and no recirculation pump in operation, except as is permitted by LCO Note 1, and until RHR or recirculation pump operation is re-established, an alternate method of reactor coolant circulation must be placed into service. This will provide the necessary circulation for monitoring coolant temperature. The 1 hour Completion Time is based on the coolant circulation function and is modified such that the 1 hour is applicable separately for each occurrence involving a loss of coolant circulation. Furthermore, verification of the

functioning of the alternate method must be reconfirmed every 12 hours thereafter. This will provide assurance of continued temperature monitoring capability.

During the period when the reactor coolant is being circulated by an alternate method (other than by the required RHR shutdown cooling system or recirculation pump), the reactor coolant temperature and pressure must be periodically monitored to ensure proper function of the alternate method. The once per hour Completion Time is deemed appropriate.

BASES

LCO (continued)

allow a 2 hour exception for the operating subsystem to be removed from operation every 8 hours.

APPLICABILITY

One RHR shutdown cooling subsystem must be OPERABLE in MODE 5, with irradiated fuel in the RPV and with the water level ≥ [22 ft 8 inches] above the top of the RPV flange, to provide decay heat removal. RHR System requirements in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS); Section 3.5, Emergency Core Cooling Systems (ECCS) and Reactor Core Isolation Cooling (RCIC) System; and Section 3.6, Containment Systems. RHR Shutdown Cooling System requirements in MODE 5, with irradiated fuel in the reactor pressure vessel and with the water level < [22 ft 8 inches] above the RPV flange, are given in LCO 3.9.9, "Residual Heat Removal (RHR) - Low Water Level."

ACTIONS

A.1

With no RHR shutdown cooling subsystem OPERABLE, an alternate method of decay heat removal must be established within 1 hour. In this condition, the volume of water above the RPV flange provides adequate capability to remove decay heat from the reactor core. However, the overall reliability is reduced because loss of water level could result in reduced decay heat removal capability. The 1 hour Completion Time is based on the decay heat removal function and the probability of a loss of the available decay heat removal capabilities. Furthermore, verification of the functional availability of these alternate method(s) must be reconfirmed every 24 hours thereafter. This will ensure continued heat removal capability.

Alternate decay heat removal methods are available to the operators for review and preplanning in the unit's Operating Procedures. *The required cooling capacity of the alternate method should be sufficient to maintain or reduce temperature. Decay heat removal by ambient losses can be considered as, or contributing to, the alternate method capability. Alternate methods that can be used include (but are not limited to) the Spent Fuel Pool Cooling System, the Reactor Water Cleanup System, or an inoperable but functional RHR shutdown cooling subsystem.* ~~For example, this may include the use of the Reactor Water Cleanup System, operating with the regenerative heat exchanger bypassed.~~ The method used to remove the decay heat should be the most prudent choice based on unit conditions.

B.1, B.2, B.3, and B.4

BASES

APPLICABILITY

Two RHR shutdown cooling subsystems are required to be OPERABLE in MODE 5, with irradiated fuel in the RPV and with the water level < [22 ft 8 inches] above the top of the RPV flange, to provide decay heat removal. RHR System requirements in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS); Section 3.5, Emergency Core Cooling Systems (ECCS) and Reactor Core Isolation Cooling (RCIC) System; and Section 3.6, Containment Systems. RHR Shutdown Cooling System requirements in MODE 5, and with the water level ≥ [22 ft 8 inches] above the RPV flange, are given in LCO 3.9.8, "Residual Heat Removal (RHR) - High Water Level."

ACTIONS

A.1

With one of the two required RHR shutdown cooling subsystems inoperable, the remaining subsystem is capable of providing the required decay heat removal. However, the overall reliability is reduced. Therefore an alternate method of decay heat removal must be provided. With both RHR shutdown cooling subsystems inoperable, an alternate method of decay heat removal must be provided in addition to that provided for the initial RHR shutdown cooling subsystem inoperability. This re-establishes backup decay heat removal capabilities, similar to the requirements of the LCO. The 1 hour Completion Time is based on the decay heat removal function and the probability of a loss of the available decay heat removal capabilities. Furthermore, verification of the functional availability of these alternate method(s) must be reconfirmed every 24 hours thereafter. This will ensure continued heat removal capability.

Alternate decay heat removal methods are available to the operators for review and preplanning in the unit's Operating Procedures. *The required cooling capacity of the alternate method should be sufficient to maintain or reduce temperature. Decay heat removal by ambient losses can be considered as, or contributing to, the alternate method capability. Alternate methods that can be used include (but are not limited to) the Spent Fuel Pool Cooling System, the Reactor Water Cleanup System, or an inoperable but functional RHR shutdown cooling subsystem.* ~~*For example, this may include the use of the Reactor Water Cleanup System, operating with the regenerative heat exchanger bypassed.*~~ The method used to remove decay heat should be the most prudent choice based on unit conditions.

B.1, B.2, and B.3

With the required decay heat removal subsystem(s) inoperable and the required alternate method(s) of decay heat removal not available in accordance with Required Action A.1, additional actions are required to minimize any potential fission product release to the environment. This