



1101 Market Street, Chattanooga, Tennessee 37402

CNL-22-045

March 10, 2023

10 CFR 50.90

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

Browns Ferry Nuclear Power Plant Units 1, 2, and 3  
Renewed Facility Operating License Nos. DPR-33, DPR-52, and DPR-68  
NRC Dockets 50-259, 50-260, and 50-296

Subject: **Browns Ferry Nuclear Plant, Units 1, 2, and 3, Application to Revise Technical Specifications to Adopt TSTF-566-A, "Revise Actions for Inoperable RHR Shutdown Cooling Subsystems," and TSTF-580-A, Revision 1, "Provide Exception from Entering Mode 4 with No Operable RHR Shutdown Cooling" (BFN TS-542)**

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.90, Tennessee Valley Authority (TVA) is submitting a request for an amendment to the Technical Specifications (TS) for the Browns Ferry Nuclear Plant (BFN), Units 1, 2, and 3.

TVA requests adoption of Technical Specification Task Force (TSTF)-566-A, "Revise Actions for Inoperable RHR Shutdown Cooling Subsystems," and TSTF-580-A, Revision 1, "Provide Exception from Entering Mode 4 with No Operable RHR Shutdown Cooling" which are approved changes to the Improved Standard Technical Specifications, into the BFN Units 1, 2, and 3 TS. The proposed amendment revises the TS actions applicable when a residual heat removal (RHR) shutdown cooling subsystem is inoperable and provides a TS exception to entering Mode 4 if both required RHR shutdown cooling subsystems are 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 final retyped TS pages. Attachment 3 provides existing Unit 1 TS Bases pages marked to show the proposed changes (the BFN Unit 2 and 3 TS Bases are identical with respect to this change) and is provided for information only.

TVA requests that the amendment be reviewed under the Consolidated Line Item Improvement Process. Approval of the proposed amendment is requested within six months of completion of the Nuclear Regulatory Commission (NRC) acceptance review. Once approved, the amendment shall be implemented within 60 days.

U.S. Nuclear Regulatory Commission  
CNL-22-045  
Page 2  
March 10, 2023

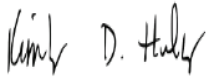
There are no new regulatory commitments made in this submittal.

In accordance with 10 CFR 50.91(b)(1), a copy of this application, with attachments is being provided to the Alabama Department of Public Health.

If you should have any questions regarding this submittal, please contact Stuart L. Rymer at slymer@tva.gov.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 10th day of March 2023.

Respectfully,



Digitally signed by Edmondson,  
Carla  
Date: 2023.03.10 12:14:59 -05'00'

Kimberly D. Hulvey  
Director, Nuclear Regulatory Affairs

Enclosure:

Description and Assessment

cc: (with Enclosure):

NRC Regional Administrator - Region II  
NRC Senior Resident Inspector - Browns Ferry Nuclear Plant  
NRC Project Manager - Browns Ferry Nuclear Plant  
State Health Officer, Alabama Department of Public Health

Enclosure

Description and Assessment

Subject: Browns Ferry Nuclear Plant, Units 1, 2, and 3, Application to Revise Technical Specifications to Adopt TSTF-566-A, "Revise Actions for Inoperable RHR Shutdown Cooling Subsystems," and TSTF-580-A, Revision 1, "Provide Exception from Entering Mode 4 with No Operable RHR Shutdown Cooling" (BFN TS-542)

**Table of Contents**

1.0 DESCRIPTION..... 2  
2.0 ASSESSMENT..... 2  
    2.1 Applicability of Safety Evaluation..... 2  
    2.2 Variations..... 2  
3.0 REGULATORY ANALYSIS ..... 3  
    3.1 No Significant Hazards Consideration Determination ..... 3  
    3.2 Conclusion..... 4  
4.0 ENVIRONMENTAL CONSIDERATION ..... 5

ATTACHMENTS

1. Proposed TS Changes (Mark-Ups) for BFN Units 1, 2, and 3
2. Proposed TS Changes (Final Retyped) for BFN Units 1, 2, and 3
3. Proposed TS Bases Page Changes (Mark-Ups) for BFN Unit 1 (For Information Only)

**1.0 DESCRIPTION**

TVA requests adoption of Technical Specification Task Force (TSTF)-566-A, "Revise Actions for Inoperable RHR Shutdown Cooling Subsystems," and TSTF-580-A, Revision 1, "Provide Exception from Entering Mode 4 with No Operable RHR Shutdown Cooling" which are approved changes to the Improved Standard Technical Specifications into the Browns Ferry Nuclear Plant (BFN) Units 1, 2, and 3 Technical Specifications (TS). The proposed amendment revises the TS actions applicable when a residual heat removal (RHR) shutdown cooling subsystem is inoperable and provides a TS exception to entering Mode 4 if both required RHR shutdown cooling subsystems are inoperable.

**2.0 ASSESSMENT**

**2.1 Applicability of Safety Evaluation**

TVA has reviewed the safety evaluations for TSTF-566 and TSTF-580 provided to the TSTF in letters dated February 21, 2019 and July 11, 2021, respectively. This review included a review of the Nuclear Regulatory Commission (NRC) staff's evaluation, as well as the information provided in TSTF-566-A and TSTF-580-A, Revision 1. As described herein, TVA has concluded that the justifications presented in TSTF-566-A and TSTF-580-A, Revision 1, and the safety evaluations prepared by the NRC staff are applicable to BFN Units 1, 2, and 3 and justify this amendment for the incorporation of the changes to the BFN TS.

**2.2 Variations**

TSTF-566-A revises the Actions for TS 3.4.8, "RHR Shutdown Cooling System - Hot Shutdown." TSTF-580-A makes further changes to the Actions of TS 3.4.8 that were revised by TSTF-566-A, which is consistent with the staff's approval of TSTF-580-A. The TSTF-580-A justification states that adoption is dependent on previous adoption of TSTF-566-A, which is satisfied by adopting both travelers.

The BFN TS utilize different numbering from the Standard Technical Specifications on which TSTF-566-A and TSTF-580-A, Revision 1 were based. The following table lists the differences. These differences are administrative and do not affect the applicability of TSTF-566-A and TSTF-580-A, Revision 1 to the BFN TS.

<b>TSTF-566-A and TSTF-580-A TS</b>	<b>Title</b>	<b>BFN TS</b>	<b>Title</b>
TS 3.4.8	RHR Shutdown Cooling System – Hot Shutdown	TS 3.4.7	RHR Shutdown Cooling System – Hot Shutdown
TS 3.4.9	RHR Shutdown Cooling System – Cold Shutdown	TS 3.4.8	RHR Shutdown Cooling System – Cold Shutdown
TS B 3.9.8	RHR – High Water Level	TS B 3.9.7	RHR – High Water Level
TS B 3.9.9	RHR – Low Water Level	TS B 3.9.8	RHR – Low Water Level

Also, TSTF-580-A, Revision 1 describes two Residual Heat Removal Service Water (RHRSW) subsystems that are required to be Operable per NUREG-1433 TS 3.7.1, and that having both RHRSW subsystems inoperable drives a shutdown Required Action if one subsystem cannot be

restored in 8 hours. BFN TS 3.7.1 requires four RHRSW subsystems to be Operable per TS 3.7.1 and having three or more RHRSW subsystems inoperable drives a shutdown Required Action if one subsystem cannot be restored in 8 hours. The distinction is that the NUREG-1433 reference plant has two separate RHRSW subsystems for each unit. BFN has a shared RHRSW of four subsystems between the three units. However, this site-specific difference is irrelevant to the TSTF-580-A requirement that at least one RHR shutdown cooling subsystem be Operable before a required unit entry into Mode 4.

### 3.0 REGULATORY ANALYSIS

#### 3.1 No Significant Hazards Consideration Determination

TVA requests adoption of TSTF-566-A, "Revise Actions for Inoperable RHR Shutdown Cooling Subsystems," and TSTF-580-A, Revision 1, "Provide Exception from Entering Mode 4 With No Operable RHR Shutdown Cooling," which are approved changes to the Improved Standard Technical Specifications into the BFN Unit 1, 2, and 3 TS. The proposed amendment revises the TS actions applicable when an RHR shutdown cooling subsystem is inoperable and provides a TS exception to entering Mode 4 if both required RHR shutdown cooling subsystems are inoperable.

TVA 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 Title 10 of the *Code of Federal Regulations* (10 CFR) 50.92, "Issuance of amendment," as discussed below.

1. *Does the proposed amendment involve a significant increase in the probability or consequence 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.

The proposed change would also exempt entering Mode 4 if both required RHR shutdown cooling subsystems are inoperable and other operating modes of the RHR System are inoperable, such as Low Pressure Core Injection and RHR suppression pool cooling, and three or more subsystems of the support system for the RHR System heat exchangers, the RHRSW System, are inoperable. The TS for those RHR operating modes require entering Mode 4 when both required subsystems are inoperable. The TS for the RHRSW System require entering Mode 4 when three or more required subsystems are inoperable. Those operating modes and systems are not initiators to any accident previously evaluated but are used to mitigate the consequences of an accident previously evaluated. However, the consequences of an accident previously evaluated resulting from remaining in Mode 3 versus Mode 4 when RHR shutdown cooling subsystems are inoperable are not significantly increased because there would be no dependable method to remove post-accident decay heat in Mode 4 if both required RHR shutdown cooling subsystems are inoperable.

## Enclosure

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 also provides a TS exception to entering Mode 4 if both required RHR shutdown cooling subsystems are 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 one or both RHR shutdown cooling subsystems are 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 and provides a TS exception to entering Mode 4 if both required RHR shutdown cooling subsystems are 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. The proposed change also applies when both required RHR shutdown cooling subsystems are inoperable, so no design or safety limits associated with the operation of the RHR System are affected.

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

Based on the above, TVA 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.

### 3.2 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.

#### **4.0 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.

Attachment 1

Proposed TS Changes (Mark-Ups) for BFN Units 1, 2, and 3

(12 pages)





ACTIONS

B. Required Action and associated Completion Time of Condition A not met.

C. Two required RHR shutdown cooling subsystems inoperable.

D. Required Action and associated Completion Time of Condition C not met.

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p><del>A. (continued)</del></p>	<p><b>1</b> ↓ A.2 Verify an alternate method of decay heat removal is available for <del>each inoperable required RHR shutdown cooling subsystem.</del></p> <p><u>AND</u></p> <p><del>A.3 Be in MODE 4.</del></p>	<p>1 hour</p> <p>AND</p> <p>Once per 24 hours thereafter</p> <p>24 hours</p>
<p><b>B. No RHR shutdown cooling subsystem in operation.</b></p> <p><u>AND</u></p> <p><b>No recirculation pump in operation.</b></p>	<p><b>B.1</b> Initiate action to restore one RHR shutdown cooling subsystem or one recirculation pump to operation.</p> <p><u>AND</u></p> <p><b>B.2</b> Verify reactor coolant circulation by an alternate method.</p> <p><u>AND</u></p> <p><b>B.3</b> Monitor reactor coolant temperature and pressure.</p>	<p>Immediately</p> <p>Immediately</p> <p>1 hour</p> <p><u>AND</u></p> <p>Once per 24 hours thereafter</p> <p>Immediately</p> <p><u>AND</u></p> <p>Once per 12 hours thereafter</p> <p>Once per hour</p>

B.1 Initiate action to restore RHR shutdown cooling subsystem to OPERABLE status.

C.1 Verify an alternate method of decay heat removal is available for each inoperable RHR shutdown cooling subsystem.

-----NOTE-----  
LCO 3.0.3 and all other LCO Required Actions requiring a MODE change to MODE 4 may be suspended until one RHR shutdown cooling subsystem is restored to OPERABLE status.

D.1 Initiate action to restore one RHR shutdown cooling subsystem to OPERABLE status.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.8 Residual Heat Removal (RHR) Shutdown Cooling System - Cold 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 required RHR shutdown cooling subsystems and recirculation pumps may not be in operation for up to 2 hours per 8 hour period.
2. One required RHR shutdown cooling subsystem may be inoperable for up to 2 hours for performance of Surveillances.

APPLICABILITY: MODE 4.

ACTIONS

NOTE

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

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

(continued)

Immediately

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.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p><b>B.</b> No RHR shutdown cooling subsystem in operation.</p> <p><u>AND</u></p> <p>No recirculation pump in operation.</p>	<p><b>B.1</b> Verify reactor coolant circulating by an alternate method.</p> <p><u>AND</u></p> <p><b>B.2</b> Monitor reactor coolant temperature and pressure.</p>	<p>1 hour from discovery of no reactor coolant circulation</p> <p><u>AND</u></p> <p>Once per 12 hours thereafter</p> <p>Once per hour</p>

3.4 REACTOR COOLANT SYSTEM (RCS)

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

LCO 3.4.7 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 required RHR shutdown cooling subsystems and recirculation pumps may not be in operation for up to 2 hours per 8 hour period.
2. One required RHR shutdown cooling subsystem may be inoperable for up to 2 hours for performance of Surveillances.

APPLICABILITY: MODE 3, with reactor steam dome pressure less than the RHR low pressure permissive pressure.

ACTIONS

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

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One <del>or two</del> required RHR shutdown cooling subsystems inoperable.	<del>A.1 Initiate action to restore required RHR shutdown cooling subsystem(s) to OPERABLE status.</del>  <u>AND</u>	Immediately          (continued)

(continued) →

**ACTIONS**

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p><del>A. (continued)</del></p>	<p><sup>1</sup> <del>A.2</del> Verify an alternate method of decay heat removal is available for <del>each inoperable required RHR shutdown cooling subsystem.</del></p> <p><del>AND</del></p> <p><del>A.3</del> Be in <del>MODE 4.</del></p>	<p>1 hour</p> <p><del>24 hours</del></p>
<p><del>B. No RHR shutdown cooling subsystem in operation.</del></p> <p><del>AND</del></p> <p><del>No recirculation pump in operation.</del></p>	<p><del>B.1</del> Initiate action to restore one RHR shutdown cooling subsystem or one recirculation pump to operation.</p> <p><del>AND</del></p> <p><del>B.2</del> Verify reactor coolant circulation by an alternate method.</p> <p><del>AND</del></p> <p><del>B.3</del> Monitor reactor coolant temperature and pressure.</p>	<p>Immediately</p> <p>1 hour</p> <p>1 hour from discovery of reactor coolant circulation</p> <p>Once per 12 hours thereafter</p> <p>Once per hour</p>

B. Required Action and associated Completion Time of Condition A not met.

C. Two required RHR shutdown cooling subsystems inoperable.

D. Required Action and associated Completion Time of Condition C not met.

AND

Once per 24 hours thereafter

Immediately

1 hour

AND

Once per 24 hours thereafter

Immediately

B.1 Initiate action to restore RHR shutdown cooling subsystem to OPERABLE status.

C.1 Verify an alternate method of decay heat removal is available for each inoperable RHR shutdown cooling subsystem.

-----NOTE-----

LCO 3.0.3 and all other LCO Required Actions requiring a MODE change to MODE 4 may be suspended until one RHR shutdown cooling subsystem is restored to OPERABLE status.

-----

D.1 Initiate action to restore one RHR shutdown cooling subsystem to OPERABLE status.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.8 Residual Heat Removal (RHR) Shutdown Cooling System - Cold 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 required RHR shutdown cooling subsystems and recirculation pumps may not be in operation for up to 2 hours per 8 hour period.
2. One required RHR shutdown cooling subsystem may be inoperable for up to 2 hours for performance of Surveillances.

APPLICABILITY: MODE 4.

ACTIONS

NOTE

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

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

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

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p><b>B.</b> No RHR shutdown cooling subsystem in operation.</p> <p><u>AND</u></p> <p>No recirculation pump in operation.</p> <p><b>C</b></p>	<p><b>B.1</b> Verify reactor coolant circulating by an alternate method.</p> <p><u>AND</u></p> <p><b>B.2</b> Monitor reactor coolant temperature and pressure.</p>	<p>1 hour from discovery of no reactor coolant circulation</p> <p><u>AND</u></p> <p>Once per 12 hours thereafter</p> <p>Once per hour</p>



3.4 REACTOR COOLANT SYSTEM (RCS)

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

LCO 3.4.7 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 required RHR shutdown cooling subsystems and recirculation pumps may not be in operation for up to 2 hours per 8 hour period.
  2. One required RHR shutdown cooling subsystem may be inoperable for up to 2 hours for performance of Surveillances.
- 

APPLICABILITY: MODE 3, with reactor steam dome pressure less than the RHR low pressure permissive pressure.

ACTIONS

-----NOTE-----

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

-----

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One <del>or two</del> required RHR shutdown cooling subsystems inoperable.	<del>A.1 Initiate action to restore required RHR shutdown cooling subsystem(s) to OPERABLE status.</del>  <u>AND</u>	<del>Immediately</del>  (continued)

(continued) →

**ACTIONS**

CONDITION	REQUIRED ACTION	COMPLETION TIME
<del>A. (continued)</del>	<p><del>A.2</del> Verify an alternate method of decay heat removal is available for <del>each inoperable required RHR shutdown cooling subsystem.</del></p> <p><u>AND</u></p> <p><del>A.3</del> Be in <del>MODE 4.</del></p>	<p>1 hour</p> <p>24 hours</p>
<p><del>B. No RHR shutdown cooling subsystem in operation.</del></p> <p><u>AND</u></p> <p><del>No recirculation pump in operation.</del></p>	<p><del>B.1</del> Initiate action to restore one RHR shutdown cooling subsystem or one recirculation pump to operation.</p> <p><u>AND</u></p> <p><del>B.2</del> Verify reactor coolant circulation by an alternate method.</p> <p><u>AND</u></p> <p><del>B.3</del> Monitor reactor coolant temperature and pressure.</p>	<p>Immediately</p> <p>1 hour</p> <p>24 hours thereafter</p> <p>1 hour from discovery of no reactor coolant circulation</p> <p><u>AND</u></p> <p>Once per 12 hours thereafter</p> <p>Once per hour</p>

1

B. Required Action and associated Completion Time of Condition A not met.

C. Two required RHR shutdown cooling subsystems inoperable.

D. Required Action and associated Completion Time of Condition C not met.

AND  
Once per 24 hours thereafter

Immediately  
1 hour  
AND  
Once per 24 hours thereafter  
Immediately

B.1 Initiate action to restore RHR shutdown cooling subsystem to OPERABLE status.

C.1 Verify an alternate method of decay heat removal is available for each inoperable RHR shutdown cooling subsystem.

-----NOTE-----  
LCO 3.0.3 and all other LCO Required Actions requiring a MODE change to MODE 4 may be suspended until one RHR shutdown cooling subsystem is restored to OPERABLE status.

D.1 Initiate action to restore one RHR shutdown cooling subsystem to OPERABLE status.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.8 Residual Heat Removal (RHR) Shutdown Cooling System - Cold 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 required RHR shutdown cooling subsystems and recirculation pumps may not be in operation for up to 2 hours per 8 hour period.
2. One required RHR shutdown cooling subsystem may be inoperable for up to 2 hours for performance of Surveillances.

APPLICABILITY: MODE 4.

ACTIONS

NOTE

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

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

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

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p><b>B.</b> No RHR shutdown cooling subsystem in operation.</p> <p><u>AND</u></p> <p>No recirculation pump in operation.</p>	<p><b>B.1</b> Verify reactor coolant circulating by an alternate method.</p> <p><u>AND</u></p> <p><b>B.2</b> Monitor reactor coolant temperature and pressure.</p>	<p>1 hour from discovery of no reactor coolant circulation</p> <p><u>AND</u></p> <p>Once per 12 hours thereafter</p> <p>Once per hour</p>

Attachment 2

Proposed TS Changes (Final Retyped) for BFN Units 1, 2, and 3

(15 pages)

3.4 REACTOR COOLANT SYSTEM (RCS)

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

LCO 3.4.7 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 required RHR shutdown cooling subsystems and recirculation pumps may not be in operation for up to 2 hours per 8 hour period.
  2. One required RHR shutdown cooling subsystem may be inoperable for up to 2 hours for performance of Surveillances.
- 

APPLICABILITY: MODE 3, with reactor steam dome pressure less than the RHR low pressure permissive pressure.

ACTIONS

-----NOTE-----

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

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CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required RHR shutdown cooling subsystem inoperable.	A.1 Verify an alternate method of decay heat removal is available.	1 hour  <u>AND</u>  Once per 24 hours thereafter

(continued)

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 to OPERABLE status.	Immediately
C. Two required RHR shutdown cooling subsystems inoperable.	C.1 Verify an alternate method of decay heat removal is available for each inoperable RHR shutdown cooling subsystem.	1 hour <u>AND</u> Once per 24 hours thereafter
D. Required Action and associated Completion Time of Condition C not met.	<p>-----NOTE-----                      LCO 3.0.3 and all other LCO Required Actions requiring a MODE change to MODE 4 may be suspended until one RHR shutdown cooling subsystem is restored to OPERABLE status.                      -----</p> <p>D.1 Initiate action to restore one RHR shutdown cooling subsystem to OPERABLE status.</p>	Immediately

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>E. No RHR shutdown cooling subsystem in operation.</p> <p><u>AND</u></p> <p>No recirculation pump in operation.</p>	<p>E.1 Initiate action to restore one RHR shutdown cooling subsystem or one recirculation pump to operation.</p> <p><u>AND</u></p> <p>E.2 Verify reactor coolant circulation by an alternate method.</p> <p><u>AND</u></p> <p>E.3 Monitor reactor coolant temperature and pressure.</p>	<p>Immediately</p> <p>1 hour from discovery of no reactor coolant circulation</p> <p><u>AND</u></p> <p>Once per 12 hours thereafter</p> <p>Once per hour</p>



3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.8 Residual Heat Removal (RHR) Shutdown Cooling System - Cold 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 required RHR shutdown cooling subsystems and recirculation pumps may not be in operation for up to 2 hours per 8 hour period.
  2. One required RHR shutdown cooling subsystem may be inoperable for up to 2 hours for 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 required RHR shutdown cooling subsystems inoperable.	A.1 Verify an alternate method of decay heat removal is available for each inoperable required RHR shutdown cooling subsystem.	1 hour <u>AND</u> Once per 24 hours thereafter
B. Required Action and associated Completion Time of Condition A not met.	B.1 Initiate action restore RHR shutdown cooling subsystem(s) to OPERABLE status.	Immediately

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>C. No RHR shutdown cooling subsystem in operation.</p> <p><u>AND</u></p> <p>No recirculation pump in operation.</p>	<p>C.1 Verify reactor coolant circulating by an alternate method.</p> <p><u>AND</u></p> <p>C.2 Monitor reactor coolant temperature and pressure.</p>	<p>1 hour from discovery of no reactor coolant circulation</p> <p><u>AND</u></p> <p>Once per 12 hours thereafter</p> <p>Once per hour</p>

3.4 REACTOR COOLANT SYSTEM (RCS)

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

LCO 3.4.7 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 required RHR shutdown cooling subsystems and recirculation pumps may not be in operation for up to 2 hours per 8 hour period.
  2. One required RHR shutdown cooling subsystem may be inoperable for up to 2 hours for performance of Surveillances.
- 

APPLICABILITY: MODE 3, with reactor steam dome pressure less than the RHR low pressure permissive pressure.

ACTIONS

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

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required RHR shutdown cooling subsystem inoperable.	A.1 Verify an alternate method of decay heat removal is available.	1 hour <u>AND</u> Once per 24 hours thereafter

(continued)

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 to OPERABLE status.	Immediately
C. Two required RHR shutdown cooling subsystems inoperable.	C.1 Verify an alternate method of decay heat removal is available for each inoperable RHR shutdown cooling subsystem.	1 hour  <u>AND</u>  Once per 24 hours thereafter
D. Required Action and associated Completion Time of Condition C not met.	<p>-----NOTE-----                      LCO 3.0.3 and all other LCO Required Actions requiring a MODE change to MODE 4 may be suspended until one RHR shutdown cooling subsystem is restored to OPERABLE status.                      -----</p> <p>D.1 Initiate action to restore one RHR shutdown cooling subsystem to OPERABLE status.</p>	Immediately

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>E. No RHR shutdown cooling subsystem in operation.</p> <p><u>AND</u></p> <p>No recirculation pump in operation.</p>	<p>E.1 Initiate action to restore one RHR shutdown cooling subsystem or one recirculation pump to operation.</p> <p><u>AND</u></p> <p>E.2 Verify reactor coolant circulation by an alternate method.</p> <p><u>AND</u></p> <p>E.3 Monitor reactor coolant temperature and pressure.</p>	<p>Immediately</p> <p>1 hour from discovery of no reactor coolant circulation</p> <p><u>AND</u></p> <p>Once per 12 hours thereafter</p> <p>Once per hour</p>

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.8 Residual Heat Removal (RHR) Shutdown Cooling System - Cold 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 required RHR shutdown cooling subsystems and recirculation pumps may not be in operation for up to 2 hours per 8 hour period.
  2. One required RHR shutdown cooling subsystem may be inoperable for up to 2 hours for 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 required RHR shutdown cooling subsystems inoperable.	A.1 Verify an alternate method of decay heat removal is available for each inoperable required RHR shutdown cooling subsystem.	1 hour <u>AND</u> 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

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>C. No RHR shutdown cooling subsystem in operation.</p> <p><u>AND</u></p> <p>No recirculation pump in operation.</p>	<p>C.1 Verify reactor coolant circulating by an alternate method.</p> <p><u>AND</u></p> <p>C.2 Monitor reactor coolant temperature and pressure.</p>	<p>1 hour from discovery of no reactor coolant circulation</p> <p><u>AND</u></p> <p>Once per 12 hours thereafter</p> <p>Once per hour</p>

3.4 REACTOR COOLANT SYSTEM (RCS)

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

LCO 3.4.7 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 required RHR shutdown cooling subsystems and recirculation pumps may not be in operation for up to 2 hours per 8 hour period.
  2. One required RHR shutdown cooling subsystem may be inoperable for up to 2 hours for performance of Surveillances.
- 

APPLICABILITY: MODE 3, with reactor steam dome pressure less than the RHR low pressure permissive pressure.

ACTIONS

-----NOTE-----

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

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CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required RHR shutdown cooling subsystem inoperable.	A.1 Verify an alternate method of decay heat removal is available.	1 hour  <u>AND</u>  Once per 24 hours thereafter

(continued)



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 to OPERABLE status.	Immediately
C. Two required RHR shutdown cooling subsystems inoperable.	C.1 Verify an alternate method of decay heat removal is available for each inoperable RHR shutdown cooling subsystem.	1 hour  <u>AND</u>  Once per 24 hours thereafter
D. Required Action and associated Completion Time of Condition C not met.	<p>-----NOTE-----</p> <p>LCO 3.0.3 and all other LCO Required Actions requiring a MODE change to MODE 4 may be suspended until one RHR shutdown cooling subsystem is restored to OPERABLE status.</p> <p>-----</p> <p>D.1 Initiate action to restore one RHR shutdown cooling subsystem to OPERABLE status.</p>	Immediately

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>E. No RHR shutdown cooling subsystem in operation.</p> <p><u>AND</u></p> <p>No recirculation pump in operation.</p>	<p>E.1 Initiate action to restore one RHR shutdown cooling subsystem or one recirculation pump to operation.</p> <p><u>AND</u></p> <p>E.2 Verify reactor coolant circulation by an alternate method.</p> <p><u>AND</u></p> <p>E.3 Monitor reactor coolant temperature and pressure.</p>	<p>Immediately</p> <p>1 hour from discovery of no reactor coolant circulation</p> <p><u>AND</u></p> <p>Once per 12 hours thereafter</p> <p>Once per hour</p>

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.8 Residual Heat Removal (RHR) Shutdown Cooling System - Cold 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 required RHR shutdown cooling subsystems and recirculation pumps may not be in operation for up to 2 hours per 8 hour period.
  2. One required RHR shutdown cooling subsystem may be inoperable for up to 2 hours for performance of Surveillances.
- 

APPLICABILITY: MODE 4.

ACTIONS

-----NOTE-----  
Separate Condition entry is allowed for each RHR shutdown cooling subsystem.  
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CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or two required RHR shutdown cooling subsystems inoperable.	A.1 Verify an alternate method of decay heat removal is available for each inoperable required RHR shutdown cooling subsystem.	1 hour <u>AND</u> 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

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
<p>C. No RHR shutdown cooling subsystem in operation.</p> <p><u>AND</u></p> <p>No recirculation pump in operation.</p>	<p>C.1 Verify reactor coolant circulating by an alternate method.</p> <p><u>AND</u></p> <p>C.2 Monitor reactor coolant temperature and pressure.</p>	<p>1 hour from discovery of no reactor coolant circulation</p> <p><u>AND</u></p> <p>Once per 12 hours thereafter</p> <p>Once per hour</p>

Attachment 3

Proposed TS Bases Page Changes (Mark-Ups) for BFN Unit 1 (For Information Only)

(15 pages)

## B 3.4 REACTOR COOLANT SYSTEM (RCS)

### B 3.4.7 Residual Heat Removal (RHR) Shutdown Cooling System - Hot Shutdown

#### BASES

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#### BACKGROUND

Irradiated fuel in the shutdown reactor core generates heat during the decay of fission products and increases the temperature of the reactor coolant. This decay heat must be removed to reduce the temperature of the reactor coolant to  $\leq 212^{\circ}\text{F}$ . This decay heat removal is in preparation for performing refueling or maintenance operations, or for keeping the reactor in the Hot Shutdown condition.

The RHR System has two loops with each loop consisting of two motor driven pumps, two heat exchangers, and associated piping and valves. There are two RHR shutdown cooling subsystems per RHR System loop. Both loops have a common suction from the same recirculation loop. The four redundant, manually controlled shutdown cooling subsystems of the RHR System provide decay heat removal. Each pump discharges the reactor coolant, after circulation through the respective heat exchanger, to the reactor via the associated recirculation loop. The RHR heat exchangers transfer heat to the RHR Service Water System. Any one of the four RHR shutdown cooling subsystems can provide the required decay heat removal function.

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(continued)

BASES (continued)

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APPLICABLE  
SAFETY ANALYSES

Decay heat removal by operation of the RHR System in the shutdown cooling mode is not required for mitigation of any event or accident evaluated in the safety analyses. Decay heat removal is, however, an important safety function that must be accomplished or core damage could result. The RHR Shutdown Cooling System meets Criterion 4 of the NRC Policy Statement (Ref. 1).

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LCO

Two RHR shutdown cooling subsystems are required to be OPERABLE, and when no recirculation pump is in operation, one RHR shutdown cooling subsystem must be in operation. An OPERABLE RHR shutdown cooling subsystem consists of one OPERABLE RHR pump, one heat exchanger, one RHRSW pump capable of providing cooling to the heat exchanger, and the associated piping and valves. The subsystems have a common suction source and are allowed to have common discharge piping. Since the piping is a passive component that is assumed not to fail, it is allowed to be common to the 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. In MODE 3, one RHR shutdown cooling subsystem can provide the required cooling, but two subsystems are required to be OPERABLE to provide redundancy. Operation of one subsystem can maintain or reduce the reactor coolant temperature as required. However, to ensure adequate core flow to allow for accurate average reactor coolant temperature monitoring, nearly continuous operation is required.

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(continued)

BASES

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LCO  
(continued)

Note 1 permits both required RHR shutdown cooling subsystems and recirculation pumps to not be in operation for a period of 2 hours in an 8 hour period. Note 2 allows one required RHR shutdown cooling subsystem to be inoperable for performance of Surveillance tests. These tests may be on the affected RHR System or on some other plant system or component that necessitates placing the RHR System in an inoperable status during the performance. This is permitted because the core heat generation can be low enough and the heatup rate slow enough to allow some changes to the RHR subsystems or other operations requiring RHR flow interruption and loss of redundancy.

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APPLICABILITY

In MODE 3 with reactor steam dome pressure below the RHR low pressure permissive pressure (i.e., the actual pressure at which the interlock resets) the RHR Shutdown Cooling System must be OPERABLE and shall be operated in the shutdown cooling mode to remove decay heat to reduce or maintain coolant temperature. Otherwise, a recirculation pump is required to be in operation.

In MODES 1 and 2, and in MODE 3 with reactor steam dome pressure greater than or equal to the RHR low pressure permissive pressure, this LCO is not applicable. Operation of the RHR System in the shutdown cooling mode is not allowed above this pressure because the RCS pressure may exceed the design pressure of the shutdown cooling piping. Decay heat removal at reactor pressures greater than or equal to the RHR low pressure permissive pressure is typically accomplished by condensing the steam in the main condenser. Additionally, in MODE 2 below this pressure, the OPERABILITY requirements for the Emergency Core Cooling Systems (ECCS) (LCO 3.5.1, "ECCS - Operating") do not allow placing the RHR shutdown cooling subsystem into operation.

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(continued)



BASES

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APPLICABILITY (continued)      The requirements for decay heat removal in MODES 4 and 5 are discussed in LCO 3.4.8, "Residual Heat Removal (RHR) Shutdown Cooling System - Cold Shutdown"; LCO 3.9.7, "Residual Heat Removal (RHR) - High Water Level"; and LCO 3.9.8, "Residual Heat Removal (RHR) - Low Water Level."

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ACTIONS      A Note has been provided to modify the ACTIONS related to RHR shutdown cooling subsystems. Section 1.3, Completion Times, specifies once a Condition has been entered, subsequent divisions, subsystems, components or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition. Section 1.3, also specifies Required Actions of the Condition 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.

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(continued)

BASES

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ACTIONS  
(continued)

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

With one required RHR shutdown cooling subsystem inoperable for decay heat removal, 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.~~ 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 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.~~

The required cooling capacity of the alternate method should be ~~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 Condensate/Main Steam (feed and bleed) Systems ~~and the adjacent unit(s) RHR SDC pumps and heat exchangers available through the RHR cross tie.~~

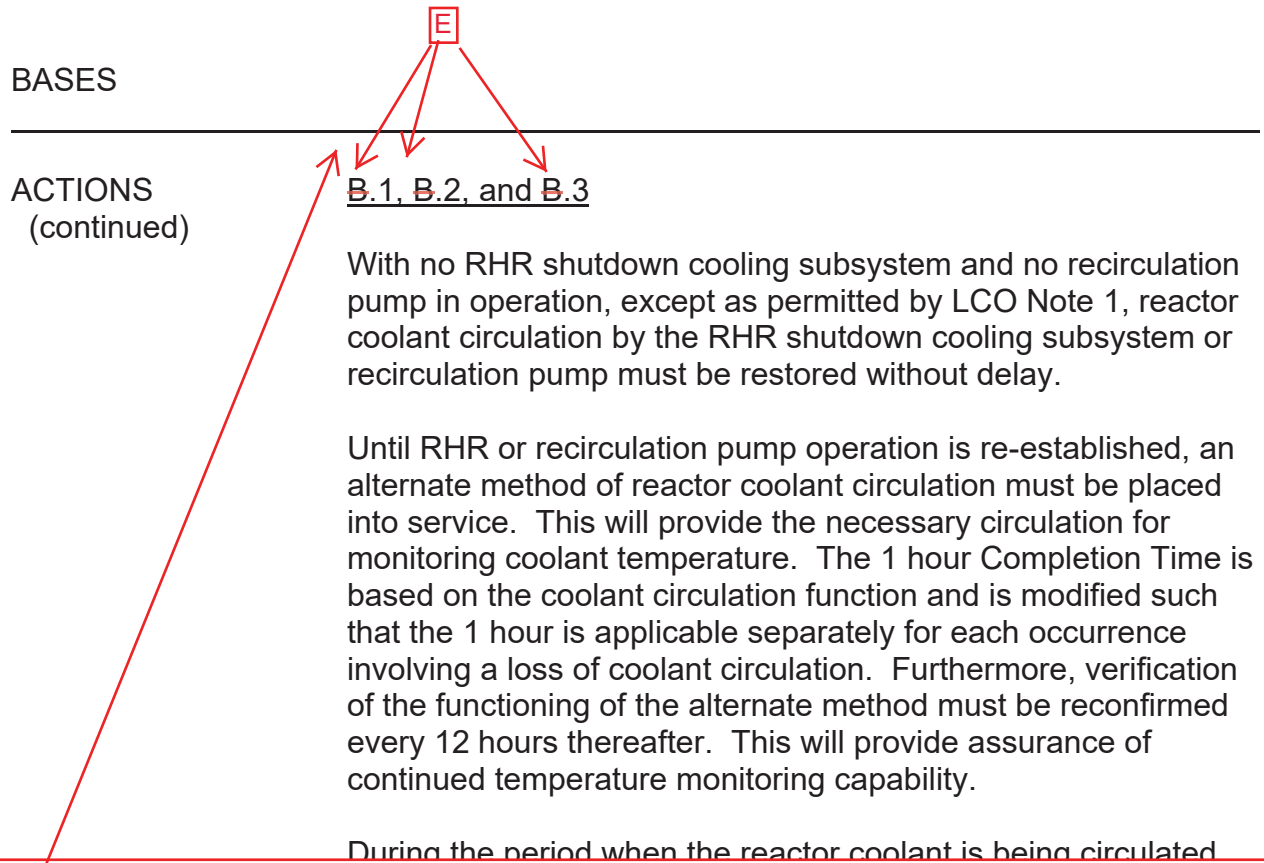
sufficient to

B.1  
If the required alternate method of decay heat removal cannot be verified within one hour, immediate action must be taken to restore the inoperable RHR shutdown cooling subsystem 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.

~~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.~~

, or an inoperable but functional RHR shutdown cooling subsystem

(continued)



C.1

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 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 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 Condensate/Main Steam (feed and bleed) Systems, the adjacent unit(s) RHR SDC pumps and heat exchangers available through the RHR cross tie, or an inoperable but functional RHR shutdown cooling subsystem.

D.1

If the required alternate methods of decay heat removal cannot be verified within one hour, immediate action must be taken to restore at least one RHR shutdown cooling subsystem to OPERABLE status. The immediate Completion Time reflects the importance of restoring a method of heat removal.

Required Action D.1 is modified by a Note indicating that all required MODE changes to MODE 4 may be suspended until one RHR shutdown cooling subsystem is restored to OPERABLE status. In this case, LCO 3.0.3 and other Required Actions directing entry into MODE 4 could force the unit into a less safe condition in which there may be no adequate means to remove decay heat. It is more appropriate to allow the restoration of one of the RHR shutdown cooling subsystems before requiring entry into a condition in which that subsystem would be needed and exiting a condition where other sources of cooling are available. When at least one RHR subsystem is restored to OPERABLE status, the Completion Times of LCO 3.0.3 or other Required Actions resume at the point at which they were suspended.

BASES (continued)

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SURVEILLANCE  
REQUIREMENTS

SR 3.4.7.1

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 Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This Surveillance is modified by a Note allowing sufficient time to align the RHR System for shutdown cooling operation after clearing the pressure interlock that isolates the system, or for placing a recirculation pump in operation. The Note takes exception to the requirements of the Surveillance being met (i.e., forced coolant circulation is not required for this initial 2 hour period), which also allows entry into the Applicability of this Specification in accordance with SR 3.0.4 since the Surveillance will not be "not met" at the time of entry into the Applicability.

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REFERENCES

1. NRC No. 93-102, "Final Policy Statement on Technical Specification Improvements," July 23, 1993.
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## B 3.4 REACTOR COOLANT SYSTEM (RCS)

### B 3.4.8 Residual Heat Removal (RHR) Shutdown Cooling System - Cold Shutdown

#### BASES

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#### BACKGROUND

Irradiated fuel in the shutdown reactor core generates heat during the decay of fission products and increases the temperature of the reactor coolant. This decay heat must be removed to maintain the temperature of the reactor coolant  $\leq 212^{\circ}\text{F}$ . This decay heat removal is in preparation for performing refueling or maintenance operations, or for keeping the reactor in the Cold Shutdown condition.

The RHR System has two loops with each loop consisting of two motor driven pumps, two heat exchangers, and associated piping and valves. There are two shutdown cooling subsystems per RHR System loop. Both loops have a common suction from the same recirculation loop. The four redundant, manually controlled shutdown cooling subsystems of the RHR System provide decay heat removal. Each pump discharges the reactor coolant, after circulation through the respective heat exchanger, to the reactor via the associated recirculation loop. The RHR heat exchangers transfer heat to the RHR Service Water System. Any one of the four RHR shutdown cooling subsystems can provide the required decay heat removal function.

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(continued)

BASES (continued)

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APPLICABLE  
SAFETY ANALYSES

Decay heat removal by operation of the RHR System in the shutdown cooling mode is not required for mitigation of any event or accident evaluated in the safety analyses. Decay heat removal is, however, an important safety function that must be accomplished or core damage could result. The RHR Shutdown Cooling System meets Criterion 4 of the NRC Policy Statement (Ref. 1).

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LCO

Two RHR shutdown cooling subsystems are required to be OPERABLE, and when no recirculation pump is in operation, one RHR shutdown cooling subsystem must be in operation. An OPERABLE RHR shutdown cooling subsystem consists of one OPERABLE RHR pump, one heat exchanger, one RHRSW pump capable of providing cooling to the heat exchanger, and the associated piping and valves. The subsystems have a common suction source and are allowed to have common discharge piping. Since piping is a passive component that is assumed not to fail, it is allowed to be common to the 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. In MODE 4, one RHR shutdown cooling subsystem can provide the required cooling, but two subsystems are required to be OPERABLE to provide redundancy. Operation of one subsystem can maintain or reduce the reactor coolant temperature as required. However, to ensure adequate core flow to allow for accurate average reactor coolant temperature monitoring, nearly continuous operation is required.

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(continued)

BASES

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LCO  
(continued)

Note 1 permits both required RHR shutdown cooling subsystems and recirculation pumps to not be in operation for a period of 2 hours in an 8 hour period. Note 2 allows one RHR shutdown cooling subsystem to be inoperable for performance of Surveillance tests. These tests may be on the affected RHR System or on some other plant system or component that necessitates placing the RHR System in an inoperable status during the performance. This is permitted because the core heat generation can be low enough and the heatup rate slow enough to allow some changes to the RHR subsystems or other operations requiring RHR flow interruption and loss of redundancy.

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APPLICABILITY

In MODE 4, the RHR Shutdown Cooling System must be OPERABLE and shall be operated in the shutdown cooling mode to remove decay heat to maintain coolant temperature below 212°F. Otherwise, a recirculation pump is required to be in operation.

In MODES 1 and 2, and in MODE 3 with reactor steam dome pressure greater than or equal to the RHR low pressure permissive pressure, this LCO is not applicable. Operation of the RHR System in the shutdown cooling mode is not allowed above this pressure because the RCS pressure may exceed the design pressure of the shutdown cooling piping. Decay heat removal at reactor pressures greater than or equal to the RHR low pressure permissive pressure is typically accomplished by condensing the steam in the main condenser. Additionally, in MODE 2 below this pressure, the OPERABILITY requirements for the Emergency Core Cooling Systems (ECCS) (LCO 3.5.1, "ECCS-Operating") do not allow placing the RHR shutdown cooling subsystem into operation.

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(continued)

BASES

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APPLICABILITY (continued)      The requirements for decay heat removal in MODE 3 below the low pressure permissive pressure and in MODE 5 are discussed in LCO 3.4.7, "Residual Heat Removal (RHR) Shutdown Cooling System - Hot Shutdown"; LCO 3.9.7, "Residual Heat Removal (RHR) - High Water Level"; and LCO 3.9.8, "Residual Heat Removal (RHR) - Low Water Level."

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ACTIONS      A Note has been provided to modify the ACTIONS related to RHR shutdown cooling subsystems. Section 1.3, Completion Times, specifies once a Condition has been entered, subsequent divisions, subsystems, components or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition. Section 1.3, also specifies Required Actions of the Condition 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, 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

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(continued)



BASES

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ACTIONS

A.1 (continued)

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.

sufficient

The required cooling capacity of the alternate method should be 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 Condensate/Main Steam (feed and bleed) Systems.

B.1 and B.2

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.

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 and pressure. 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 and pressure monitoring capability.

(continued)

BASES

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ACTIONS

B.1 and B.2 (continued)

During the period when the reactor coolant is being circulated by an alternate method (other than by the required RHR shutdown cooling subsystem 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.

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SURVEILLANCE  
REQUIREMENTS

SR 3.4.8.1

This Surveillance verifies that one required 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 Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

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REFERENCES

1. NRC No. 93-102, "Final Policy Statement on Technical Specification Improvements," July 23, 1993.
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BASES (continued)

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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  $\geq 22$  feet above the top of the RPV flange, to provide decay heat removal. RHR shutdown cooling subsystem requirements in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS). RHR Shutdown Cooling System requirements in MODE 5 with irradiated fuel in the reactor pressure vessel and with the water level  $< 22$  ft above the RPV flange are given in LCO 3.9.8, "Residual Heat Removal (RHR) - Low Water Level."

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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. ~~For example, this may include the use of the Reactor Water Cleanup System.~~ The method used to remove the decay heat should be the most prudent choice based on unit conditions.

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 Reactor Water Cleanup System or an inoperable but functional RHR shutdown cooling subsystem.

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(continued)

BASES (continued)

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**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 < 22 ft above the top of the RPV flange, to provide decay heat removal. RHR shutdown cooling subsystem requirements in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS). RHR Shutdown Cooling System requirements in MODE 5 with irradiated fuel in the RPV and with the water level  $\geq$  22 ft above the RPV flange are given in LCO 3.9.7, "Residual Heat Removal (RHR) - High Water Level."

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**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. ~~For example, this may include the use of the Reactor Water Cleanup System.~~ The method used to remove decay heat should be the most prudent choice based on unit conditions.

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 Reactor Water Cleanup System or an inoperable but functional RHR shutdown cooling subsystem.

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