

10 CFR 50.90

July 10, 2014

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

Calvert Cliffs Nuclear Power Plant, Units 1 and 2
Renewed Facility Operating License Nos. DPR-53 and DPR-69
NRC Docket Nos. 50-317 and 50-318

Nine Mile Point Nuclear Station, Unit 2
Renewed Facility Operating License No. NPF-69
NRC Docket No. 50-410

R. E. Ginna Nuclear Power Plant, Unit 1
Renewed Facility Operating License No. DPR-18
NRC Docket No. 50-244

Subject: Application to Revise Technical Specifications to Adopt TSTF-523, "Generic Letter 2008-01, Managing Gas Accumulation," using the Consolidated Line Item Improvement Process

References:

1. TSTF-523, "Generic Letter 2008-01, Managing Gas Accumulation," Revision 2, dated February 20, 2013
2. Notice of Availability of the " TSTF-523, 'Generic Letter 2008-01, Managing Gas Accumulation,' Using the Consolidated Line Item Improvement Process," dated January 15, 2014

Pursuant to 10 CFR 50.90, Exelon Generation Company, LLC (EGC) is submitting a request for an amendment to the Technical Specifications for Calvert Cliffs Nuclear Power Plant, Units 1 and 2 (CCNPP), Nine Mile Point Nuclear Station, Unit 2 (NMP, Unit 2), and R. E. Ginna Nuclear Power Plant, Unit 1 (Ginna).

The proposed amendment would modify Technical Specification requirements to address Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," as described in TSTF-523, Revision 2, "Generic Letter 2008-01, Managing Gas Accumulation."

Attachment 1 provides a description and assessment of the proposed change. Attachment 2 provides the existing Technical Specification pages marked up to show the proposed changes. Attachment 3 provides the existing Technical Specification Bases pages marked up to show the proposed changes. Changes to the existing Technical Specification Bases, consistent with the technical and regulatory analyses, will be implemented under the Technical Specification Bases Control Program. They are provided in Attachment 3 for information only. There are no regulatory commitments contained in this letter.

U.S. Nuclear Regulatory Commission
July 10, 2014
Page 2

These proposed changes have been reviewed and approved by the site's Plant Operations Review Committees and approved by the Nuclear Safety Review Board in accordance with the requirements of the EGC Quality Assurance Program.

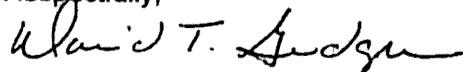
EGC requests approval of the proposed amendment by July 10, 2015. Once approved, the amendment shall be implemented within 120 days.

In accordance with 10 CFR 50.91, "Notice for public comment; State consultation," paragraph (b), EGC is notifying the States of Maryland and New York of this application for license amendment by transmitting a copy of this letter and its attachments to the designated State Official.

Should you have any questions concerning this letter please contact Wendy E. Croft at (610) 765-5726.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 10th day of July 2014.

Respectfully,



David T. Gudger
Manager - Licensing and Regulatory Affairs
Exelon Generation Company, LLC

- Attachments:
- 1. Description and Assessment
 - 2a. Proposed Technical Specification Changes (Mark-Up) for Calvert Cliffs Nuclear Power Plant, Units 1 and 2
 - 2b. Proposed Technical Specification Changes (Mark-Up) for Nine Mile Point Nuclear Station, Unit 2
 - 2c. Proposed Technical Specification Changes (Mark-Up) for R. E. Ginna Nuclear Power Plant, Unit 1
 - 3a. Proposed Technical Specification Bases Changes (Mark-Up) for Calvert Cliffs Nuclear Power Plant, Units 1 and 2 (For Information Only)
 - 3b. Proposed Technical Specification Bases Changes (Mark-Up) for Nine Mile Point Nuclear Station, Unit 2 (For Information Only)
 - 3c. Proposed Technical Specification Bases Changes (Mark-Up) for R. E. Ginna Nuclear Power Plant, Unit 1 (For Information Only)

cc: USNRC Region I, Regional Administrator
USNRC Project Manager, CCNPP
USNRC Project Manager, NMP, Unit 2
USNRC Project Manager, Ginna
USNRC Senior Resident Inspector, CCNPP
USNRC Senior Resident Inspector, NMP, Unit 2
USNRC Senior Resident Inspector, Ginna
A. L. Peterson, NYSERDA
S. T. Gray, State of Maryland

Attachment 1

Description and Assessment

Page 1 of 4

1.0 DESCRIPTION

The proposed change revises or adds Surveillance Requirements to verify that the system locations susceptible to gas accumulation are sufficiently filled with water and to provide allowances which permit performance of the verification. The changes are being made to address the concerns discussed in Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems."

The proposed amendment is consistent with TSTF-523, Revision 2, "Generic Letter 2008-01, Managing Gas Accumulation."

2.0 ASSESSMENT

2.1 Applicability of Published Safety Evaluation

Exelon Generation Company, LLC (EGC) has reviewed the model safety evaluation dated December 23, 2013 as part of the Federal Register Notice of Availability. This review included a review of the NRC Staff's evaluation, as well as the information provided in TSTF-523, Revision 2. As described in the subsequent paragraphs, EGC has concluded that the justifications presented in the TSTF-523, Revision 2 proposal and the model safety evaluation prepared by the NRC Staff are applicable to for Calvert Cliffs Nuclear Power Plant, Units 1 and 2 (CCNPP), Nine Mile Point Nuclear Station, Unit 2 (NMP, Unit 2), and R. E. Ginna Nuclear Power Plant, Unit 1 (Ginna) and justify this amendment for the incorporation of the changes to the plant Technical Specifications (TSs).

The traveler and model safety evaluation discusses the applicable regulatory requirements and guidance, including the 10 CFR 50, Appendix A, General Design Criteria (GDC). CCNPP and Ginna are not licensed to the 10 CFR 50, Appendix A, GDC. CCNPP's Updated Final Safety Analysis Report (UFSAR), Section 1C.0, "AEC Proposed General Design Criteria for Nuclear Power Plants," provides an assessment against the draft GDC published in 1967. A review has determined that the CCNPP plant-specific requirements are sufficiently similar to the Appendix A GDC as related to the proposed change. Ginna's UFSAR, Section 3.1 "Conformance with NRC General Design Criteria," provides an assessment against the 10 CFR 50, Appendix A, General Design Criteria for Nuclear Power Plants, in effect in 1972. A review has determined that the Ginna plant-specific requirements are sufficiently similar to the Appendix A, GDC as related to the proposed change. Therefore, the proposed change is applicable to CCNPP, Ginna, and NMP, Unit 2.

2.2 Optional Changes and Variations

EGC is not proposing any significant variations or deviations from the TS changes described in TSTF-523, Revision 2, or the applicable parts of the NRC Staff's model safety evaluation dated December 23, 2013. EGC is noting the following minor variations from the TS changes described in TSTF-523, Revision 2:

- TSTF-523, Revision 2 is based on the Standard Technical Specification (STS). CCNPP, NMP, Unit 2 and Ginna have adopted a plant specific revision of the STS. In the cases listed below the STS Section number corresponds to a different plant TS Section number.
 - BWR/4 STS Section 3.4.8, "RHR Shutdown Cooling System – Hot Shutdown," corresponds to NMP, Unit 2 TS Section 3.4.9, "RHR Shutdown Cooling System – Hot Shutdown."

Attachment 1

Description and Assessment

Page 2 of 4

- BWR/4 STS Section 3.4.9, "RHR Shutdown Cooling System – Cold Shutdown," corresponds to NMP, Unit 2 TS Section 3.4.10, "RHR Shutdown Cooling System – Cold Shutdown."
 - Westinghouse STS Section 3.5.2, "ECCS – Operating," corresponds to Ginna TS Section 3.5.2, "ECCS – MODES 1, 2, and 3."
 - Westinghouse STS Section 3.6.6A, "Containment Spray and Cooling Systems (Atmospheric and Dual)," corresponds to Ginna TS Section 3.6.6, "Containment Spray (CS), Containment recirculation Fan Cooler (CRFC), and NaOH Systems."
 - Westinghouse STS Section 3.9.5, "RHR and Coolant Circulation – High Water Level," corresponds to Ginna TS Section 3.9.4, "RHR and Coolant Circulation - Water Level \geq 23 Ft."
 - Westinghouse STS Section 3.9.6, "RHR and Coolant Circulation – Low Water Level," corresponds to Ginna TS Section 3.9.5, "RHR and Coolant Circulation - Water Level < 23 Ft."
- TSTF-523, Revision 2 provides revisions to TS that currently have an SR related to gas accumulation. However, in the cases listed below there was no existing SR related to gas accumulation in the plant TS; therefore, a new SR was added based on the corresponding proposed ITS SR in TSTF-523, Revision 2.
 - CCNPS TS Section 3.5.2, "Emergency Core Cooling Systems (ECCS)"
 - Ginna TS Section 3.5.2, "Emergency Core Cooling Systems (ECCS)"
 - As stated in the bullet above, TSTF-523, Revision 2 provides revisions to TS that currently have an SR related to gas accumulation. However, in Ginna TS Section 3.5.2, "Emergency Core Cooling Systems (ECCS)," there was no existing SR related to gas accumulation; therefore, a new SR was added. TSTF-523, Revision 2, Section 2.3, "Affected Specifications," for NUREG-1431 (Westinghouse Plants) states for ITS Section 3.5.3 only the bases were revised because "SR 3.5.3.1 references the SRs and Bases in LCO 3.5.2." Consistent with TSTF-523, Revision 2 intent, Ginna SR 3.5.3.1 was revised to include a reference to the added SR related to gas accumulation, SR 3.5.2.8.

EGC has reviewed these changes and determined that they are administrative and do not affect the applicability of TSTF-523, Revision 2 to the CCNPP, NMP, Unit 2 or Ginna TS.

3.0 REGULATORY ANALYSIS

3.1 No Significant Hazards Consideration Determination

Exelon Generation Company, LLC (EGC) requests adoption of TSTF-523, Revision 2, "Generic Letter 2008-01, Managing Gas Accumulation," which is an approved change to the standard technical specifications (STS), into the Calvert Cliffs Nuclear Power Plant, Units 1 and 2, Nine Mile Point Nuclear Station, Unit 2, and R. E. Ginna Nuclear Power Plant, Unit 1 Technical Specifications. The proposed change revises or adds Surveillance Requirements (SRs) to verify that the system locations susceptible to gas accumulation are sufficiently filled with water and to provide allowances which permit performance of the verification.

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

Attachment 1

Description and Assessment

Page 3 of 4

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

Response: No.

The proposed change revises or adds SRs that require verification that the Emergency Core Cooling System (ECCS), Residual Heat Removal (RHR) System, Shutdown Cooling (SDC) System, the Containment Spray (CS) System, and the Reactor Core Isolation Cooling (RCIC) System, as appropriate, are not rendered inoperable due to accumulated gas and to provide allowances which permit performance of the revised verification. Gas accumulation in the subject systems is not an initiator of any accident previously evaluated. As a result, the probability of any accident previously evaluated is not significantly increased. The proposed SRs ensure that the subject systems continue to be capable to perform their assumed safety function and are not rendered inoperable due to gas accumulation. Thus, the consequences of any accident previously evaluated are not significantly increased.

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

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

Response: No.

The proposed change revises or adds SRs that require verification that the ECCS, RHR, SDC, CS, and RCIC systems, as appropriate, are not rendered inoperable due to accumulated gas and to provide allowances which permit performance of the revised verification. The proposed change does not involve a physical alteration of the plant (i.e., no new or different type of equipment will be installed) or a change in the methods governing normal plant operation. In addition, the proposed change does not impose any new or different requirements that could initiate an accident. The proposed change does not alter assumptions made in the safety analysis and is consistent with the safety analysis assumptions.

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 change involve a significant reduction in a margin of safety?

Response: No.

The proposed change revises or adds SRs that require verification that the ECCS, RHR, SDC, CS, and RCIC systems, as appropriate, are not rendered inoperable due to accumulated gas and to provide allowances which permit performance of the revised verification. The proposed change adds new requirements to manage gas accumulation in order to ensure the subject systems are capable of performing their assumed safety functions. The proposed SRs are more comprehensive than the current SRs and will ensure that the assumptions of the safety analysis are protected. The proposed change does not adversely affect any current plant safety margins or the reliability of the equipment assumed in the safety analysis. Therefore, there are no changes being made to any safety analysis assumptions, safety limits or limiting safety system settings that would adversely affect plant safety as a result of the proposed change.

Attachment 1
Description and Assessment
Page 4 of 4

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

Based on the above, EGC 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 Conclusions

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 EVALUATION

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 2a
Proposed Technical Specification Changes (Mark-Up)

Calvert Cliffs Nuclear Power Plant, Units 1 and 2
Renewed Facility Operating License Nos. DPR-53 and DPR-69

REVISED TECHNICAL SPECIFICATIONS PAGES

*Page 3.4.6-3
Page 3.4.7-3
Page 3.4.8-2
Page 3.5.2-2
Page 3.5.2-3
Page 3.6.6-3
Page 3.6.6-4
Page 3.9.4-3
Page 3.9.5-4*

RCS Loops - MODE 4

3.4.6

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.4.6.1 Verify one RCS or SDC loop is in operation.	12 hours
SR 3.4.6.2 Verify secondary side water level in required steam generator(s) is > -50 inches.	12 hours
SR 3.4.6.3 Verify correct breaker alignment and indicated power available to the required loop components that are not in operation.	7 days
SR 3.4.6.4	<p>----- NOTE -----</p> <p>Not required to be performed until 12 hours after entering MODE 4.</p> <p>Verify required SDC train locations susceptible to gas accumulation are sufficiently filled with water.</p>
	31 days

CALVERT CLIFFS - UNIT 1
CALVERT CLIFFS - UNIT 2

3.4.6-3

Amendment No. 227
Amendment No. 201

RCS Loops - MODE 5, Loops Filled
3.4.7

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.4.7.1 Verify one SDC loop is in operation.	12 hours
SR 3.4.7.2 Verify required SG secondary side water level is > -50 inches.	12 hours
SR 3.4.7.3 Verify correct breaker alignment and indicated power available to the required SDC loop components that are not in operation.	7 days
SR 3.4.7.4 Verify required SDC train locations susceptible to gas accumulation are sufficiently filled with water.	31 days

RCS Loops - MODE 5, Loops Not Filled

3.4.8

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required SDC loops inoperable. <u>OR</u> No SDC loop in operation.	B.1 Suspend operations that would cause introduction of coolant into the RCS with boron concentration less than required to meet the SDM of LCO 3.1.1. <u>AND</u> B.2 Initiate action to restore one SDC loop to OPERABLE status and operation.	Immediately Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.4.8.1 Verify one SDC loop is in operation.	12 hours
SR 3.4.8.2 Verify correct breaker alignment and indicated power available to the required SDC loop components that are not in operation.	7 days
SR 3.4.8.3 Verify SDC train locations susceptible to gas accumulation are sufficiently filled with water.	31 days

SURVEILLANCE REQUIREMENTS

	<u>SURVEILLANCE</u>	<u>FREQUENCY</u>												
SR 3.5.2.1	<p>Verify the following valves are in the listed position with power to the valve operator removed.</p> <table> <thead> <tr> <th><u>Valve Number</u></th><th><u>Position</u></th><th><u>Function</u></th></tr> </thead> <tbody> <tr> <td>MOV-659</td><td>Open</td><td>Mini-flow Isolation</td></tr> <tr> <td>MOV-660</td><td>Open</td><td>Mini-flow Isolation</td></tr> <tr> <td>CV-306</td><td>Open</td><td>Low Pressure Safety Injection Flow Control</td></tr> </tbody> </table>	<u>Valve Number</u>	<u>Position</u>	<u>Function</u>	MOV-659	Open	Mini-flow Isolation	MOV-660	Open	Mini-flow Isolation	CV-306	Open	Low Pressure Safety Injection Flow Control	12 hours
<u>Valve Number</u>	<u>Position</u>	<u>Function</u>												
MOV-659	Open	Mini-flow Isolation												
MOV-660	Open	Mini-flow Isolation												
CV-306	Open	Low Pressure Safety Injection Flow Control												
SR 3.5.2.2	<p>Verify each ECCS manual, power-operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position.</p>	31 days												
SR 3.5.2.3	<p>Verify each high pressure safety injection - and low pressure safety injection pump's developed head at the test flow point is greater than or equal to the required developed head.</p>	In accordance with the Inservice Testing Program												
SR 3.5.2.4	Deleted													
SR 3.5.2.5	<p>Verify each ECCS automatic valve that is not locked, sealed, or otherwise secured in position, in the flow path actuates to the correct position on an actual or simulated actuation signal.</p>	24 months												

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.5.2.6 Verify each ECCS pump starts automatically on an actual or simulated actuation signal.	24 months
SR 3.5.2.7 Verify each low pressure safety injection pump stops on an actual or simulated actuation signal.	24 months
SR 3.5.2.8 Verify, by visual inspection, each ECCS train containment sump suction inlet is not restricted by debris and the suction inlet strainers show no evidence of structural distress or abnormal corrosion.	24 months
SR 3.5.2.9 Verify the Shutdown Cooling System open-permissive interlock prevents the Shutdown Cooling System suction isolation valves from being opened with a simulated or actual Reactor Coolant System pressure signal of ≥ 309 psia.	24 months
3.5.2.10 Verify ECCS locations susceptible to gas accumulation are sufficiently filled with water.	31 days

Containment Spray and Cooling Systems

3.6.6

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.6.6.1	Verify each containment spray manual, power-operated, and automatic valve in the flow path that is not locked, sealed, or otherwise secured in position is in the correct position.	31 days -----NOTE----- Not required to be met for system vent flow paths opened under administrative control.
SR 3.6.6.2	Operate each containment cooling train fan unit for \geq 15 minutes.	31 days
SR 3.6.6.3	Verify each containment cooling train cooling water flow rate is \geq 2000 gpm to each fan cooler.	31 days
SR 3.6.6.4	Verify each containment spray pump's developed head at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.6.6.5	Verify each automatic containment spray valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	24 months
SR 3.6.6.6	Verify each containment spray pump starts automatically on an actual or simulated actuation signal.	24 months
SR 3.6.6.7	Verify each containment cooling train starts automatically on an actual or simulated actuation signal.	24 months

Containment Spray and Cooling Systems
3.6.6

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.6.6.8 Verify each spray nozzle is unobstructed.	Following maintenance that could result in nozzle blockage
SR 3.6.6.9 Verify containment spray locations susceptible to gas accumulation are sufficiently filled with water.	31 days

SDC and Coolant Circulation-High Water Level
3.9.4

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. (Continued)	<p>A.5 Close one door in each air lock.</p> <p><u>AND</u></p> <p>A.6.1 Close each penetration providing direct access from the containment atmosphere to the outside atmosphere with a manual or automatic isolation valve, blind flange, or equivalent.</p> <p><u>OR</u></p> <p>A.6.2 Verify each penetration is capable of being closed by an OPERABLE Containment Purge Valve Isolation System.</p>	<p>4 hours</p> <p>4 hours</p> <p>4 hours</p>

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.9.4.1 Verify one SDC loop is in operation and circulating reactor coolant at a flow rate of ≥ 1500 gpm.	12 hours
SR 3.9.4.2 Verify required SDC loop locations susceptible to gas accumulation are sufficiently filled with water.	31 days

SDC and Coolant Circulation-Low Water Level

3.9.5

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (Continued)	B.5.2 Verify each penetration is capable of being closed by an OPERABLE Containment Purge Valve Isolation System.	4 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.9.5.1 Verify required SDC loops are OPERABLE and one SDC loop is in operation.	12 hours
SR 3.9.5.2 Verify SDC loop in operation is circulating reactor coolant at a flow rate of ≥ 1500 gpm.	12 hours
SR 3.9.5.3 Verify correct breaker alignment and indicated power available to the required SDC loop components that are not in operation.	7 days
SR 3.9.5.4 Verify SDC loop locations susceptible to gas accumulation are sufficiently filled with water.	31 days

ATTACHMENT 2b

Proposed Technical Specification Changes (Mark-Up)

Nine Mile Point Nuclear Station, Unit 2
Renewed Facility Operating License No. NPF-69

REVISED TECHNICAL SPECIFICATIONS PAGES

Page 3.4.9-3

Page 3.4.10-2

Page 3.5.1-4

Page 3.5.2-3

Page 3.5.3-2

Page 3.6.2.3-2

Page 3.6.2.4-2

Page 3.9.8-3

Page 3.9.9-3

RHR Shutdown Cooling System – Hot Shutdown
3.4.9

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.4.9.1 <p>-----NOTE----- Not required to be met until 2 hours after reactor steam dome pressure is less than the RHR cut-in permissive pressure.</p> <p>----- Verify one RHR shutdown cooling subsystem or recirculation pump is operating.</p>	12 hours
<p>-----NOTE----- Not required to be performed until 12 hours after reactor steam dome pressure is less than the RHR cut-in permissive pressure.</p> <p>----- SR 3.4.9.2 Verify RHR shutdown cooling subsystem locations susceptible to gas accumulation are sufficiently filled with water.</p>	31 days

RHR Shutdown Cooling System – Cold Shutdown
3.4.10

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. No RHR shutdown cooling subsystem in operation. <u>AND</u> No recirculation pump in operation.	B.1 Verify reactor coolant circulating by an alternate method. <u>AND</u> B.2 Monitor reactor coolant temperature and pressure.	1 hour from discovery of no reactor coolant circulation <u>AND</u> 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
SR 3.4.10.2 Verify RHR shutdown cooling subsystem locations susceptible to gas accumulation are sufficiently filled with water.	31 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
<p>SR 3.5.1.1 Verify, for each ECCS injection/spray subsystem, the piping is filled with water from the pump discharge valve to the injection valve.</p>	<p>31 days</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> locations susceptible to gas accumulation are sufficiently filled with water. </div>
<p>SR 3.5.1.2 -----NOTE----- Low pressure coolant injection (LPCI) subsystems may be considered OPERABLE during alignment and operation for decay heat removal with reactor steam dome pressure less than the residual heat removal cut-in permissive pressure in MODE 3, if capable of being manually realigned and not otherwise inoperable.</p> <p>-----NOTE----- Not required to be met for system vent flow paths opened under administrative control.</p> <p>Verify each ECCS injection/spray subsystem manual, power operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position.</p>	<p>31 days</p>
<p>SR 3.5.1.3 Verify:</p> <ul style="list-style-type: none"> a. For each ADS nitrogen receiver discharge header, the pressure is ≥ 160 psig; and b. For each ADS nitrogen receiver tank, the pressure is ≥ 334 psig. 	<p>31 days</p>

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
<p>SR 3.5.2.2 Verify, for the required High Pressure Core Spray (HPCS) System, the:</p> <ul style="list-style-type: none"> a. Suppression pool water level is ≥ 195 ft; or b. Condensate storage tank B water level is ≥ 26.9 ft. 	12 hours
<p>SR 3.5.2.3 Verify, for each required ECCS injection/spray subsystem, the piping is filled with water from the pump discharge valve to the injection valve.</p>	<p>31 days</p> <div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p>locations susceptible to gas accumulation are sufficiently filled with water.</p> </div>
<p>SR 3.5.2.4 -----NOTE----- One low pressure coolant injection (LPCI) subsystem may be considered OPERABLE during alignment and operation for decay heat removal, if capable of being manually realigned and not otherwise inoperable.</p> <p>Verify each required ECCS injection/spray subsystem manual, power operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position.</p>	<p>-----NOTE----- Not required to be met for system vent flow paths opened under administrative control.</p> <p>31 days</p>

(continued)

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.5.3.1 Verify the RCIC System piping is filled with water from the pump discharge valve to the injection valve.	31 days locations susceptible to gas accumulation are sufficiently filled with water.
SR 3.5.3.2 Verify each RCIC System manual, power operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position.	31 days -----NOTE----- Not required to be met for system vent flow paths opened under administrative control.
SR 3.5.3.3 -----NOTE----- Not required to be performed until 12 hours after reactor steam pressure and flow are adequate to perform the test. ----- Verify, with reactor pressure \leq 1035 psig and \geq 935 psig, the RCIC pump can develop a flow rate \geq 600 gpm against a system head corresponding to reactor pressure.	92 days
SR 3.5.3.4 -----NOTE----- Not required to be performed until 12 hours after reactor steam pressure and flow are adequate to perform the test. ----- Verify, with reactor pressure \leq 165 psig, the RCIC pump can develop a flow rate \geq 600 gpm against a system head corresponding to reactor pressure.	24 months

(continued)

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.6.2.3.1 Verify each RHR suppression pool cooling subsystem manual and power operated valve in the flow path that is not locked, sealed, or otherwise secured in position, is in the correct position or can be aligned to the correct position.	31 days
SR 3.6.2.3.2 Verify each required RHR pump develops a flow rate ≥ 7450 gpm through the associated heat exchanger while operating in the suppression pool cooling mode.	In accordance with the Inservice Testing Program
SR 3.6.2.3.3 Verify RHR suppression pool cooling subsystem locations susceptible to gas accumulation are sufficiently filled with water.	31 days

RHR Suppression Pool Spray
3.6.2.4

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.6.2.4.1 Verify each RHR suppression pool spray subsystem manual and power operated valve in the flow path that is not locked, sealed, or otherwise secured in position, is in the correct position or can be aligned to the correct position.	31 days
SR 3.6.2.4.2 Verify each required RHR pump develops a flow rate ≥ 450 gpm while operating in the suppression pool spray mode.	In accordance with the Inservice Testing Program
SR 3.6.2.4.3 Verify RHR suppression pool spray subsystem locations susceptible to gas accumulation are sufficiently filled with water.	31 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.9.8.1 Verify one RHR shutdown cooling subsystem is operating.	12 hours

SR 3.9.8.2 Verify required RHR shutdown cooling subsystem locations susceptible to gas accumulation are sufficiently filled with water.

31 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.9.9.1 Verify one RHR shutdown cooling subsystem is operating.	12 hours
SR 3.9.9.2 Verify RHR shutdown cooling subsystem locations susceptible to gas accumulation are sufficiently filled with water.	31 days

ATTACHMENT 2c

Proposed Technical Specification Changes (Mark-Up)

R. E. Ginna Nuclear Power Plant, Unit 1
Renewed Facility Operating License No. DPR-18

REVISED TECHNICAL SPECIFICATIONS PAGES

*Page 3.4.6-1
Page 3.4.6-2
Page 3.4.7-1
Page 3.4.7-2
Page 3.4.8-1
Page 3.4.8-2
Page 3.5.2-1
Page 3.5.2-2
Page 3.5.3-1
Page 3.5.3-2
Page 3.5.2-3
Page 3.6.6-1
Page 3.6.6-2
Page 3.6.6-3
Page 3.9.4-1
Page 3.9.4-2
Page 3.9.5-1
Page 3.9.5-2*

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.6 RCS Loops - MODE 4

LCO 3.4.6 Two loops consisting of any combination of RCS loops and residual heat removal (RHR) loops shall be OPERABLE, and one loop shall be in operation.

- NOTE -

1. All reactor coolant pumps (RCPs) and RHR pumps may be de-energized for \leq 1 hour per 8 hour period provided:
 - a. No operations are permitted that would cause introduction of coolant into the RCS with boron concentration less than required to meet the SDM of LCO 3.1.1; and
 - b. Core outlet temperature is maintained at least 10°F below saturation temperature.
2. No RCP shall be started with any RCS cold leg temperature less than or equal to the LTOP enable temperature specified in the PTLR unless:
 - a. The secondary side water temperature of each steam generator (SG) is \leq 50°F above each of the RCS cold leg temperatures; or
 - b. The pressurizer water volume is < 324 cubic feet (38% level).

APPLICABILITY: MODE 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One RCS loop inoperable. <u>AND</u> Two RHR loops inoperable.	A.1 Initiate action to restore a second loop to OPERABLE status.	Immediately

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One RHR loop inoperable. <u>AND</u> Two RCS loops inoperable.	- - - - - - NOTE - Required Action B.1 is not applicable if all RCS and RHR loops are inoperable and Condition C is entered. - - - - - B.1 Be in MODE 5.	24 hours
C. All RCS and RHR loops inoperable. <u>OR</u> No RCS or RHR loop in operation.	C.1 Suspend operations that would cause introduction of coolant into the RCS with boron concentration less than required to meet the SDM of LCO 3.1.1. <u>AND</u> C.2 Initiate action to restore one loop to OPERABLE status and operation.	Immediately Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.4.6.1 Verify one RHR or RCS loop is in operation.	12 hours
SR 3.4.6.2 Verify SG secondary side water level is $\geq 16\%$ for each required RCS loop.	12 hours
SR 3.4.6.3 Verify correct breaker alignment and indicated power are available to the required pump that is not in operation.	7 days
SR 3.4.6.4 -----NOTE----- Not required to be performed until 12 hours after entering MODE 4. Verify required RHR loop locations susceptible to gas accumulation are sufficiently filled with water.	31 days

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.7 RCS Loops - MODE 5, Loops Filled

LCO 3.4.7 One residual heat removal (RHR) loop shall be OPERABLE and in operation, and either:

- a. One additional RHR loop shall be OPERABLE; or
- b. The secondary side water level of at least one steam generator (SG) shall be $\geq 16\%$.

- NOTE -

1. The RHR pump of the loop in operation may be de-energized for ≤ 1 hour per 8 hour period provided:
 - a. No operations are permitted that would cause introduction of coolant into the RCS with boron concentration less than required to meet the SDM of LCO 3.1.1; and
 - b. Core outlet temperature is maintained at least 10°F below saturation temperature.
2. One required RHR loop may be inoperable for ≤ 2 hours for surveillance testing provided that the other RHR loop is OPERABLE and in operation.
3. No reactor coolant pump shall be started with one or more RCS cold leg temperatures less than or equal to the LTOP enable temperature specified in the PTLR unless:
 - a. The secondary side water temperature of each SG is $\leq 50^{\circ}\text{F}$ above each of the RCS cold leg temperatures; or
 - b. The pressurizer water volume is < 324 cubic feet (38% level).
4. All RHR loops may be removed from operation during planned heatup to MODE 4 when at least one RCS loop is in operation.

APPLICABILITY: MODE 5 with RCS loops filled.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One RHR loop inoperable. <u>AND</u> Both SGs secondary side water levels not within limits.	A.1 Initiate action to restore a second RHR loop to OPERABLE status. <u>OR</u> A.2 Initiate action to restore required SG secondary side water levels to within limits.	Immediately
B. Both RHR loops inoperable. <u>OR</u> No RHR loop in operation.	B.1 Suspend operations that would cause introduction of coolant into the RCS with boron concentration less than required to meet the SDM of LCO 3.1.1. <u>AND</u> B.2 Initiate action to restore one RHR loop to OPERABLE status and operation.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.4.7.1 Verify one RHR loop is in operation.	12 hours
SR 3.4.7.2 Verify SG secondary side water level is $\geq 16\%$ in the required SG.	12 hours
SR 3.4.7.3 Verify correct breaker alignment and indicated power are available to the required RHR pump that is not in operation.	7 days
SR 3.4.7.4 Verify required RHR loop locations susceptible to gas accumulation are sufficiently filled with water.	31 days

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.8 RCS Loops - MODE 5, Loops Not Filled

LCO 3.4.8 Two residual heat removal (RHR) loops shall be OPERABLE and one RHR loop shall be in operation.

- NOTE -

1. All RHR pumps may be de-energized for \leq 15 minutes when switching from one loop to another provided:
 - a. No operations are permitted that would cause introduction of coolant into the RCS with boron concentration less than required to meet the SDM of LCO 3.1.1; and
 - b. Core outlet temperature is maintained at least 10°F below saturation temperature; and
 - c. No draining operations to further reduce the RCS water volume are permitted.
2. One RHR loop may be inoperable for \leq 2 hours for surveillance testing provided that the other RHR loop is OPERABLE and in operation.

APPLICABILITY: MODE 5 with RCS loops not filled.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One RHR loop inoperable.	A.1 Initiate action to restore RHR loop to OPERABLE status.	Immediately
B. Both RHR loops inoperable. <u>OR</u> No RHR loop in operation.	B.1 Suspend operations that would cause introduction of coolant into the RCS with boron concentration less than required to meet the SDM of LCO 3.1.1. <u>AND</u>	Immediately

RCS Loops - MODE 5, Loops Not Filled

3.4.8

CONDITION	REQUIRED ACTION	COMPLETION TIME
	B.2 Initiate action to restore one RHR loop to OPERABLE status and operation.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.8.1	Verify one RHR loop is in operation.	12 hours
SR 3.4.8.2	Verify correct breaker alignment and indicated power are available to the RHR pump that is not in operation.	7 days
SR 3.4.8.3	Verify required RHR loop locations susceptible to gas accumulation are sufficiently filled with water.	31 days

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.2 ECCS - MODES 1, 2, and 3

LCO 3.5.2 Two ECCS trains shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

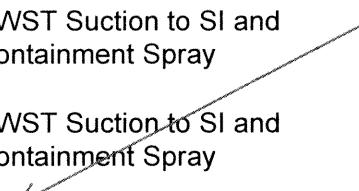
- NOTE -

1. In MODE 3, both safety injection (SI) pump flow paths may be isolated by closing the isolation valves for up to 2 hours to perform pressure isolation valve testing per SR 3.4.14.1. Power may be restored to motor operated isolation valves 878B and 878D for up to 12 hours for the purpose of testing per SR 3.4.14.1 provided that power is restored to only one valve at a time.
2. Operation in MODE 3 with ECCS pumps declared inoperable pursuant to LCO 3.4.12, "Low Temperature Overpressure Protection (LTOP) System," is allowed for up to 4 hours or until the temperature of both RCS cold legs exceeds 375°F, whichever comes first.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One train inoperable. <u>AND</u> At least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train available.	A.1 Restore train to OPERABLE status.	72 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. <u>AND</u> B.2 Be in MODE 4.	6 hours 12 hours
C. Two trains inoperable.	C.1 Enter LCO 3.0.3	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE				FREQUENCY
SR 3.5.2.1	Verify the following valves are in the listed position.			12 hours
	<u>Number</u>	<u>Position</u>	<u>Function</u>	 <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> NOTE Not required to be met for system vent flow paths opened under administrative control. </div>
	825A	Open	RWST Suction to SI Pumps	
	825B	Open	RWST Suction to SI Pumps	
	826A	Closed	BAST Suction to SI Pumps	
	826B	Closed	BAST Suction to SI Pumps	
	826C	Closed	BAST Suction to SI Pumps	
	826D	Closed	BAST Suction to SI Pumps	
	851A	Open	Sump B to RHR Pumps	
	851B	Open	Sump B to RHR Pumps	
	856	Open	RWST Suction to RHR Pumps	
	878A	Closed	SI Injection to RCS Hot Leg	
	878B	Open	SI Injection to RCS Cold Leg	
	878C	Closed	SI Injection to RCS Hot Leg	
	878D	Open	SI Injection to RCS Cold Leg	
SR 3.5.2.2	896A	Open	RWST Suction to SI and Containment Spray	31 days
SR 3.5.2.3	896B	Open	RWST Suction to SI and Containment Spray	31 days

SURVEILLANCE		FREQUENCY
SR 3.5.2.4	Verify each ECCS pump's developed head at the test flow point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.5.2.5	Verify each ECCS automatic valve in the flow path that is not locked, sealed, or otherwise secured in position actuates to the correct position on an actual or simulated actuation signal.	24 months
SR 3.5.2.6	Verify each ECCS pump starts automatically on an actual or simulated actuation signal.	24 months
SR 3.5.2.7	Verify, by visual inspection, each RHR containment sump suction inlet is not restricted by debris and the containment sump screen shows no evidence of structural distress or abnormal corrosion.	24 months
SR 3.5.2.8	Verify ECCS locations susceptible to gas accumulation are sufficiently filled with water.	31 days

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.3 ECCS - MODE 4

LCO 3.5.3 One ECCS train shall be OPERABLE.

APPLICABILITY: MODE 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required ECCS residual heat removal (RHR) subsystem inoperable.	A.1 Initiate action to restore required ECCS RHR subsystem to OPERABLE status.	Immediately
B. Required ECCS Safety Injection (SI) subsystem inoperable.	B.1 ----- - NOTE - LCO 3.0.4.b is not applicable. ----- Restore required ECCS SI subsystem to OPERABLE status.	1 hour
C. Required Action and associated Completion Time of Condition B not met.	C.1 Be in MODE 5.	24 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
<p>SR 3.5.3.1</p> <p>- - - - -</p> <p>- NOTE -</p> <p>An RHR train may be considered OPERABLE during alignment and operation for decay heat removal, if capable of being manually realigned to the ECCS mode of operation.</p> <p>- - - - -</p> <p>SR 3.5.2.4 is applicable for all equipment required to be OPERABLE.</p>	In accordance with applicable SR

and SR 3.5.2.8 are

3.6 CONTAINMENT SYSTEMS

3.6.6 Containment Spray (CS), Containment Recirculation Fan Cooler (CRFC), and NaOH Systems

LCO 3.6.6 Two CS trains, four CRFC units, and the NaOH system shall be OPERABLE.

- - - - -
- NOTE -

In MODE 4, both CS pumps may be in pull-stop for up to 2 hours for the performance of interlock and valve testing of motor operated valves (MOVs) 857A, 857B, and 857C. Power may also be restored to MOVs 896A and 896B, and the valves placed in the closed position, for up to 2 hours for the purpose of each test.
- - - - -

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One CS train inoperable.	A.1 Restore CS train to OPERABLE status.	72 hours
B. NaOH system inoperable.	B.1 Restore NaOH System to OPERABLE status.	72 hours
C. Required Action and associated Completion Time of Condition A or B not met.	C.1 Be in MODE 3. <u>AND</u> C.2 Be in MODE 5.	6 hours 84 hours
D. One or two CRFC units inoperable.	D.1 Restore CRFC unit(s) to OPERABLE status.	7 days
E. Required Action and associated Completion Time of Condition D not met.	E.1 Be in MODE 3. <u>AND</u> E.2 Be in MODE 5.	6 hours 36 hours

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. Two CS trains inoperable.	F.1 Enter LCO 3.0.3.	Immediately
<u>OR</u> Three or more CRFC units inoperable.		<p style="text-align: center;">NOTE</p> <p>Not required to be met for system vent flow paths opened under administrative control.</p>
SURVEILLANCE REQUIREMENTS		
SURVEILLANCE	FREQUENCY	
SR 3.6.6.1 Perform SR 3.5.2.1 and SR 3.5.2.3 for valves 896A and 896B.	In accordance with applicable SRs.	
SR 3.6.6.2 Verify each CS manual, power operated, and automatic valve in the flow path that is not locked, sealed, or otherwise secured in position is in the correct position.	31 days	
SR 3.6.6.3 Verify each NaOH System manual, power operated, and automatic valve in the flow path that is not locked, sealed, or otherwise secured in position is in the correct position.	31 days	
SR 3.6.6.4 Operate each CRFC unit for \geq 15 minutes.	31 days	
SR 3.6.6.5 Verify cooling water flow through each CRFC unit.	31 days	
SR 3.6.6.6 Verify each CS pump's developed head at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program	
SR 3.6.6.7 Verify NaOH System solution volume is \geq 3000 gal.	184 days	
SR 3.6.6.8 Verify NaOH System tank NaOH solution concentration is \geq 30% and \leq 35% by weight.	184 days	
SR 3.6.6.9 Perform required CRFC unit testing in accordance with the VFTP.	In accordance with the VFTP	
SR 3.6.6.10 Verify each automatic CS valve in the flow path that is not locked, sealed, or otherwise secured in position actuates to the correct position on an actual or simulated actuation signal.	24 months	

SURVEILLANCE		FREQUENCY
SR 3.6.6.11	Verify each CS pump starts automatically on an actual or simulated actuation signal.	24 months
SR 3.6.6.12	Verify each CRFC unit starts automatically on an actual or simulated actuation signal.	24 months
SR 3.6.6.13	Verify each automatic NaOH System valve in the flow path that is not locked, sealed, or otherwise secured in position actuates to the correct position on an actual or simulated actuation signal.	24 months
SR 3.6.6.14	Verify spray additive flow through each eductor path.	5 years
SR 3.6.6.15	Verify each spray nozzle is unobstructed.	Following maintenance which could result in nozzle blockage
SR 3.6.6.16	Verify CS locations susceptible to gas accumulation are sufficiently filled with water.	31 days

3.9 REFUELING OPERATIONS

3.9.4 Residual Heat Removal (RHR) and Coolant Circulation - Water Level \geq 23 Ft

LCO 3.9.4 One RHR loop shall be OPERABLE and in operation.

- - - - -
- NOTE -

The required RHR loop may be removed from operation for \leq 1 hour per 8 hour period, provided no operations are permitted that would cause introduction of coolant into the Reactor Coolant System (RCS) with boron concentration less than that required to meet the minimum required boron concentration of LCO 3.9.1 .

APPLICABILITY: MODE 6 with the water level \geq 23 ft above the top of reactor vessel flange.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. RHR loop requirements not met.	A.1 Suspend operations that would cause introduction of coolant into the RCS with boron concentration less than required to meet the boron concentration of LCO 3.9.1. <u>AND</u> A.2 Suspend loading irradiated fuel assemblies in the core. <u>AND</u> A.3 Initiate action to satisfy RHR loop requirements. <u>AND</u>	Immediately

RHR and Coolant Circulation - Water Level \geq 23 Ft
3.9.4

CONDITION	REQUIRED ACTION	COMPLETION TIME
A.4	Close all containment penetrations providing direct access from containment atmosphere to outside atmosphere.	4 hours

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.9.4.1	Verify one RHR loop is in operation and circulating reactor coolant.	12 hours
SR 3.9.4.2	Verify required RHR loop locations susceptible to gas accumulation are sufficiently filled with water.	31 days

3.9 REFUELING OPERATIONS

3.9.5 Residual Heat Removal (RHR) and Coolant Circulation - Water Level < 23 Ft

LCO 3.9.5 Two RHR loops shall be OPERABLE, and one RHR loop shall be in operation.

APPLICABILITY: MODE 6 with the water level < 23 ft above the top of reactor vessel flange.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Less than the required number of RHR loops OPERABLE.	<p>A.1 Initiate action to restore RHR loop(s) to OPERABLE status.</p> <p><u>OR</u></p> <p>A.2 Initiate action to establish ≥ 23 ft of water above the top of reactor vessel flange.</p>	Immediately
B. No RHR loop in operation.	<p>B.1 Suspend operations that would cause introduction of coolant into the RCS with boron concentration less than required to meet the boron concentration of LCO 3.9.1.</p> <p><u>AND</u></p> <p>B.2 Initiate action to restore one RHR loop to operation.</p> <p><u>AND</u></p> <p>B.3 Close all containment penetrations providing direct access from containment to outside atmosphere.</p>	<p>Immediately</p> <p>Immediately</p> <p>4 hours</p>

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.5.1	Verify one RHR loop is in operation and circulating reactor coolant.	12 hours
SR 3.9.5.2	Verify correct breaker alignment and indicated power available to the required RHR pump that is not in operation.	7 days
SR 3.9.5.3	Verify RHR loop locations susceptible to gas accumulation are sufficiently filled with water.	31 days

ATTACHMENT 3a
Proposed Technical Specification Bases Changes (Mark-Up)
(For Information Only)

Calvert Cliffs Nuclear Power Plant, Units 1 and 2
Renewed Facility Operating License Nos. DPR-53 and DPR-69

REVISED TECHNICAL SPECIFICATION BASES PAGES

*Page B 3.4.6-3
Page B 3.4.6-5
Page B 3.4.7-4
Page B 3.4.7-6
Page B 3.4.8-2
Page B 3.4.8-3
Page B 3.5.2-4
Page B 3.5.2-7
Page B 3.5.2-9
Page B 3.5.3-2
Page B 3.6.6-4
Page B 3.6.6-7
Page B 3.6.6-9
Page B 3.9.4-2
Page B 3.9.4-5
Page B 3.9.5-2
Page B 3.9.5-6*

BASES

An OPERABLE RCS loop consists of at least one OPERABLE RCP and an SG that is OPERABLE and has the minimum water level specified in SR 3.4.6.2.

Similarly, for the SDC System, an OPERABLE SDC loop is composed of the OPERABLE SDC pump(s) capable of providing forced flow to the SDC heat exchanger(s). Reactor coolant pumps and SDC pumps are OPERABLE if they are capable of being powered and are able to provide flow if required.

APPLICABILITY

Management of gas voids is important to SDC System OPERABILITY.

In MODE 4, this LCO applies because it is possible to remove core decay heat and to provide proper boron mixing with either the RCS loops and SGs, or the SDC System.

Operation in other MODEs is covered by: LCO 3.4.4, LCO 3.4.5, LCO 3.4.7, LCO 3.4.8, LCO 3.9.4, and LCO 3.9.5.

ACTIONS

A.1

If only one required RCS loop is OPERABLE and in operation, and no SDC loops are OPERABLE, redundancy for heat removal is lost. Action must be initiated immediately to restore a second loop to OPERABLE status. The immediate Completion Time reflects the importance of maintaining the availability of two paths for decay heat removal.

B.1

If one required SDC loop is OPERABLE and in operation and no RCS loops are OPERABLE, redundancy for heat removal is lost. The plant must be placed in MODE 5 within the next 24 hours. Placing the plant in MODE 5 is a conservative action with regard to decay heat removal. With only one SDC loop OPERABLE, redundancy for decay heat removal is lost and, in the event of a loss of the remaining SDC loop, it would be safer to initiate that loss from MODE 5 ($\leq 200^{\circ}\text{F}$) rather than MODE 4 ($> 200^{\circ}\text{F}$ to $< 300^{\circ}\text{F}$). The Completion Time of 24 hours is reasonable, based on operating experience, to reach MODE 5 from MODE 4, with only one SDC loop operating, in an orderly manner and without challenging plant systems.

BASES

SR 3.4.6.3

Verification that the required pump is OPERABLE ensures that an additional RCS or SDC loop can be placed in operation, if needed to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available to the required loop components that are not in operation. For an RCS loop, the required component is a pump. For an SDC loop, the required components are the pump and valves. The Frequency of seven days is considered reasonable in view of other administrative controls available and has been shown to be acceptable by operating experience.

REFERENCES None

Insert 1

Insert 1

SR 3.4.6.4

SDC System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required SDC train(s) and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of SDC System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The SDC System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the SDC System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

SDC System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

This SR is modified by a Note that states the SR is not required to be performed until 12 hours after entering MODE 4. In a rapid shutdown, there may be insufficient time to verify all susceptible locations prior to entering MODE 4.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the SDC System piping and the procedural controls governing system operation

BASES

An OPERABLE SDC loop is composed of an OPERABLE SDC pump and an OPERABLE SDC heat exchanger. An OPERABLE SDC loop is supported by a functional saltwater and component cooling water subsystem. Note that one functional saltwater and component cooling water subsystem may support both OPERABLE SDC loops, if its heat removal capacity is sufficient.

Management of
gas voids is
important to
SDC System
OPERABILITY.

~~SDC pumps are OPERABLE if they are capable of being powered and are able to provide flow if required. A SG can perform as a heat sink when it has an adequate water level and is OPERABLE.~~

APPLICABILITY

In MODE 5 with RCS loops filled, this LCO requires forced circulation to remove decay heat from the core and to provide proper boron mixing. One SDC loop provides sufficient circulation for these purposes.

Operation in other MODEs is covered by: LCO 3.4.4, LCO 3.4.5, LCO 3.4.6, LCO 3.4.8, LCO 3.9.4, and LCO 3.9.5.

ACTIONSA.1 and A.2

If the required SDC loop is inoperable and any SGs have secondary side water levels < -50 inches, redundancy for heat removal is lost. Action must be initiated immediately to restore a second SDC loop to OPERABLE status or to restore the water level in the required SGs. Either Required Action A.1 or Required Action A.2 will restore redundant decay heat removal paths. The immediate Completion Times reflect the importance of maintaining the availability of two paths for decay heat removal.

B.1 and B.2

If no SDC loop is in operation, except as permitted in Note 1, all operations involving introduction of water into the RCS with a boron concentration less than that required to meet the minimum SDM of LCO 3.1.1 must be suspended. Action to restore one SDC loop to OPERABLE status and place it in operation must be initiated. The required margin to criticality must not be reduced in this type of operation. Suspending the introduction of water into the RCS with a boron concentration less than that required to meet the minimum SDM of LCO 3.1.1 is required to assure continued

RCS Loops - MODE 5, Loops Filled
B 3.4.7

BASES

performed by verifying proper breaker alignment and power available to the required pumps and valves that are not in operation. This surveillance test is required to be performed when the LCO requirement is being met by one of two SDC loops, e.g., both SGs have < -50 inches water level. The Frequency of seven days is considered reasonable in view of other administrative controls available and has been shown to be acceptable by operating experience.

REFERENCES

None

Insert 2

Insert 2

SR 3.4.7.4

SDC System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required SDC train(s) and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of SDC System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The SDC System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the SDC System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

SDC System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the SDC System piping and the procedural controls governing system operation

BASES

saturation temperature. The Note prohibits boron dilution with water at a boron concentration less than that required to assure the SDM of LCO 3.1.1 is maintained or draining operations when SDC forced flow is stopped.

Note 2 allows one SDC loop to be inoperable for a period of two hours provided that the other loop is OPERABLE and in operation. This permits periodic surveillance tests to be performed on the inoperable loop during the only time when these tests are safe and possible.

An OPERABLE SDC loop is composed of an OPERABLE SDC pump capable of providing forced flow to an OPERABLE SDC heat exchanger, along with the appropriate flow and temperature instrumentation for control, protection, and indication. An OPERABLE SDC loop is supported by a functional saltwater and component cooling water subsystem. Note that one functional saltwater and component cooling water subsystem may support both OPERABLE SDC loops, if its heat removal capacity is sufficient. Shutdown cooling pumps are OPERABLE if they are capable of being powered and are able to provide flow if required.

Management of gas voids is important to SDC System OPERABILITY.

APPLICABILITY

In MODE 5 with loops not filled, this LCO requires core heat removal and coolant circulation by the SDC System.

Operation in other MODEs is covered by: LCO 3.4.4, LCO 3.4.5, LCO 3.4.6, LCO 3.4.7, LCO 3.9.4, and LCO 3.9.5.

ACTIONS

A.1

If the required SDC loop is inoperable, redundancy for heat removal is lost. Action must be initiated immediately to restore a second loop to OPERABLE status. The Completion Time reflects the importance of maintaining the availability of two paths for heat removal.

B.1 and B.2

If no SDC loop is OPERABLE or in operation, except as provided in Note 1, all operations involving introduction of water into the RCS with a boron concentration less than that required to meet the minimum SDM of LCO 3.1.1 must be suspended. Action to restore one SDC loop to OPERABLE

BASES

status and place it in operation must be initiated immediately. The required margin to criticality must not be reduced in this type of operation. Suspending the introduction of water into the RCS with a boron concentration less than that required to meet the minimum SDM of LCO 3.1.1 is required to assure continued safe operation. When water is added without forced circulation, unmixed coolant could be introduced to the core, however water added with a boron concentration meeting the minimum SDM maintains an acceptable margin to subcritical operations. The immediate Completion Time reflects the importance of maintaining operation for decay heat removal.

SURVEILLANCE
REQUIREMENTS

SR 3.4.8.1

This SR requires verification every 12 hours that one SDC loop is in operation. Verification includes flow rate, temperature, or pump status monitoring, which help ensure that forced flow is providing decay heat removal. The 12 hour Frequency has been shown by operating practice to be sufficient to regularly assess degradation and verify operation is within safety analyses assumptions.

SR 3.4.8.2

Verification that the required number of loops are OPERABLE ensures that redundant paths for heat removal are available and that additional loops can be placed in operation, if needed, to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and indicated power available to the required pumps and valves that are not in operation. The Frequency of seven days is considered reasonable in view of other administrative controls available and has been shown to be acceptable by operating experience.

REFERENCES

None

Insert 3

Insert 3

SR 3.4.8.3

SDC System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the SDC trains and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of SDC System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The SDC System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the SDC System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

SDC System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the SDC System piping and the procedural controls governing system operation

BASES

LCO

In MODEs 1, 2, and 3, with pressurizer pressure ≥ 1750 psia, two independent (and redundant) ECCS trains are required to ensure that sufficient ECCS flow is available, assuming there is a single failure affecting either train. Additionally, individual components within the ECCS trains may be called upon to mitigate the consequences of other transients and accidents.

In MODEs 1 and 2, and in MODE 3 with pressurizer pressure ≥ 1750 psia, an ECCS train consists of a HPSI subsystem, and a LPSI subsystem.

Each HPSI and LPSI train includes the piping, instruments, and controls to ensure the availability of an OPERABLE flow path capable of taking suction from the RWT on a SIAS and automatically transferring suction to the containment sump upon a recirculation actuation signal.

Management of gas voids is important to ECCS OPERABILITY.

During an event requiring ECCS actuation, a flow path is provided to ensure an abundant supply of water from the RWT to the RCS, via the HPSI and LPSI pumps and their respective supply headers, to each of the four cold leg injection nozzles. In the long-term, this flow path may be switched to take its supply from the containment sump and to supply part of its flow to the RCS hot legs via the pressurizer or the shutdown cooling (SDC) suction nozzles.

The flow path for each train must maintain its designed independence to ensure that no single failure can disable both ECCS trains.

In addition for the HPSI pump system to be considered OPERABLE, each HPSI pump system (consisting of a HPSI pump and one of two safety injection headers) must have balanced flows, such that the sum of the flow rates of the three lowest flow legs is > 470 gpm.

APPLICABILITY

In MODEs 1 and 2, and in MODE 3 with RCS pressure ≥ 1750 psia, the ECCS OPERABILITY requirements for the limiting DBA large break LOCA are based on full power operation. Although reduced power would not require the same level of performance, the accident analysis does not provide for reduced cooling requirements in the lower MODEs.

BASES

SR 3.5.2.2

Verifying the correct alignment for manual, power-operated, and automatic valves in the ECCS flow paths provides assurance that the proper flow paths will exist for ECCS operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these valves were verified to be in the correct position prior to locking, sealing, or securing. A valve that receives an actuation signal is allowed to be in a non-accident position provided the valve automatically repositions within the proper stroke time. This SR does not require any testing or valve manipulation. Rather, it involves verification that those valves capable of being mispositioned are in the correct position.

The 31 day Frequency is appropriate because the valves are operated under procedural control and an improper valve position would only affect a single train. This Frequency has been shown to be acceptable through operating experience.

SR 3.5.2.3

The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.

Periodic surveillance testing of the HPSI and LPSI pumps to detect gross degradation caused by impeller structural damage or other hydraulic component problems is required by the American Society of Mechanical Engineers Code. This type of testing may be accomplished by measuring the pump developed head at only one point of the pump characteristic curve. This verifies both that the measured performance is within an acceptable tolerance of the original pump baseline performance and that the performance at the test flow is greater than or equal to the performance assumed in the unit safety analysis. Surveillance Requirements are specified in the Inservice Testing Program, which encompasses American Society of Mechanical Engineers Code. American Society of Mechanical Engineers Code provides the activities and Frequencies necessary to satisfy the requirements.

SR 3.5.2.4

The Surveillance Requirement was deleted in Amendment Nos. 260/237.

BASES

350 psia. The suction piping of the LPSI pumps, is the SDC component with the limiting design pressure rating. The interlock provides assurance that double isolation of the SDC System from the RCS is preserved whenever RCS pressure, is at or above, the design pressure. The 309 psia value specified in the Surveillance is the actual pressurizer pressure at the instrument tap elevation for PT-103 and PT-103-1 when the SDC System suction pressure is 350 psia. The procedure for this surveillance test contains the required compensation to be applied to this value to account for instrument uncertainties. This surveillance test is normally performed using a simulated RCS pressure input signal. The 24 month Frequency is based on the need to perform this surveillance test under conditions that apply during an outage. The 24 month Frequency is also acceptable based on consideration of the design reliability (and confirming operating experience) for the equipment.

REFERENCES

1. UFSAR
2. 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Plants"
3. Nuclear Regulatory Commission Memorandum to V. Stello, Jr., from R. L. Baer, "Recommended Interim Revisions to LCOs for ECCS Components," December 1, 1975
4. Inspection and Enforcement Information Notice No. 87-01, "RHR Valve Misalignment Causes Degradation of ECCS in PWRs," January 6, 1987

Insert 4

Insert 4

SR 3.5.2.10

ECCS piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the ECCS and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of ECCS locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The ECCS is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the ECCS is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

ECCS locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the ECCS piping and the procedural controls governing system operation

BASES

Management of gas voids is important to ECCS OPERABILITY.

containment sump and to deliver its flow to the RCS hot and cold legs.

With RCS pressure < 1750 psia, one HPSI pump is acceptable without single failure consideration, based on the stable reactivity condition of the reactor, and the limited core cooling requirements. The LPSI pumps may therefore be released from the ECCS train for use in SDC. In MODE 3 with RCS cold leg temperature \leq 365°F (Unit 1), \leq 301°F (Unit 2), a maximum of one HPSI pump is allowed to be OPERABLE in accordance with LCO 3.4.12.

The LCO is modified by a Note which allows the HPSI train to not be capable of automatically starting on an actuation signal when RCS cold leg temperature is $<$ 385°F (Unit 1), $<$ 325°F (Unit 2), during heatup and cooldown and when $<$ 365°F (Unit 1), $<$ 301°F (Unit 2), during other conditions. This allowance is necessary to ensure low temperature overpressure protection analysis assumptions are maintained. The LCO Note provides a transition period [between 385°F and 365°F (Unit 1), between 325°F and 301°F (Unit 2)] where the OPERABLE HPSI pump will be placed in pull-to-lock on a cooldown and restored to automatic status on heatup (see LCO 3.4.12). At 365°F and less (Unit 1), 301°F and less (Unit 2), the required HPSI pump shall be placed in pull-to-lock and will not start automatically. The HPSI pumps and HPSI header isolation valves are required to be out of automatic when operating within the MODEs of Applicability for the Low Temperature Overpressure Protection System (LCO 3.4.12).

APPLICABILITY In MODEs 1, 2, and 3 with RCS pressure \geq 1750 psia, the OPERABILITY requirements for ECCS are covered by LCO 3.5.2.

In MODE 3 with RCS pressure < 1750 psia and in MODE 4, one OPERABLE ECCS train is acceptable without single failure consideration, based on the stable reactivity condition of the reactor, and the limited core cooling requirements.

In MODEs 5 and 6, unit conditions are such that the probability of an event requiring ECCS injection is extremely low. Core cooling requirements in MODE 5 are

BASES

cooling capacity under varying containment ambient conditions, required to perform the accident analyses, is also shown in Reference 1, Chapter 6.

The modeled Containment Cooling System actuation from the containment analysis, is based upon the unit specific response time associated with exceeding the SIAS to achieve full Containment Cooling System air and safety grade cooling water flow.

The Containment Spray and Cooling Systems satisfy 10 CFR 50.36(c)(2)(ii), Criterion 3.

LCO During a DBA, a minimum of one containment cooling train and one containment spray train, is required to maintain the containment peak pressure and temperature, below the design limits (Reference 1, Chapter 6). Additionally, one containment spray train is also required to remove iodine from the containment atmosphere and maintain concentrations below those assumed in the safety analysis. To ensure that these requirements are met, two containment spray trains and two containment cooling trains (all four coolers) must be OPERABLE. Therefore, in the event of an accident, the minimum requirements are met, assuming that the worst case single active failure occurs.

Each Containment Spray System includes a spray pump, spray headers, nozzles, valves, piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWT upon an ESF actuation signal and automatically transferring suction to the containment sump. Each spray system flow path from the containment sump will be via an OPERABLE shutdown cooling heat exchanger.

Management of gas voids is important to Containment Spray System OPERABILITY.

Each Containment Cooling System includes cooling coils, dampers, fans, instruments, and controls to ensure an OPERABLE flow path.

APPLICABILITY In MODEs 1, 2, and 3, a DBA could cause a release of radioactive material to the Containment Structure and an increase in containment pressure and temperature, requiring the operation of the containment spray trains and containment cooling trains.

BASESE.1 and E.2

If the Required Actions and associated Completion Times of Conditions C or D of this LCO are not met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 4 within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

F.1

With two containment spray trains or any combination of three or more Containment Spray and Cooling Systems trains inoperable, the unit is in a condition outside the accident analysis. Therefore, LCO 3.0.3 must be entered immediately.

**SURVEILLANCE
REQUIREMENTS**

The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.

SR 3.6.6.1

Verifying the correct alignment for manual, power-operated, and automatic valves in the containment spray flow path provides assurance that the proper flow paths will exist for Containment Spray System operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position since these were verified to be in the correct position prior to being secured. This SR also does not apply to valves that cannot be inadvertently misaligned, such as check valves. This SR does not require any testing or valve manipulation. Rather, it involves verifying, through a system walkdown, that those valves outside the Containment Structure and capable of potentially being mispositioned are in the correct position.

SR 3.6.6.2

Starting each containment cooling train fan unit from the Control Room and operating it for \geq 15 minutes ensures that all trains are OPERABLE and that all associated controls are functioning properly. It also ensures that blockage, fan or motor failure, or excessive vibration can be detected and corrective action taken. The 31 day Frequency of this SR

BASES

24 month Frequency is based on the need to perform these surveillance tests under the conditions that apply during a plant outage and the potential for an unplanned transient if the surveillance tests were performed with the reactor at power. Operating experience has shown that these components usually pass the surveillance tests when performed at the 24 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

The surveillance test of containment sump isolation valves is also required by SR 3.5.2.5. A single surveillance test may be used to satisfy both requirements.

SR 3.6.6.7

This SR verifies that each containment cooling train actuates upon receipt of an actual or simulated actuation signal (i.e., the appropriate Engineered Safety Feature Actuation System signal). The 24 month Frequency is based on engineering judgment and has been shown to be acceptable through operating experience. See SR 3.6.6.5 and SR 3.6.6.6, above, for further discussion of the basis for the 24 month Frequency.

SR 3.6.6.8

With the containment spray inlet valves closed and the spray header drained of any solution, low pressure air or smoke can be blown through check valve bonnets. Performance of this SR demonstrates that each spray nozzle is unobstructed and provides assurance that spray coverage of the Containment Structure during an accident is not degraded. Due to the passive design of the nozzle, a test after maintenance that could result in nozzle blockage is considered adequate. Maintenance that could result in nozzle blockage is generally loss of foreign material control or a flow of borated water through a nozzle. Should either of these events occur, a supervisory evaluation will be required to determine whether nozzle blockage is a possible result of the event.

Insert 5

Insert 5

SR 3.6.6.9

Containment Spray System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required Containment Spray trains and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of Containment Spray System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The Containment Spray System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the Containment Spray System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

Containment Spray System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the Containment Spray System piping and the procedural controls governing system operation

BASES

Shutdown cooling and Coolant Circulation-High Water Level satisfies 10 CFR 50.36(c)(2)(ii), Criterion 2.

LCO

Only one SDC loop is required for decay heat removal in MODE 6, with water level \geq 23 ft above the top of the irradiated fuel assemblies seated in the reactor vessel. Only one SDC loop is required because the volume of water above the irradiated fuel assemblies seated in the reactor vessel provides backup decay heat removal capability. At least one SDC loop must be OPERABLE and in operation to provide:

- a. Removal of decay heat;
- b. Mixing of borated coolant to minimize the possibility of a criticality; and
- c. Indication of reactor coolant temperature.

An OPERABLE SDC loop includes an SDC pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path, and to determine the low end temperature. An OPERABLE SDC loop is supported by a functional saltwater and component cooling water subsystem. Note that one functional saltwater and component cooling water subsystem may support both OPERABLE SDC loops, if its heat removal capacity is sufficient. The flow path starts in one of the RCS hot legs and is returned to the RCS cold legs.

Management of gas voids is important to SDC System OPERABILITY.

The LCO is modified by a Note that allows the required operating SDC loop not to be in operation for up to one hour in each eight hour period, provided no operations are permitted that would cause the introduction of water into the RCS with a boron concentration less than that required to meet the minimum boron concentration of LCO 3.9.1. Boron concentration reduction with water at boron concentrations less than that required to meet the minimum boron concentration of LCO 3.9.1 is prohibited because uniform concentration distribution cannot be ensured without forced circulation. This permits operations such as core mapping or alterations in the vicinity of the reactor vessel hot leg nozzles, and RCS to SDC isolation valve testing. During this one hour period, decay heat is removed by natural convection to the large mass of water in the refueling pool.

BASES

With SDC loop requirements not met, the potential exists for the coolant to boil and release radioactive gas to the containment atmosphere. Performing the actions described above ensure that all containment penetrations are either closed or can be closed so that the dose limits are not exceeded.

The Completion Time of four hours allows fixing of most SDC problems and is reasonable, based on the low probability of the coolant boiling in that time.

The emergency air lock temporary closure device cannot be credited for containment closure for a loss of shutdown cooling event. At least one door in the emergency air lock must be closed to satisfy this action statement.

SURVEILLANCE
REQUIREMENTS

SR 3.9.4.1

This SR demonstrates that the SDC loop is in operation and circulating reactor coolant. The flow rate is determined by the flow rate necessary to provide sufficient decay heat removal capability, and to prevent thermal and boron stratification in the core. The Frequency of 12 hours is sufficient, considering the flow, temperature, pump control, and alarm indications available to the operator in the Control Room for monitoring the SDC System.

REFERENCES

1. UFSAR, Section 9.2, "Shutdown Cooling System"

Insert 6

Insert 6

SR 3.9.4.2

SDC System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required SDC loop(s) and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of SDC System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The SDC System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the SDC System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

SDC System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the SDC System piping and the procedural controls governing system operation

BASES

LCO

In MODE 6, with the water level < 23 ft above the top of the irradiated fuel assemblies seated in the reactor vessel, both SDC loops must be OPERABLE. Additionally, one loop of the SDC System must be in operation in order to provide:

- a. Removal of decay heat;
- b. Mixing of borated coolant to minimize the possibility of a criticality; and
- c. Indication of reactor coolant temperature.

An OPERABLE SDC loop consists of an SDC pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the low end temperature. An OPERABLE SDC loop is supported by a functional saltwater and component cooling water subsystem. Note that one functional saltwater and component cooling water subsystem may support both OPERABLE SDC loops, if its heat removal capacity is sufficient. The flow path starts in one of the RCS hot legs and is returned to the RCS cold legs. Both SDC pumps may be aligned to the Refueling Water Tank to support filling the refueling pool or for performance of required testing.

Management of gas voids is important to SDC System OPERABILITY.

The LCO is modified by a note that allows one required SDC loop to be replaced by one spent fuel pool cooling loop when it is lined up to provide cooling flow to the irradiated fuel assemblies in the reactor core, and the heat generation rate of the core is below the heat removal capacity of the spent fuel cooling loop.

This LCO is modified by a Note that allows one SDC loop to be inoperable for a period of two hours provided the other loop is OPERABLE and in operation. Prior to declaring the loop inoperable, consideration should be given to the existing plant configuration. This consideration should include that the core time to boil is short, there is no draining operation to further reduce RCS water level and that the capability exists to inject borated water into the reactor vessel. This permits surveillance tests to be performed on the inoperable loop during a time when these tests are safe and possible.

BASESSR 3.9.5.3

Verification that the required pump and valves are OPERABLE ensures that an additional SDC loop can be placed in operation, if needed, to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available to the required pump and valves. The Frequency of seven days is considered reasonable in view of other administrative controls available and has been shown to be acceptable by operating experience.

REFERENCES

-
1. UFSAR, Section 9.2, "Shutdown Cooling System"
-

Insert 7

Insert 7

SR 3.9.5.4

SDC System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the SDC loops and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of SDC System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The SDC System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the SDC System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

SDC System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the SDC System piping and the procedural controls governing system operation

ATTACHMENT 3b
Proposed Technical Specification Bases Changes (Mark-Up)
(For Information Only)

Nine Mile Point Nuclear Station, Unit 2
Renewed Facility Operating License No. NPF-69

REVISED TECHNICAL SPECIFICATION BASES PAGES

*Page B 3.4.9-2
Page B 3.4.9-5
Page B 3.4.10-4
Page B 3.5.1-5
Page B 3.5.1-9
Page B 3.5.1-10
Page B 3.5.2-1
Page B 3.5.2-6
Page B 3.5.3-2
Page B 3.5.3-4
Page B 3.6.2.3-2
Page B 3.6.2.3-4
Page B 3.6.2.4-2
Page B 3.6.2.4-4
Page B 3.9.8-1
Page B 3.9.8-4
Page B 3.9.9-1
Page B 3.9.9-4*

BASES

LCO (continued)	<p>one subsystem can maintain or reduce the reactor coolant temperature as required. To ensure adequate core flow to allow for accurate average reactor coolant temperature monitoring, nearly continuous operation is required.</p> <p>Management of gas voids is important to RHR Shutdown Cooling System OPERABILITY.</p> <p>Note 1 permits both 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 up to 2 hours 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.</p>
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APPLICABILITY	<p>In MODE 3 with reactor steam dome pressure below the RHR cut-in permissive pressure (i.e., the actual pressure at which the interlock resets) the RHR Shutdown Cooling System must be OPERABLE and one RHR shutdown cooling subsystem 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.</p> <p>In MODES 1 and 2, and in MODE 3 with reactor steam dome pressure greater than or equal to the RHR cut-in 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 cut-in 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.</p> <p>The requirements for decay heat removal in MODES 4 and 5 are discussed in LCO 3.4.10, "Residual Heat Removal (RHR) Shutdown Cooling System – Cold Shutdown"; LCO 3.9.8, "Residual Heat Removal (RHR) – High Water Level"; and LCO 3.9.9, "Residual Heat Removal (RHR) – Low Water Level."</p>
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(continued)

BASES (continued)

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.

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.

REFERENCES

1. 10 CFR 50.36(c)(2)(ii).
-

Insert 1

Insert 1

SR 3.4.9.2

RHR Shutdown Cooling System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RHR shutdown cooling subsystems and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RHR Shutdown Cooling System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plant and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR Shutdown Cooling System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR Shutdown Cooling System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR Shutdown Cooling System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative subset of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

This SR is modified by a Note that states the SR is not required to be performed until 12 hours after reactor steam dome pressure is less than the RHR cut in permissive pressure. In a rapid shutdown, there may be insufficient time to verify all susceptible locations prior to entering the Applicability.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR Shutdown Cooling System piping and the procedural controls governing system operation.

BASES

LCO
(continued)

redundancy. Operation of one subsystem can maintain and reduce the reactor coolant temperature as required. To ensure adequate core flow to allow for accurate average reactor coolant temperature monitoring, nearly continuous operation is required.

Management of gas voids is important to RHR Shutdown Cooling System OPERABILITY.

Note 1 permits both 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 up to 2 hours 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.

APPLICABILITY

In MODE 4, the RHR Shutdown Cooling System must be OPERABLE and one RHR shutdown cooling subsystem shall be operated in the shutdown cooling mode to remove decay heat to maintain coolant temperature below 200°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 cut-in 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 cut-in 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.

The requirements for decay heat removal in MODE 3 below the cut-in permissive pressure and in MODE 5 are discussed in LCO 3.4.9, "Residual Heat Removal (RHR) Shutdown Cooling System – Hot Shutdown"; LCO 3.9.8, "Residual Heat Removal (RHR) – High Water Level"; and LCO 3.9.9, "Residual Heat Removal (RHR) – Low Water Level."

(continued)

BASES

ACTIONS
(continued)

B.1 and 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.

SURVEILLANCE
REQUIREMENTS

SR 3.4.10.1

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.

REFERENCES

1. 10 CFR 50.36(c)(2)(ii).

Insert 2

Insert 2

SR 3.4.10.2

RHR Shutdown Cooling System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RHR shutdown cooling subsystems and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RHR Shutdown Cooling System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plant and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR Shutdown Cooling System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR Shutdown Cooling System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR Shutdown Cooling System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative subset of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR Shutdown Cooling System piping and the procedural controls governing system operation.

BASES

APPLICABLE SAFETY ANALYSES (continued)

inoperable at the time of the accident. The remaining OPERABLE ECCS subsystems provide the capability to adequately cool the core and prevent excessive fuel damage.

The ECCS satisfy Criterion 3 of Reference 12.

LCO

Each ECCS injection/spray subsystem and six ADS valves are required to be OPERABLE. The ECCS injection/spray subsystems are defined as the three LPCI subsystems, the LPCS System, and the HPCS System. The low pressure ECCS injection/spray subsystems are defined as the LPCS System and the three LPCI subsystems→

Management of gas voids is important to ECCS injection/spray subsystem OPERABILITY.

With less than the required number of ECCS subsystems OPERABLE during a limiting design basis LOCA concurrent with the worst case single failure, the limits specified in 10 CFR 50.46 (Ref. 10) could potentially be exceeded. All ECCS subsystems must therefore be OPERABLE to satisfy the single failure criterion required by 10 CFR 50.46 (Ref. 10).

LPCI subsystems may be considered OPERABLE during alignment and operation for decay heat removal when below the actual RHR cut in permissive pressure in MODE 3, if capable of being manually realigned (remote or local) to the LPCI mode and not otherwise inoperable. Alignment and operation for decay heat removal includes when the required RHR pump is not operating or when the system is realigned from or to the RHR shutdown cooling mode. At these low pressures and decay heat levels, a reduced complement of ECCS subsystems should provide the required core cooling, thereby allowing operation of RHR shutdown cooling when necessary.

APPLICABILITY

All ECCS subsystems are required to be OPERABLE during MODES 1, 2, and 3 when there is considerable energy in the reactor core and core cooling would be required to prevent fuel damage in the event of a break in the primary system piping. In MODES 2 and 3, the ADS function is not required when pressure is ≤ 150 psig because the low pressure ECCS subsystems (LPCS and LPCI) are capable of providing flow into the RPV below this pressure. ECCS requirements for MODES 4 and 5 are specified in LCO 3.5.2, "ECCS – Shutdown."

(continued)

BASES (continued)

SURVEILLANCE
REQUIREMENTS

SR 3.5.1.1

The flow path piping has the potential to develop voids and pockets of entrained air. Maintaining the pump discharge lines of the HPCS System, LPCS System, and LPCI subsystems full of water ensures that the systems will perform properly, injecting their full capacity into the RCS upon demand. This will also prevent a water hammer following an ECCS initiation signal. One acceptable method of ensuring the lines are full is to vent at the high points. The 31 day Frequency is based on operating experience, on the procedural controls governing system operation, and on the gradual nature of void buildup in the ECCS piping.

Insert 3

SR 3.5.1.2

Verifying the correct alignment for manual, power operated, and automatic valves in the ECCS flow paths provides assurance that the proper flow paths will exist for ECCS operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position since these valves were verified to be in the correct position prior to locking, sealing, or securing. A valve that receives an initiation signal is allowed to be in a nonaccident position provided the valve will automatically reposition in the proper stroke time. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves potentially capable of being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves.

The 31 day Frequency of this SR was derived from the Inservice Testing Program requirements for performing valve testing at least once every 92 days. The Frequency of 31 days is further justified because the valves are operated under procedural control and because improper valve alignment would only affect a single subsystem. This Frequency has been shown to be acceptable through operating experience.

(continued)

Insert 3

The ECCS injection/spray subsystem flow path piping and components have the potential to develop voids and pockets of entrained airgases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the ECCS injection/spray subsystems and may also prevent a water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of ECCS injection/spray subsystem locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The ECCS injection/spray subsystem is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the ECCS injection/spray subsystems are not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

ECCS injection/spray subsystem locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative subset of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the ECCS injection/spray subsystem piping and the procedural controls governing system operation.

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.5.1.2 (continued)

In MODE 3 with reactor steam dome pressure less than the actual RHR cut-in permissive pressure, the RHR System may be required to operate in the shutdown cooling mode to remove decay heat and sensible heat from the reactor. Therefore, this SR is modified by a Note that allows LPCI subsystems to be considered OPERABLE during alignment and operation for decay heat removal, if capable of being manually realigned (remote or local) to the LPCI mode and not otherwise inoperable. Alignment and operation for decay heat removal includes when the required RHR pump is not operating or when the system is realigned from or to the RHR shutdown cooling mode. At the low pressures and decay heat loads associated with operation in MODE 3 with reactor steam dome pressure less than the RHR cut-in permissive pressure, a reduced complement of low pressure ECCS subsystems should provide the required core cooling, thereby allowing operation of RHR shutdown cooling, when necessary.

SR 3.5.1.3

Insert 4

Verification every 31 days that ADS nitrogen receiver discharge header pressure is \geq 160 psig and ADS nitrogen receiver tank pressure is \geq 334 psig assures adequate nitrogen pressure for reliable ADS operation. The accumulator on each ADS valve provides nitrogen pressure for valve actuation. The designed nitrogen supply pressure requirements for the accumulator are such that, following a failure of the nitrogen supply to the accumulator, at least one valve actuation can occur with the drywell at 100% of design pressure (Ref. 15). The ECCS safety analysis assumes only one actuation to achieve the depressurization required for operation of the low pressure ECCS. This minimum required nitrogen receiver discharge header pressure of 160 psig is provided by two ADS nitrogen receiver tanks. The minimum ADS nitrogen receiver tank pressure of 334 psig ensures a 5 day supply of nitrogen is available to recharge the ADS accumulators. The 31 day Frequency takes into consideration administrative control over operation of the nitrogen receiver tanks and alarms for low nitrogen pressure.

(continued)

Insert 4

The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS) AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

B 3.5.2 ECCS – Shutdown

BASES

BACKGROUND A description of the High Pressure Core Spray (HPCS) System, Low Pressure Core Spray (LPCS) System, and low pressure coolant injection (LPCI) mode of the Residual Heat Removal (RHR) System is provided in the Bases for LCO 3.5.1, "ECCS – Operating."

APPLICABLE SAFETY ANALYSES The ECCS performance is evaluated for the entire spectrum of break sizes for a postulated loss of coolant accident (LOCA). The long term cooling analysis following a design basis LOCA (Ref. 1) demonstrates that only one ECCS injection/spray subsystem is required, post LOCA, to maintain adequate reactor vessel water level in the event of an inadvertent vessel draindown. It is reasonable to assume, based on engineering judgment, that while in MODES 4 and 5, one ECCS injection/spray subsystem can maintain adequate reactor vessel water level. To provide redundancy, a minimum of two ECCS injection/spray subsystems are required to be OPERABLE in MODES 4 and 5.

The ECCS satisfy Criterion 3 of Reference 2.

LCO Two ECCS injection/spray subsystems are required to be OPERABLE. The ECCS injection/spray subsystems are defined as the three LPCI subsystems, the LPCS System, and the HPCS System. The LPCS System and each LPCI subsystem consist of one motor driven pump, piping, and valves to transfer water from the suppression pool to the RPV. The HPCS System consists of one motor driven pump, piping, and valves to transfer water from the suppression pool or condensate storage tank B (CST) to the RPV. The necessary portions of the Service Water System and Ultimate Heat Sink capable of providing cooling to the RHR pump seal cooler are also required for a LPCI subsystem.

Management of gas voids is important to ECCS injection/spray subsystem OPERABILITY.

One LPCI subsystem (A or B) may be considered OPERABLE during alignment and operation for decay heat removal, if capable of being manually realigned (remote or local) to the LPCI mode and not otherwise inoperable. Alignment and

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.5.2.4 (continued)

Because of the low pressure and low temperature conditions in MODES 4 and 5, sufficient time will be available to manually align and initiate LPCI subsystem operation to provide core cooling prior to postulated fuel uncover. This will ensure adequate core cooling if an inadvertent vessel draindown should occur.

REFERENCES

1. USAR, Section 6.3.3.3.
 2. 10 CFR 50.36(c)(2)(ii).
-

Insert 4

BASES

BACKGROUND (continued)

The RCIC pump is provided with a minimum flow bypass line, which discharges to the suppression pool. The valve in this line automatically opens to prevent pump damage due to overheating when other discharge line valves are closed. To ensure rapid delivery of water to the RPV and to minimize water hammer effects, the RCIC System discharge line "keep fill" system is designed to maintain the pump discharge line filled with water.

APPLICABLE SAFETY ANALYSES

The function of the RCIC System is to respond to transient events by providing makeup coolant to the reactor. The RCIC System is not an Engineered Safety Feature System and no credit is taken in the safety analyses for RCIC System operation. Based on its contribution to the reduction of overall plant risk, the system satisfies Criterion 4 of Reference 3.

LCO

The OPERABILITY of the RCIC System provides adequate core cooling such that actuation of any of the ECCS subsystems is not required in the event of RPV isolation accompanied by a loss of feedwater flow. The RCIC System has sufficient capacity to maintain RPV inventory during an isolation event.

APPLICABILITY

Management of gas voids is important to RCIC System OPERABILITY.

The RCIC System is required to be OPERABLE in MODE 1, and MODES 2 and 3 with reactor steam dome pressure > 150 psig since RCIC is the primary non-ECCS water source for core cooling when the reactor is isolated and pressurized. In MODES 2 and 3 with reactor steam dome pressure ≤ 150 psig, and in MODES 4 and 5, RCIC is not required to be OPERABLE since the ECCS injection/spray subsystems can provide sufficient flow to the vessel.

ACTIONS

A Note prohibits the application of LCO 3.0.4.b to an inoperable RCIC System. There is an increased risk associated with entering a MODE or other specified condition in the Applicability with an inoperable RCIC System and the provisions of LCO 3.0.4.b, which allow entry into a MODE or other specified condition in the Applicability with the LCO not met after performance of a risk assessment addressing inoperable systems and components, should not be applied in this circumstance.

A.1 and A.2

If the RCIC System is inoperable during MODE 1, or MODES 2 or 3 with reactor steam dome pressure > 150 psig, and the

(continued)

BASES (continued)

SURVEILLANCE
REQUIREMENTS

SR 3.5.3.1

Insert 5

The flow path piping has the potential to develop voids and pockets of entrained air. Maintaining the pump discharge line of the RCIC System full of water ensures that the system will perform properly, injecting its full capacity into the Reactor Coolant System upon demand. This will also prevent a water hammer following an initiation signal. One acceptable method of ensuring the line is full is to vent at the high point. The 31 day Frequency is based on the gradual nature of void buildup in the RCIC piping, the procedural controls governing system operation, and operating experience.

SR 3.5.3.2

Verifying the correct alignment for manual, power operated, and automatic valves (including the RCIC pump flow controller) in the RCIC flow path provides assurance that the proper flow path will exist for RCIC operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position since these were verified to be in the correct position prior to locking, sealing, or securing. A valve that receives an initiation signal is allowed to be in a nonaccident position provided the valve will automatically reposition in the proper stroke time. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of potentially being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves. For the RCIC System, this SR also includes the steam flow path for the turbine and the flow controller position.

The 31 day Frequency of this SR was derived from the Inservice Testing Program requirements for performing valve testing at least every 92 days. The Frequency of 31 days is further justified because the valves are operated under procedural control and because improper valve position would affect only the RCIC System. This Frequency has been shown to be acceptable through operating experience.

(continued)

Insert 4

Insert 5

The RCIC System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RCIC System and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RCIC System locations susceptible to gas accumulation is based on a self-assessment of the piping configuration to identify where gases may accumulate and remain even after the system is filled and vented, and to identify vulnerable potential degassing flow paths. The review is supplemented by verification that installed high-point vents are actually at the system high points, including field verification to ensure pipe shapes and construction tolerances have not inadvertently created additional high points. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RCIC System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RCIC System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RCIC System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative subset of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RCIC System piping and the procedural controls governing system operation.

BASES

APPLICABLE SAFETY ANALYSES (continued)	suppression pool temperature is calculated to remain below the design limit. The RHR Suppression Pool Cooling System satisfies Criterion 3 of Reference 2.
LCO	During a DBA, a minimum of one RHR suppression pool cooling subsystem is required to maintain the primary containment peak pressure and temperature below the design limits (Ref. 1). To ensure that these requirements are met, two RHR suppression pool cooling subsystems must be OPERABLE. Therefore, in the event of an accident, at least one subsystem is OPERABLE, assuming the worst case single active failure. An RHR suppression pool cooling subsystem is OPERABLE when the pump, a heat exchanger, and associated piping, valves, instrumentation, and controls are OPERABLE.
APPLICABILITY	In MODES 1, 2, and 3, a DBA could cause both a release of radioactive material to primary containment and a heatup and pressurization of primary containment. In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations in these MODES. Therefore, the RHR Suppression Pool Cooling System is not required to be OPERABLE in MODE 4 or 5.
ACTIONS	<u>A.1</u> With one RHR suppression pool cooling subsystem inoperable, the inoperable subsystem must be restored to OPERABLE status within 7 days. In this condition, the remaining RHR suppression pool cooling subsystem is adequate to perform the primary containment cooling function. However, the overall reliability is reduced because a single failure in the OPERABLE subsystem could result in reduced primary containment cooling capability. The 7 day Completion Time is acceptable in light of the redundant RHR suppression pool cooling capabilities afforded by the OPERABLE subsystem and the low probability of a DBA occurring during this period.

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.6.2.3.1 (continued)

The Frequency of 31 days is justified because the valves are operated under procedural control, improper valve position would affect only a single subsystem, the probability of an event requiring initiation of the system is low, and the system is a manually initiated system. This Frequency has been shown to be acceptable, based on operating experience.

SR 3.6.2.3.2

Verifying each required RHR pump develops a flow rate ≥ 7450 gpm, while operating in the suppression pool cooling mode with flow through the associated heat exchanger, ensures that the primary containment peak pressure and temperature can be maintained below the design limits during a DBA (Ref. 1). The flow is also a normal test of centrifugal pump performance required by the ASME OM Code (Ref. 3). This test confirms one point on the pump design curve, and the results are indicative of overall performance. Such inservice tests confirm component OPERABILITY and detect incipient failures by indicating abnormal performance. The Frequency of this SR is in accordance with the Inservice Testing Program.

REFERENCES

1. USAR, Section 6.2.
 2. 10 CFR 50.36(c)(2)(ii).
 3. ASME Code for Operation and Maintenance of Nuclear Power Plants.
-

Insert 6

Insert 6

SR 3.6.2.3.3

RHR Suppression Pool Cooling System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RHR Suppression Pool Cooling Subsystems and may also prevent water hammer and pump cavitation.

Selection of RHR Suppression Pool Cooling System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR Suppression Pool Cooling System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR Suppression Pool Cooling System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR Suppression Pool Cooling System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative subset of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR Suppression Pool Cooling Subsystem piping and the procedural controls governing system operation.

BASES (continued)

APPLICABLE SAFETY ANALYSES

Reference 1 contains the results of analyses used to predict primary containment pressure and temperature following large and small break loss of coolant accidents. The intent of the analyses is to demonstrate that the pressure reduction capacity of the RHR Suppression Pool Spray System (in conjunction with the RHR Drywell Spray System) is adequate to maintain the primary containment conditions within design limits. The time history for primary containment pressure is calculated to demonstrate that the maximum pressure remains below the design limit.

The RHR suppression pool spray satisfies Criterion 3 of Reference 2.

LCO

In the event of a DBA, a minimum of one RHR suppression pool spray subsystem is required to mitigate potential bypass leakage paths and maintain the primary containment peak pressure below the design limits (Ref. 1). To ensure that these requirements are met, two RHR suppression pool spray subsystems must be OPERABLE. Therefore, in the event of an accident, at least one subsystem is OPERABLE assuming the worst case single active failure. An RHR suppression pool spray subsystem is OPERABLE when one pump and associated piping, valves, instrumentation, and controls are OPERABLE.

APPLICABILITY

Management of gas voids is important to RHR Suppression Pool Spray System OPERABILITY.

In MODES 1, 2, and 3, a DBA could cause pressurization of primary containment. In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining RHR suppression pool spray subsystems OPERABLE is not required in MODE 4 or 5.

ACTIONS

A.1

With one RHR suppression pool spray subsystem inoperable, the inoperable subsystem must be restored to OPERABLE status within 7 days. In this condition, the remaining OPERABLE RHR suppression pool spray subsystem is adequate to perform the primary containment bypass leakage mitigation function.

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.6.2.4.1 (continued)

acceptable since the RHR suppression pool cooling mode is manually initiated. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves.

The Frequency of 31 days is justified because the valves are operated under procedural control, improper valve position would affect only a single subsystem, the probability of an event requiring initiation of the system is low, and the subsystem is a manually initiated system. This Frequency has been shown to be acceptable based on operating experience.

SR 3.6.2.4.2

Verifying each required RHR pump develops a flow rate ≥ 450 gpm while operating in the suppression pool spray mode helps ensure that the primary containment pressure can be maintained below the design limits during a DBA (Ref. 1). The normal test of centrifugal pump performance required by the ASME OM Code (Ref. 3) is covered by the requirements of LCO 3.6.2.3, "RHR Suppression Pool Cooling." The Frequency of this SR is in accordance with the Inservice Testing Program.

REFERENCES

1. USAR, Section 6.2.2.2.
 2. 10 CFR 50.36(c)(2)(ii).
 3. ASME Code for Operation and Maintenance of Nuclear Power Plants.
-

Insert 7

Insert 7

SR 3.6.2.4.3

RHR Suppression Pool Spray System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RHR Suppression Pool Spray Subsystems and may also prevent water hammer and pump cavitation.

Selection of RHR Suppression Pool Spray System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR Suppression Pool Spray System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR Suppression Pool Spray System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR Suppression Pool Spray System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative subset of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR Suppression Pool Spray System piping and the procedural controls governing system operation.

B 3.9 REFUELING OPERATIONS

B 3.9.8 Residual Heat Removal (RHR) – High Water Level

BASES

BACKGROUND

The purpose of the RHR System in MODE 5 is to remove decay heat and sensible heat from the reactor coolant, as required by GDC 34 (Ref. 1). Each of the two shutdown cooling loops of the RHR System can provide the required decay heat removal. Each loop consists of one motor driven pump, a heat exchanger, and associated piping and valves. Both loops have a common suction from the same recirculation loop. Each pump discharges the reactor coolant, after it has been cooled by circulation through the respective heat exchanger, to the reactor via the associated recirculation loop. The RHR heat exchangers transfer heat to the Service Water (SW) System. The RHR shutdown cooling mode is manually controlled.

In addition to the RHR subsystems, the volume of water above the reactor pressure vessel (RPV) flange provides a heat sink for decay heat removal.

APPLICABLE SAFETY ANALYSES

With the unit in MODE 5, the RHR Shutdown Cooling System is not required to mitigate any events or accidents evaluated in the safety analyses. The RHR Shutdown Cooling System is required for removing decay heat to maintain the temperature of the reactor coolant.

The RHR System satisfies Criterion 4 of Reference 2.

LCO

Only one RHR shutdown cooling subsystem is required to be OPERABLE and in operation in MODE 5 with irradiated fuel in the RPV and the water level \geq 22 ft 3 inches above the RPV flange. Only one subsystem is required to be OPERABLE because the volume of water above the RPV flange provides backup decay heat removal capability.

Management of gas voids is important to RHR Shutdown Cooling System OPERABILITY.

An OPERABLE RHR shutdown cooling subsystem consists of an RHR pump, a heat exchanger, the necessary portions of the SW System and Ultimate Heat Sink capable of providing cooling to the heat exchanger and the RHR pump seal cooler, valves, piping, instruments, and controls to ensure an OPERABLE flow path.

(continued)

BASES

ACTIONS	<u>B.1, B.2, B.3, and B.4</u> (continued)
	must be restored to OPERABLE status. In this case, a surveillance may need to be performed to restore the component to OPERABLE status. Actions must continue until all required components are OPERABLE.

C.1 and C.2

If no RHR shutdown cooling subsystem is in operation, an alternate method of coolant circulation is required to be established within 1 hour. The Completion Time is modified such that 1 hour is applicable separately for each occurrence involving a loss of coolant circulation.

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

SURVEILLANCE REQUIREMENTS	<u>SR 3.9.8.1</u>
	This Surveillance demonstrates that the required RHR shutdown cooling subsystem 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 shutdown cooling subsystem in the control room.
REFERENCES	<hr/> <ul style="list-style-type: none">1. 10 CFR 50, Appendix A, GDC 34.2. 10 CFR 50.36(c)(2)(ii). <hr/> <p>Insert 8</p>

Insert 8

SR 3.9.8.2

RHR Shutdown Cooling System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required RHR shutdown cooling subsystem(s) and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RHR Shutdown Cooling System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR Shutdown Cooling System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR Shutdown Cooling System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR Shutdown Cooling System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative subset of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR Shutdown Cooling System piping and the procedural controls governing system operation.

B 3.9 REFUELING OPERATIONS

B 3.9.9 Residual Heat Removal (RHR) – Low Water Level

BASES

BACKGROUND

The purpose of the RHR System in MODE 5 is to remove decay heat and sensible heat from the reactor coolant, as required by GDC 34 (Ref. 1). Each of the two shutdown cooling loops of the RHR System can provide the required decay heat removal. Each loop consists of one motor driven pump, a heat exchanger, and associated piping and valves. Both loops have a common suction from the same recirculation loop. Each pump discharges the reactor coolant, after it has been cooled by circulation through the respective heat exchanger, to the reactor via the associated recirculation loop. The RHR heat exchangers transfer heat to the Service Water (SW) System. The RHR shutdown cooling mode is manually controlled.

APPLICABLE SAFETY ANALYSES

With the unit in MODE 5, the RHR Shutdown Cooling System is not required to mitigate any events or accidents evaluated in the safety analyses. The RHR Shutdown Cooling System is required for removing decay heat to maintain the temperature of the reactor coolant.

The RHR System satisfies Criterion 4 of Reference 2.

LCO

In MODE 5 with irradiated fuel in the reactor pressure vessel (RPV) and with the water level < 22 ft 3 inches above the RPV flange both RHR shutdown cooling subsystems must be OPERABLE and one RHR shutdown cooling subsystem must be in operation.

Management of gas voids is important to RHR Shutdown Cooling System OPERABILITY.

An OPERABLE RHR shutdown cooling subsystem consists of an RHR pump, a heat exchanger, the necessary portions of the SW System and Ultimate Heat Sink capable of providing cooling to the heat exchanger and the RHR pump seal cooler, valves, piping, instruments, and controls to ensure an OPERABLE flow path.

Additionally, each RHR 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. Operation (either continuous or intermittent) of one subsystem can maintain and reduce the reactor coolant

(continued)

BASES

ACTIONS B.1, B.2, and B.3 (continued)

need for secondary containment isolation is indicated). This may be performed as an administrative check, by examining logs or other information to determine whether the components are out of service for maintenance or other reasons. It is not necessary to perform the Surveillances needed to demonstrate the OPERABILITY of the components. If, however, any required component is inoperable, then it must be restored to OPERABLE status. In this case, a surveillance may need to be performed to restore the component to OPERABLE status. Actions must continue until all required components are OPERABLE.

C.1 and C.2

If no RHR shutdown cooling subsystem is in operation, an alternate method of coolant circulation is required to be established within 1 hour. The Completion Time is modified such that the 1 hour is applicable separately for each occurrence involving a loss of coolant circulation.

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

SURVEILLANCE
REQUIREMENTS

SR 3.9.9.1

This Surveillance demonstrates that one RHR shutdown cooling subsystem 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 shutdown cooling subsystem in the control room.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 34.
 2. 10 CFR 50.36(c)(2)(ii).
-

Insert 9

SR 3.9.9.2

RHR Shutdown Cooling System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RHR shutdown cooling subsystems and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RHR Shutdown Cooling System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR Shutdown Cooling System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR Shutdown Cooling System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR Shutdown Cooling System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative subset of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR Shutdown Cooling System piping and the procedural controls governing system operation.

ATTACHMENT 3c
Proposed Technical Specification Bases Changes (Mark-Up)
(For Information Only)

**R. E. Ginna Nuclear Power Plant, Unit 1
Renewed Facility Operating License No. DPR-18**

REVISED TECHNICAL SPECIFICATION BASES PAGES

<i>Page B 3.4.6-1</i>	<i>Page B 3.5.2-16</i>
<i>Page B 3.4.6-2</i>	<i>Page B 3.5.2-17</i>
<i>Page B 3.4.6-3</i>	<i>Page B 3.5.2-18</i>
<i>Page B 3.4.6-4</i>	<i>Page B 3.5.3-1</i>
<i>Page B 3.4.6-5</i>	<i>Page B 3.5.3-2</i>
<i>Page B 3.4.7-1</i>	<i>Page B 3.5.3-3</i>
<i>Page B 3.4.7-2</i>	<i>Page B 3.5.3-4</i>
<i>Page B 3.4.7-3</i>	<i>Page B 3.6.6-1</i>
<i>Page B 3.4.7-4</i>	<i>Page B 3.6.6-2</i>
<i>Page B 3.4.7-5</i>	<i>Page B 3.6.6-3</i>
<i>Page B 3.4.8-1</i>	<i>Page B 3.6.6-4</i>
<i>Page B 3.4.8-2</i>	<i>Page B 3.6.6-5</i>
<i>Page B 3.4.8-3</i>	<i>Page B 3.6.6-6</i>
<i>Page B 3.4.8-4</i>	<i>Page B 3.6.6-7</i>
<i>Page B 3.5.2-1</i>	<i>Page B 3.6.6-8</i>
<i>Page B 3.5.2-2</i>	<i>Page B 3.6.6-9</i>
<i>Page B 3.5.2-3</i>	<i>Page B 3.6.6-10</i>
<i>Page B 3.5.2-4</i>	<i>Page B 3.6.6-11</i>
<i>Page B 3.5.2-5</i>	<i>Page B 3.6.6-12</i>
<i>Page B 3.5.2-6</i>	<i>Page B 3.6.6-13</i>
<i>Page B 3.5.2-7</i>	<i>Page B 3.6.6-14</i>
<i>Page B 3.5.2-8</i>	<i>Page B 3.9.4-1</i>
<i>Page B 3.5.2-9</i>	<i>Page B 3.9.4-2</i>
<i>Page B 3.5.2-10</i>	<i>Page B 3.9.4-3</i>
<i>Page B 3.5.2-11</i>	<i>Page B 3.9.4-4</i>
<i>Page B 3.5.2-12</i>	<i>Page B 3.9.5-1</i>
<i>Page B 3.5.2-13</i>	<i>Page B 3.9.5-2</i>
<i>Page B 3.5.2-14</i>	<i>Page B 3.9.5-3</i>
<i>Page B 3.5.2-15</i>	<i>Page B 3.9.5-4</i>

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.6 RCS Loops - MODE 4

BASES

BACKGROUND In MODE 4, the primary function of the reactor coolant is the removal of decay heat and the transfer of this heat to either the steam generator (SG) secondary side coolant or the component cooling water via the residual heat removal (RHR) heat exchangers. The secondary function of the reactor coolant is to act as a carrier for soluble neutron poison, boric acid.

The reactor coolant is circulated through two RCS loops connected in parallel to the reactor vessel, each containing a SG, a reactor coolant pump (RCP), and appropriate flow, pressure, level, and temperature instrumentation for control, protection, and indication. The reactor vessel contains the cladded fuel. The SGs or the RHR heat exchangers provide the heat sink. The RCPs and the RHR pumps circulate the coolant through the reactor vessel and SGs at a sufficient rate to ensure proper heat transfer and to prevent boric acid stratification.

In MODE 4, either RCS or RHR loops can be used to provide forced circulation. The intent of this LCO is to provide forced flow from at least one RCS or one RHR loop for decay heat removal and transport. The flow provided by one RCS loop or one RHR loop is adequate for decay heat removal. The other intent of this LCO is to require that two paths be available to provide redundancy for decay heat removal.

APPLICABLE SAFETY ANALYSES In MODE 4, RCS circulation is considered in the determination of the time available for mitigation of an accidental boron dilution event. The RCS and RHR loops provide this circulation.

RCS Loops - MODE 4 have been identified in the NRC Policy Statement as important contributors to risk reduction.

LCO The purpose of this LCO is to require that at least two loops be OPERABLE in MODE 4 and that one of these loops be in operation. The LCO allows the two loops that are required to be OPERABLE to consist of any combination of RCS loops and RHR loops. Any one loop in operation provides enough flow to remove the decay heat from the core with forced circulation. An additional loop is required to be OPERABLE to provide redundancy for heat removal.

Note 1 permits all RCPs and RHR pumps to be de-energized for \leq 1 hour per 8 hour period. The purpose of the Note is to permit tests that are designed to validate various accident analyses values. One of the tests performed during the startup testing program was the validation of rod drop times during cold conditions, both with and without flow (Ref. 1). If changes are made to the RCS that would cause a change to the flow characteristics of the RCS, the input values must be revalidated by conducting the test again. The no flow test may be performed in MODE 3, 4, or 5 and requires that the pumps be stopped for a short period of time. The Note permits the de-energizing of the pumps in order to perform this test and validate the assumed analysis values. The 1 hour time period is adequate to perform the test, and operating experience has shown that boron stratification is not a problem during this short period with no forced flow.

Utilization of Note 1 is permitted provided the following conditions are met along with any other conditions imposed by test procedures:

- a. No operations are permitted that would dilute the RCS boron concentration with coolant at boron concentrations less than required to assure the SDM of LCO 3.1.1, thereby maintaining the margin to criticality. Boron reduction with coolant at boron concentrations less than required to assure SDM is maintained is prohibited because a uniform concentration distribution throughout the RCS cannot be ensured when in natural circulation; and
- b. Core outlet temperature is maintained at least 10°F below saturation temperature, so that no vapor bubble may form and possibly cause a natural circulation flow obstruction.

Note 2 requires that the pressurizer water volume be $<$ 324 cubic feet (38% level), or that the secondary side water temperature of each SG be \leq 50°F above each of the RCS cold leg temperatures before the start of an RCP with any RCS cold leg temperature less than or equal to the LTOP enable temperature specified in the PTLR. The water volume limit ensures that the pressurizer will accommodate the swell resulting from an RCP start. Restraints on the pressurizer water volume and SG secondary side water temperature prevent a low temperature overpressure event due to a thermal transient when an RCP is started and the colder RCS water enters the warmer SG and expands. Violation of this Note places the plant in an unanalyzed condition.

An OPERABLE RCS loop comprises an OPERABLE RCP and an OPERABLE SG, which has the minimum water level specified in SR 3.4.6.2. RCPs are OPERABLE if they are capable of being powered and are able to provide forced flow if required.

Similarly for the RHR System, an OPERABLE RHR loop comprises an OPERABLE RHR pump capable of providing forced flow to an OPERABLE RHR heat exchanger. An OPERABLE RHR loop may be isolated from the RCS provided that the loop can be placed into service from the control room. RHR pumps are OPERABLE if they are capable of being powered and are able to provide forced flow if required.

APPLICABILITY

Management of gas voids is important to RHR System OPERABILITY.

In MODE 4, this LCO ensures forced circulation of the reactor coolant to remove decay heat from the core and to provide proper boron mixing. One loop of either RCS or RHR provides sufficient circulation for these purposes. However, two loops consisting of any combination of RCS and RHR loops are required to be OPERABLE to meet single failure considerations.

Operation in other MODES is covered by:

- LCO 3.4.4, "RCS Loops - MODE 1 > 8.5% RTP";
- LCO 3.4.5, "RCS Loops - MODES 1 ≤ 8.5% RTP, 2, AND 3";
- LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled";
- LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled";
- LCO 3.9.4, "Residual Heat Removal (RHR) and Coolant Circulation-Water Level ≥ 23 Ft" (MODE 6); and
- LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation-Water Level < 23 Ft" (MODE 6).

ACTIONS

A.1

If one RCS loop is inoperable and two RHR loops are inoperable, redundancy for heat removal is lost. Action must be initiated to restore a second RCS or RHR loop to OPERABLE status. If no RHR is available, the plant cannot enter a reduced MODE since no long term means of decay heat removal would be available. The immediate Completion Time reflects the importance of maintaining the availability of two paths for heat removal.

B.1

If one RHR loop is inoperable and both RCS loops are inoperable, an inoperable RCS or RHR loop must be restored to OPERABLE status to provide a redundant means for decay heat removal.

If a second loop cannot be restored, the plant must be brought to MODE 5 within 24 hours. Bringing the plant to MODE 5 is a conservative action with regard to decay heat removal. With only one RHR loop OPERABLE, redundancy for decay heat removal is lost and, in the event of a loss of the remaining RHR loop, it would be safer to initiate that loss from MODE 5 ($\leq 200^{\circ}\text{F}$) rather than MODE 4 (200 to 350°F). The Completion Time of 24 hours is a reasonable time, based on operating experience, to reach MODE 5 from MODE 4 in an orderly manner and without challenging plant systems.

Required Action B.1 is modified by a Note stating that only the Required Actions of Condition C are entered if all RCS and RHR loops are inoperable. With all RCS and RHR loops inoperable, MODE 5 cannot be entered and Required Actions C.1 and C.2 are the appropriate remedial actions.

C.1 and C.2

If no loop is OPERABLE or in operation, except during conditions permitted by Note 1 in the LCO section, all operations involving introduction of coolant into the RCS with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 must be suspended and action to restore one RCS or RHR loop to OPERABLE status and operation must be initiated. The required margin to criticality must not be reduced in this type of operation. Suspending the introduction of coolant into the RCS with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 is required to assure continued safe operation. With coolant added without forced circulation, unmixed coolant could be introduced to the core, however coolant added with boron concentration meeting the minimum SDM maintains acceptable margin to subcritical operations. The immediate Completion Times reflect the importance of maintaining operation for decay heat removal. The action to restore must be continued until one loop is restored to OPERABLE status and operation.

SURVEILLANCE
REQUIREMENTS

SR 3.4.6.1

This SR requires verification every 12 hours that one RCS or RHR loop is in operation. Verification includes flow rate, temperature, or pump status monitoring, which help ensure that forced flow is providing heat removal. Use of control board indication for these parameters is an acceptable verification. The Frequency of 12 hours is sufficient considering other indications and alarms available to the operator in the control room to monitor RCS and RHR loop performance.

SR 3.4.6.2

This SR requires verification of SG OPERABILITY. SG OPERABILITY is verified by ensuring that the secondary side narrow range water level is $\geq 16\%$. If the SG secondary side narrow range water level is $< 16\%$, the tubes may become uncovered and the associated loop may not be capable of providing the heat sink necessary for removal of decay heat. The 12 hour Frequency is considered adequate in view of other indications available in the control room to alert the operator to the loss of SG level.

SR 3.4.6.3

Verification that the required pump is OPERABLE ensures that an additional RCS or RHR pump can be placed in operation, if needed, to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available to the required pump that is not in operation. The Frequency of 7 days is considered reasonable in view of other administrative controls available and has been shown to be acceptable by operating experience.

REFERENCES

1. UFSAR, Section 14.6.1.2.6.

Insert 1

Insert 1

SR 3.4.6.4

RHR System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required RHR loop(s) and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RHR System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

This SR is modified by a Note that states the SR is not required to be performed until 12 hours after entering MODE 4. In a rapid shutdown, there may be insufficient time to verify all susceptible locations prior to entering MODE 4.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR System piping and the procedural controls governing system operation.

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.7 RCS Loops - MODE 5, Loops Filled

BASES

BACKGROUND

In MODE 5 with the RCS loops filled, the primary function of the reactor coolant is the removal of decay heat and the transfer of this heat either to the steam generator (SG) secondary side coolant or the component cooling water via the residual heat removal (RHR) heat exchangers. While the principal means for decay heat removal is via the RHR System, the SGs are specified as a backup means for redundancy. Even though the SGs cannot produce steam in this MODE, they are capable of being a heat sink due to their large contained volume of secondary water. As long as the SG secondary side water is at a lower temperature than the reactor coolant, heat transfer will occur. The rate of heat transfer is directly proportional to the temperature difference. The secondary function of the reactor coolant is to act as a carrier for soluble neutron poison, boric acid.

In MODE 5 with RCS loops filled, the reactor coolant is normally circulated by means of two RHR loops connected to the RCS, each loop containing an RHR heat exchanger, an RHR pump, and appropriate flow and temperature instrumentation for control, protection, and indication. One RHR pump circulates the water through the RCS at a sufficient rate to prevent boric acid stratification.

The number of loops in operation can vary to suit the operational needs. The intent of this LCO is to provide forced flow from at least one RHR loop for decay heat removal and transport. The flow provided by one RHR loop is adequate for decay heat removal. The other intent of this LCO is to require that a second path be available to provide redundancy for heat removal.

The LCO provides for redundant paths of decay heat removal capability. The first path can be an RHR loop that must be OPERABLE and in operation. The second path can be another OPERABLE RHR loop or maintaining one SG with a secondary side water level at or above 16% to provide an alternate method for decay heat removal.

APPLICABLE
SAFETY
ANALYSES

In MODE 5, RCS circulation is considered in the determination of the time available for mitigation of an accidental boron dilution event. The RHR loops provide this circulation.

RCS Loops - MODE 5 (Loops Filled) have been identified in the NRC Policy Statement as important contributors to risk reduction.

LCO

The purpose of this LCO is to require that at least one of the RHR loops be OPERABLE and in operation with an additional RHR loop OPERABLE or one SG with a secondary side water level $\geq 16\%$. One RHR loop provides sufficient forced circulation to perform the safety functions of the reactor coolant under these conditions. An additional RHR loop is required to be OPERABLE to meet single failure considerations. However, if the standby RHR loop is not OPERABLE, an acceptable alternate method is one SG with a secondary side water level $\geq 16\%$. Should the operating RHR loop fail, the SG could be used to remove the decay heat.

Note 1 permits all RHR pumps to be de-energized ≤ 1 hour per 8 hour period. The purpose of the Note is to permit tests designed to validate various accident analyses values. One of the tests performed during the startup testing program was the validation of rod drop times during cold conditions, both with and without flow (Ref. 1). If changes are made to the RCS that would cause a change to the flow characteristics of the RCS, the input values must be revalidated by conducting the test again. The no flow test may be performed in MODE 3, 4, or 5 and requires that the pumps be stopped for a short period of time. The Note permits de-energizing of the pumps in order to perform this test and validate the assumed analysis values. The 1 hour time period is adequate to perform the test, and operating experience has shown that boron stratification is not likely during this short period with no forced flow.

Utilization of Note 1 is permitted provided the following conditions are met, along with any other conditions imposed by test procedures:

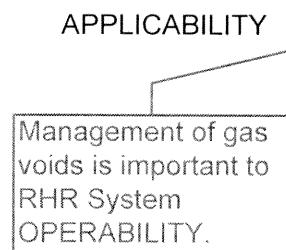
- a. No operations are permitted that would dilute the RCS boron concentration with coolant at boron concentrations less than required to assure the SDM of LCO 3.1.1, thereby maintaining the margin to criticality. Boron reduction with coolant at boron concentrations less than required to assure SDM is maintained is prohibited because a uniform concentration distribution throughout the RCS cannot be ensured when in natural circulation; and
- b. Core outlet temperature is maintained at least 10°F below saturation temperature, so that no vapor bubble may form and possibly cause a natural circulation flow obstruction.

Note 2 allows one RHR loop to be inoperable for a period ≤ 2 hours, provided that the other RHR loop is OPERABLE and in operation. This permits periodic surveillance tests to be performed on the inoperable loop during the only time when such testing is safe and possible. The 2 hour allowance may be used separately for each individual loop.

Note 3 requires that the pressurizer water volume be < 324 cubic feet (38% level), or that the secondary side water temperature of each SG be $\leq 50^{\circ}\text{F}$ above each of the RCS cold leg temperatures before the start of a reactor coolant pump (RCP) with an RCS cold leg temperature less than or equal to the LTOP enable temperature specified in the PTLR. The water volume limit ensures that the pressurizer will accommodate the swell resulting from an RCP start. Restraints on the pressurizer water volume and SG secondary side water temperature are to prevent a low temperature overpressure event due to a thermal transient when an RCP is started and the colder RCS water enters the warmer SG and expands. Violation of this Note places the plant in an unanalyzed Condition.

Note 4 provides for an orderly transition from MODE 5 to MODE 4 during a planned heatup by permitting removal of RHR loops from operation when at least one RCS loop is in operation. This Note provides for the transition to MODE 4 where an RCS loop is permitted to be in operation and replaces the RCS circulation function provided by the RHR loops. A planned heatup is a scheduled transition to MODE 4 within a defined time period.

RHR pumps are OPERABLE if they are capable of being powered and are able to provide flow if required. Also included are all necessary support systems not addressed by applicable LCOs (e.g., component cooling water and service water). A SG can perform as a heat sink when it is OPERABLE, with the minimum water level specified in SR 3.4.7.2.



In MODE 5 with RCS loops filled, this LCO requires forced circulation of the reactor coolant to remove decay heat from the core and to provide proper boron mixing. The RCS loops are considered filled until the isolation valves are opened to facilitate draining of the RCS. The loops are also considered filled following the completion of filling and venting the RCS. However, in both cases, loops filled is based on the ability to use a SG as a backup. To be able to take credit for the use of one SG the ability to pressurize to 50 psig and control pressure in the RCS must be available. This is to prevent flashing and void formation at the top of the SG tubes which may degrade or interrupt the natural circulation flow path (Ref. 2). One loop of RHR provides sufficient circulation for these purposes. However, one additional RHR loop is required to be OPERABLE, or the secondary side water level of at least one SG is required to be $\geq 16\%$.

Operation in other MODES is covered by:

- LCO 3.4.4, "RCS Loops - MODE 1 > 8.5% RTP";
- LCO 3.4.5, "RCS Loops - MODES 1 ≤ 8.5% RTP, 2, AND 3";
- LCO 3.4.6, "RCS Loops - MODE 4";
- LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled";
- LCO 3.9.4, "Residual Heat Removal (RHR) and Coolant Circulation-Water Level ≥ 23 Ft" (MODE 6); and
- LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation-Water Level < 23 Ft" (MODE 6).

ACTIONS	<u>A.1 and A.2</u>
	<p>If one RHR loop is inoperable and both SGs have secondary side water levels < 16%, redundancy for heat removal is lost. Action must be initiated immediately to restore a second RHR loop to OPERABLE status or to restore at least one SG secondary side water level. Either Required Action A.1 or Required Action A.2 will restore redundant heat removal paths. The immediate Completion Time reflects the importance of maintaining the availability of two paths for heat removal. The action to restore must continue until an RHR bop is restored to OPERABLE status or SG secondary side water level is restored.</p>
	<p><u>B.1 and B.2</u></p> <p>If no RHR loop is in operation, except during conditions permitted by Notes 1 and 4, or if no loop is OPERABLE, all operations involving introduction of coolant into the RCS with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 must be suspended and action to restore one RHR loop to OPERABLE status and operation must be initiated. Suspending the introduction of coolant into the RCS with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 is required to assure continued safe operation. With coolant added without forced circulation, unmixed coolant could be introduced to the core, however coolant added with boron concentration meeting the minimum SDM maintains acceptable margin to subcritical operations. The immediate Completion Times reflect the importance of maintaining operation for heat removal. The action to restore must continue until one loop is restored to OPERABLE status and operation.</p>

SURVEILLANCE
REQUIREMENTS

SR 3.4.7.1

This SR requires verification every 12 hours that one RHR loop is in operation. Verification includes flow rate, temperature, or pump status monitoring, which help ensure that forced flow is providing heat removal. Use of control board indication for these parameters is an acceptable verification. The Frequency of 12 hours is sufficient considering other indications and alarms available to the operator in the control room to monitor RHR loop performance.

SR 3.4.7.2

This SR requires verification of SG OPERABILITY. Verifying that at least one SG is OPERABLE by ensuring its secondary side narrow range water level is $\geq 16\%$ ensures an alternate decay heat removal method in the event that the second RHR loop is not OPERABLE. If both RHR loops are OPERABLE, this Surveillance is not needed. The 12 hour Frequency is considered adequate in view of other indications available in the control room to alert the operator to the loss of SG level.

SR 3.4.7.3

Verification that a second RHR pump is OPERABLE ensures that an additional pump can be placed in operation, if needed, to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available to the standby RHR pump. If secondary side water level is $\geq 16\%$ in at least one SG, this Surveillance is not needed. The Frequency of 7 days is considered reasonable in view of other administrative controls available and has been shown to be acceptable by operating experience.

REFERENCES

1. UFSAR, Section 14.6.1.2.6
 2. NRC Information Notice 95-35
-
-

Insert 2

Insert 2

SR 3.4.7.4

RHR System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required RHR loop(s) and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RHR System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR System piping and the procedural controls governing system operation.

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.8 RCS Loops - MODE 5, Loops Not Filled

BASES

BACKGROUND	<p>In MODE 5 with the RCS loops not filled, the primary function of the reactor coolant is the removal of decay heat and the transfer of this heat to the component cooling water via the residual heat removal (RHR) heat exchangers. The steam generators (SGs) are not available as a heat sink when the loops are not filled. The secondary function of the reactor coolant is to act as a carrier for the soluble neutron poison, boric acid.</p> <p>In MODE 5 with loops not filled, only RHR pumps can be used for coolant circulation. The number of pumps in operation can vary to suit the operational needs. The intent of this LCO is to provide forced flow from at least one RHR pump for decay heat removal and transport and to require that two paths be available to provide redundancy for heat removal.</p>
APPLICABLE SAFETY ANALYSES	<p>In MODE 5, RCS circulation is considered in the determination of the time available for mitigation of an accidental boron dilution event. The RHR loops provide this circulation. The flow provided by one RHR loop is adequate for heat removal and for boron mixing.</p> <p>RCS loops in MODE 5 (loops not filled) have been identified in the NRC Policy Statement as important contributors to risk reduction.</p>
LCO	<p>The purpose of this LCO is to require that at least two RHR loops be OPERABLE and one of these loops be in operation to transfer heat from the reactor coolant at a controlled rate. Heat cannot be removed via the RHR System unless forced flow is used. A minimum of one operating RHR pump meets the LCO requirement for one loop in operation. An additional RHR loop is required to be OPERABLE to meet single failure considerations.</p>

Note 1 permits all RHR pumps to be de-energized for \leq 15 minutes when switching from one loop to another. The circumstances for stopping both RHR pumps are to be limited to situations when the outage time is short and requires that the following conditions be met:

- a. No operations are permitted that would cause introduction of coolant into the RCS with boron concentration less than required to meet the SDM of LCO 3.1.1.
- b. Core outlet temperature is maintained at least 10°F below saturation temperature, so that no vapor bubble may form and possibly cause a natural circulation flow obstruction; and
- c. No draining operations are permitted that would further reduce the RCS water volume and possibly cause a more rapid heatup of the remaining RCS inventory.
- d. Suspending the introduction of coolant into the RCS with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 is required to assure continued safe operation. With coolant added without forced circulation, unmixed coolant could be introduced to the core, however coolant added with boron concentration meeting the minimum SDM maintains acceptable margin to subcritical operations.

Note 2 allows one RHR loop to be inoperable for a period of \leq 2 hours, provided that the other loop is OPERABLE and in operation. This permits periodic surveillance tests to be performed on the inoperable loop during the only time when these tests are safe and possible. The 2 hour allowance may be used separately for each individual loop.

An OPERABLE RHR loop is comprised of an OPERABLE RHR pump capable of providing forced flow to an OPERABLE RHR heat exchanger. RHR pumps are OPERABLE if they are capable of being powered and are able to provide flow if required. Also included are all necessary support systems not addressed by applicable LCOs (e.g., component cooling water and service water) 

APPLICABILITY

Management of gas voids is important to RHR System OPERABILITY.

In MODE 5 with loops not filled, this LCO requires core heat removal and coolant circulation by the RHR System. The RCS loops are considered not filled from the time period beginning with the opening of isolation valves and draining of the RCS and ending with the completion of filling and venting the RCS.

Operation in other MODES is covered by:

- LCO 3.4.4, "RCS Loops - MODE 1 > 8.5% RTP";
- LCO 3.4.5, "RCS Loops - MODES 1 ≤ 8.5% RTP, 2, and 3";
- LCO 3.4.6, "RCS Loops - MODE 4";
- LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled";
- LCO 3.9.4, "Residual Heat Removal (RHR) and Coolant Circulation-Water Level ≥ 23 Ft" (MODE 6); and
- LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation-Water Level < 23 Ft" (MODE 6).

ACTIONS	
	<u>A.1</u> If only one RHR loop is OPERABLE and in operation, redundancy for RHR is lost. Action must be initiated to restore a second loop to OPERABLE status. The immediate Completion Time reflects the importance of maintaining the availability of two paths for heat removal. The action to restore must continue until the second RHR loop is restored to OPERABLE status.
	<u>B.1 and B.2</u> If no RHR loop is in operation, except during conditions permitted by Note 1, or if no loop is OPERABLE all operations involving introduction of coolant into the RCS with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 must be suspended and action to restore one RHR loop to OPERABLE status and operation must be initiated. The required margin to criticality must not be reduced in this type of operation. Suspending the introduction of coolant into the RCS with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 is required to assure continued safe operation. With coolant added without forced circulation, unmixed coolant could be introduced to the core, however coolant added with boron concentration meeting the minimum SDM maintains acceptable margin to subcritical operations. The immediate Completion Time reflects the importance of maintaining operation for heat removal. The action to restore must continue until one loop is restored to OPERABLE status and operation.

**SURVEILLANCE
REQUIREMENTS****SR 3.4.8.1**

This SR requires verification every 12 hours that one RHR loop is in operation. Verification includes flow rate, temperature, or pump status monitoring, which help ensure that forced flow is providing heat removal. The Frequency of 12 hours is sufficient considering other indications and alarms available to the operator in the control room to monitor RHR loop performance.

SR 3.4.8.2

Verification that a second RHR pump is OPERABLE ensures that an additional pump can be placed in operation, if needed, to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available to the standby pump. The Frequency of 7 days is considered reasonable in view of other administrative controls available and has been shown to be acceptable by operating experience.

REFERENCES

1. None.
-
-

Insert 3

Insert 3

SR 3.4.8.3

RHR System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RHR loops and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RHR System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR System piping and the procedural controls governing system operation.

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.2 ECCS-MODES 1, 2, and 3

BASES

BACKGROUND

The function of the ECCS is to provide core cooling and negative reactivity to ensure that the reactor core is protected after any of the following accidents:

- a. Loss of coolant accident (LOCA) and coolant leakage greater than the capability of the normal charging system;
- b. Rod ejection accident;
- c. Loss of secondary coolant accident, including uncontrolled steam release or loss of feedwater; and
- d. Steam generator tube rupture (SGTR).

The addition of negative reactivity is designed primarily for the loss of secondary coolant accident where primary cooldown could add enough positive reactivity to achieve criticality and return to significant power.

There are two phases of ECCS operation: injection and recirculation. In the injection phase, water is taken from the refueling water storage tank (RWST) and injected into the Reactor Coolant System (RCS) through the cold legs and reactor vessel upper plenum. When sufficient water is removed from the RWST to ensure that enough boron has been added to maintain the reactor subcritical and the containment sump has enough water to supply the required net positive suction head to the ECCS pumps, suction is switched to Containment Sump B for recirculation. Within approximately 5.5 hours from initiation of sump recirculation, simultaneous ECCS injection is used to reduce the potential for boiling in the top of the core and any resulting boron precipitation.

The ECCS consists of two separate subsystems: safety injection (SI) and residual heat removal (RHR) (see Figure B 3.5.2-1A). Each subsystem consists of two redundant, 100% capacity trains. The ECCS accumulators and the RWST are also part of the ECCS, but are not considered part of an ECCS flow path as described by this LCO.

The ECCS flow paths which comprise the redundant trains consist of piping, valves, heat exchangers, and pumps such that water from the RWST can be injected into the RCS following the accidents described in this LCO. The major components of each subsystem are the RHR pumps, heat exchangers, and the SI pumps. The RHR subsystem consists of two 100% capacity trains that are interconnected and redundant such that either train is capable of supplying 100% of the flow required to mitigate the accident consequences. The SI subsystem consists of three redundant, 50% capacity pumps which supply two RCS cold leg injection lines. Each injection line is capable of providing 100% of the flow required to mitigate the consequences of an accident. These interconnecting and redundant subsystem designs provide the operators with the ability to utilize components from opposite trains to achieve the required 100% flow to the core.

Containment Sump B collects liquid discharged into the containment following a LOCA and then provides the source of water for long-term recirculation. The sump has been designed to protect against the entrance of debris through the use of concrete curbing, solid steel plating covering the sump, and steel debris strainers (screens) connected to the sump . The sump strainers serve as a means of allowing any postulated LOCA water into the sump. The strainers are credited as having the capability to exclude the detrimental debris from the RHR pump suction. The sump cover plate prevents debris from bypassing the sump strainers to enter the sump, and provides a personnel egress route over the sump.

During the injection phase of LOCA recovery, suction headers supply water from the RWST to the ECCS pumps. A common supply header is used from the RWST to the safety injection (SI) and containment spray (CS) System pumps. This common supply header is provided with two in-series motor-operated isolation valves (896A and 896B) that receive power from separate sources for single failure considerations. These isolation valves are maintained open with DC control power removed via a key switch located in the control room. The removal of DC control power eliminates the most likely causes for spurious valve actuation while maintaining the capability to manually close the valves from the control room during the recirculation phase of the accident (Ref. 1). The SI pump supply header also contains two parallel motor-operated isolation valves (825A and 825B) which are maintained open by removing AC power. The removal of AC power to these isolation valves is an acceptable design against single failures that could result in undesirable component actuation (Ref. 2).

A separate supply header is used for the residual heat removal (RHR) pumps. This supply header is provided with a check valve (854) and motor operated isolation valve (856) which is maintained open with DC control power removed via a key switch located in the control room. The removal of DC control power eliminates the most likely causes for spurious valve actuation while maintaining the capability to manually close the valve from the control room during the recirculation phase of the accident (Ref. 3).

The three SI pumps feed two RCS cold leg injection lines. SI Pumps A and B each feeds one of the two injection lines while SI Pump C can feed both injection lines. The discharge of SI Pump C is controlled through use of two normally open parallel motor operated isolation valves (871A and 871B). These isolation valves are designed to close based on the operating status of SI Pumps A and B to ensure that SI Pump C provides the necessary flow through the RCS cold leg injection line containing the failed pump.

The discharges of the two RHR pumps and heat exchangers feed a common injection line which penetrates containment. This line then divides into two redundant core deluge flow paths each containing a normally closed motor operated isolation valve (852A and 852B) and check valve (853A and 853B) which provide injection into the reactor vessel upper plenum. Each motor operated isolation valve (852A and 852B) also has a key switch located in the control room, which is maintained in the "off" position. This key switch removes DC control power to the closing circuit to reduce the possibility of a spurious closure of the valves, due to a single short or inadvertent operator misposition, after they have opened.

For LOCAs that are too small to depressurize the RCS below the shutoff head of the SI pumps, the steam generators provide core cooling until the RCS pressure decreases below the SI pump shutoff head.

During the recirculation phase of LOCA recovery, RHR pump suction is manually transferred to Containment Sump B (Refs. 4 and 5). This transfer is accomplished by stopping the RHR pumps, isolating RHR from the RWST by closing motor operated isolation valve 856, opening the Containment Sump B motor operated isolation valves to RHR (850A and 850B) and then starting the RHR pumps. If motor operated isolation valve 856 fails to close, check valve 854 provides necessary isolation of the RWST. The SI and CS pumps are then stopped and the RWST isolated by closing motor operated isolation valve 896A and 896B for the SI and CS pump common supply header and closing motor operated isolation valve 897 or 898 for the SI pumps recirculation line.

The RHR pumps then supply the SI pumps if the RCS pressure remains above the RHR pump shutoff head as correlated through core exit temperature, containment pressure, and reactor vessel level indications (Ref. 6). The RHR pumps can also provide suction to the CS pumps for containment pressure control. This high-head recirculation path is provided through RHR motor operated isolation valves 857A, 857B, and 857C. These isolation valves are interlocked with valves 896A, 896B, 897, and 898. This interlock prevents opening of the RHR high-head recirculation isolation valves unless either 896A or 896B are closed and either 897 or 898 are closed. If RCS pressure is such that RHR provides adequate core and containment cooling, the SI and CS pumps remain in pull-stop. During recirculation, flow is discharged through the same paths as the injection phase. Within approximately 5.5 hours from initiation of sump recirculation, simultaneous injection by the SI and RHR pumps is used to prevent boron precipitation. This consists of providing SI through the RCS cold legs and into the lower plenum while providing RHR through the core deluge valves into the upper plenum.

The two redundant flow paths from Containment Sump B to the RHR pumps also contain a motor operated isolation valve located within the sump (851A and 851B). These isolation valves are maintained open with power removed to improve the reliability of switchover to the recirculation phase. The operators for isolation valves 851A and 851B are also not qualified for containment post accident conditions. The removal of AC power to these isolation valves is an acceptable design against single failures that could result in an undesirable actuation (Ref. 2).

The SI subsystem of the ECCS also functions to supply borated water to the reactor core following increased heat removal events, such as a steam line break (SLB). The limiting design conditions occur when the negative moderator temperature coefficient is highly negative, such as at the end of each cycle.

During low temperature conditions in the RCS, limitations are placed on the maximum number of ECCS pumps that may be OPERABLE. Refer to the Bases for LCO 3.4.12, "Low Temperature Overpressure Protection (LTOP) System," for the basis of these requirements.

The ECCS subsystems are actuated upon receipt of an SI signal. The actuation of safeguard loads is accomplished in a programmed time sequence. If offsite power is available, the safeguard loads start immediately in the programmed sequence. If offsite power is not available, the Engineered Safety Feature (ESF) buses shed normal operating loads and are connected to the emergency diesel generators (EDGs). Safeguard loads are then actuated in the programmed time sequence. The time delay associated with diesel starting, sequenced loading, and pump starting determines the time required before pumped flow is available to the core following a LOCA.

The active ECCS components, along with the passive accumulators and the RWST covered in LCO 3.5.1, "Accumulators," and LCO 3.5.4, "Refueling Water Storage Tank (RWST)," provide the cooling water necessary to meet AIF-GDC 44 (Ref. 8).

APPLICABLE SAFETY ANALYSES	<p>The LCO helps to ensure that the following acceptance criteria for the ECCS, established by 10 CFR 50.46 (Ref. 9), will be met following a LOCA:</p> <ul style="list-style-type: none">a. Maximum fuel element cladding temperature is $\leq 2200^{\circ}\text{F}$;b. Maximum cladding oxidation is ≤ 0.17 times the total cladding thickness before oxidation;c. Maximum hydrogen generation from a zirconium water reaction is ≤ 0.01 times the hypothetical amount generated if all of the metal in the cladding cylinders surrounding the fuel, excluding the cladding surrounding the plenum volume, were to react;d. Core is maintained in a coolable geometry; ande. Adequate long term core cooling capability is maintained. <p>The LCO also limits the potential for a post trip return to power following an SLB event and helps ensure that containment temperature limits are met post accident.</p>
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Both ECCS subsystems are taken credit for in a large break LOCA event at full power (Refs. 6 and 10). This event establishes the requirement for runout flow for the ECCS pumps, as well as the maximum response time for their actuation. The SI pumps are credited in a small break LOCA event. This event establishes the flow and discharge head at the design point for the pumps. The SGTR and SLB events also credit the SI pumps. The OPERABILITY requirements for the ECCS are based on the following LOCA analysis assumptions:

- a. A large break LOCA event, with limiting offsite power assumptions and a single failure disabling one ECCS train (both EDG trains are assumed to operate for heat removal and spray systems in containment backpressure calculation); and
- b. A small break LOCA event, with a loss of offsite power and a single failure disabling one ECCS train.

During the blowdown stage of a LOCA, the RCS depressurizes as primary coolant is ejected through the break into the containment. The nuclear reaction is terminated either by moderator voiding during large breaks or control rod insertion for small breaks. Following depressurization, emergency cooling water is injected by the SI pumps into the cold legs, flows into the downcomer, fills the lower plenum, and refloods the core. The RHR pumps inject directly into the core barrel by upper plenum injection.

The effects on containment mass and energy releases are accounted for in appropriate analyses (Refs. 10 and 11). The LCO ensures that an ECCS train will deliver sufficient water to match boiloff rates quickly enough to minimize the consequences of the core being uncovered following a large LOCA. It also ensures that the SI pumps will deliver sufficient water and boron during a small LOCA to maintain core subcriticality. For smaller LOCAs, the SI pumps deliver sufficient fluid to maintain RCS inventory. For a small break LOCA, the steam generators continue to serve as the heat sink, providing part of the required core cooling.

The ECCS trains satisfy Criterion 3 of the NRC Policy Statement.

LCO

In MODES 1, 2, and 3, two independent (and redundant) ECCS trains are required to ensure that sufficient ECCS flow is available, assuming a single failure affecting either train. Additionally, individual components within the ECCS trains may be called upon to mitigate the consequences of other transients and accidents.

In MODES 1, 2, and 3, an ECCS train consists of an SI subsystem and an RHR subsystem (see Figure B 3.5.2-1A). Each train includes the piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWST upon an SI signal and transferring suction to Containment Sump B. This includes securing the motor operated isolation valves as specified in SR 3.5.2.1 in position by removing the power sources as listed below.

<u>EIN</u>	<u>Position</u>	<u>Secured in Position By</u>
825A	Open	Removal of AC Power
825B	Open	Removal of AC Power
826A	Closed	Removal of AC Power
826B	Closed	Removal of AC Power
826C	Closed	Removal of AC Power
826D	Closed	Removal of AC Power
851A	Open	Removal of AC Power
851B	Open	Removal of AC Power
856	Open	Removal of DC Control Power
878A	Closed	Removal of AC Power
878B	Open	Removal of AC Power
878C	Closed	Removal of AC Power
878D	Open	Removal of AC Power
896A	Open	Removal of DC Control Power
896B	Open	Removal of DC Control Power

The major components of an ECCS train consists of an RHR pump and heat exchanger taking suction from the RWST (and eventually Containment Sump B), and capable of injecting through one of the two isolation valves to the reactor vessel upper plenum and one of the two lines which provide high-head recirculation to the SI and CS pumps. OPERABILITY of the RHR pumps includes their minimum recirculation lines.

Also included within the ECCS train are two of three SI pumps capable of taking suction from the RWST and Containment Sump B (via RHR), and injecting through one of the two RCS cold leg injection lines. OPERABILITY of the SI pumps includes their minimum recirculation lines back to the RWST. These lines must remain open during the injection phase of a small break LOCA to prevent the SI pumps from deadheading. MOVs 897 and 898 must also be capable of closing during the recirculation phase of an accident to prevent the addition of containment sump fluid to the RWST. In addition, both SI Pump C breakers(to Bus 14 and Bus 16) must be OPERABLE.

The flow path for each train must maintain its designed independence to ensure that no single failure can disable both ECCS trains. Due to the complex configuration of the two ECCS subsystems, Table B 3.5.2-1 provides a matrix of which ECCS train(s) are inoperable for major system component inoperabilities. In addition to the table, the following clarifications are provided. In the case where SI Pump C is inoperable, both RCS cold leg injection lines must be OPERABLE to provide 100% of the ECCS flow equivalent to a single train of SI due to the location of check valves 870A and 870B. If either SI Pump C breaker is inoperable, declare the associated ECCS train inoperable (e.g., if breaker to Bus 14 is inoperable, declare ECCS Train A inoperable.)

Since the Containment Sump B provides the source of water for long-term recirculation to both trains of ECCS, the physical integrity of the sump must be maintained. This includes the steel plating covering the sump and the sump strainers. Entering Sump B has the potential to allow debris to enter the sump following a LOCA and therefore both trains of ECCS must be declared inoperable if the sump is opened in MODES 1, 2, and 3.

Management of gas voids is important to ECCS OPERABILITY.

APPLICABILITY	<p>In MODES 1, 2, and 3, the ECCS OPERABILITY requirements for the limiting Design Basis Accident, a large break LOCA, are based on full power operation. Although reduced power would not require the same level of performance, the accident analysis does not provide for reduced cooling requirements in the lower MODES. The SI pump performance requirements are based on a small break LOCA. MODE 2 and MODE 3 requirements are bounded by the MODE 1 analysis.</p> <p>In MODE 4, the ECCS requirements are as described in LCO 3.5.3, "ECCS-MODE 4."</p> <p>In MODES 5 and 6, plant conditions are such that the probability of an event requiring ECCS injection is extremely low. Core cooling requirements in MODE 5 are addressed by LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled," and LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled." MODE 6 core cooling requirements are addressed by LCO 3.9.4, "Residual Heat Removal (RHR) and Coolant Circulation-Water Level \geq 23 Ft," and LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation-Water Level < 23 Ft."</p>
	<p>As indicated in Note 1, a SI flow path to the RCS may be isolated for up to 2 hours in MODE 3, under controlled conditions, to perform pressure isolation valve testing per SR 3.4.14.1. The flow path is readily restorable from the control room or by field test personnel. An SI flowpath is considered to be the cold and hot leg injection lines to one RCS loop such that only one of the two SI trains can be removed from service at one time. The note also allows an SI isolation MOV to be powered for up to 12 hours for the performance of this testing.</p> <p>As indicated in Note 2, operation in MODE 3 with ECCS trains declared inoperable pursuant to LCO 3.4.12, "Low Temperature Overpressure Protection (LTOP) System," may be necessary since the LTOP arming temperature is near the MODE 3 boundary temperature of 350°F. LCO 3.4.12 requires that certain pumps be rendered inoperable at and below the LTOP arming temperature. When this temperature is near the MODE 3 boundary temperature, time is needed to restore the inoperable pumps to OPERABLE status.</p>

In MODES 4, 5 and 6, plant conditions are such that the probability of an event requiring ECCS injection is extremely low. Mode 4 core cooling requirements are addressed by LCO 3.4.6, "RCS Loops - MODE 4," and LCO 3.5.3, "ECCS - MODE 4." Core cooling requirements in MODE 5 are addressed by LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled," and LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled." MODE 6 core cooling requirements are addressed by LCO 3.9.4, "Residual Heat Removal (RHR) and Coolant Circulation-Water Level \geq 23 Ft," and LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation-Water Level $<$ 23 Ft."

ACTIONS	<u>A.1</u>
	With one train inoperable and at least 100% of the ECCS flow equivalent to a single OPERABLE ECCS train available, the inoperable components must be returned to OPERABLE status within 72 hours. The 72 hour Completion Time is based on an NRC reliability evaluation (Ref. 12) and is a reasonable time for repair of many ECCS components.
	An ECCS train is inoperable if it is not capable of delivering 100% design flow to the RCS. Individual components are inoperable if they are not capable of performing their design function.
	The LCO requires the OPERABILITY of a number of independent subsystems. Due to the redundancy of trains and the diversity of subsystems, the inoperability of one active component in a train does not render the ECCS incapable of performing its function. Neither does the inoperability of two different components, each in a different train, necessarily result in a loss of function for the ECCS. The intent of this Condition is to maintain a combination of equipment such that 100% of the ECCS flow equivalent to a single OPERABLE ECCS train remains available. This allows increased flexibility in plant operations under circumstances when components in opposite trains are inoperable.
	In the case where SI Pump C is inoperable, both RCS cold leg injection lines must be OPERABLE to provide 100% of the ECCS flow equivalent to a single train of SI due to the location of check valves 870A and 870B.
	An event accompanied by a loss of offsite power and the failure of an EDG can disable one ECCS train until power is restored. A reliability analysis (Ref. 2) has shown that the impact of having one full ECCS train inoperable is sufficiently small to justify continued operation for 72 hours.

B.1 and B.2

If the inoperable train cannot be returned to OPERABLE status within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to MODE 3 within 6 hours and MODE 4 within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

C.1

If both trains of ECCS are inoperable, the plant is in a condition outside the accident analyses; therefore, LCO 3.0.3 must be immediately entered. With one or more component(s) inoperable such that 100% of the flow equivalent to a single OPERABLE ECCS train is not available, the facility is in a condition outside the accident analysis. Therefore, LCO 3.0.3 must be immediately entered.

SURVEILLANCE
REQUIREMENTS

SR 3.5.2.1

Verification of proper valve position ensures that the flow path from the ECCS pumps to the RCS is maintained. Use of control board indication for valve position is an acceptable verification. Misalignment of these valves could render both ECCS trains inoperable. The listed valves are secured in position by removal of AC power or key locking the DC control power. These valves are operated under administrative controls such that any changes with respect to the position of the valve breakers or key locks is unlikely. The verification of the valve breakers and key locks is performed by SR 3.5.2.3. Mispositioning of these valves can disable the function of both ECCS trains and invalidate the accident analyses. A 12 hour Frequency is considered reasonable in view of other administrative controls that ensure a mispositioned valve is unlikely.

SR 3.5.2.2

Verifying the correct alignment for manual, power operated, and automatic valves in the ECCS flow paths provides assurance that the proper flow paths will exist for ECCS operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these were verified to be in the correct position prior to locking, sealing, or securing. A valve that receives an actuation signal is allowed to be in a nonaccident position provided the valve will automatically reposition within the proper stroke time. This Surveillance does not require any testing or valve manipulation. Rather, it involves verification that those valves capable of being mispositioned are in the correct position. The 31 day Frequency is appropriate because the valves are operated under administrative control, and an improper valve position in most cases,

would only affect a single train. This Frequency has been shown to be acceptable through operating experience.

SR 3.5.2.3

The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.

Verification every 31 days that AC or DC power is removed, as appropriate, for each valve specified in SR 3.5.2.1 ensures that an active failure could not result in an undetected misposition of a valve which affects both trains of ECCS. If this were to occur, no ECCS injection or recirculation would be available. Since power is removed under administrative control and valve position is verified every 12 hours, the 31 day Frequency will provide adequate assurance that power is removed.

SR 3.5.2.4

Periodic surveillance testing of ECCS pumps to detect gross degradation caused by impeller structural damage or other hydraulic component problems is required by the ASME Code. This type of testing may be accomplished by measuring the pump developed head at a single point of the pump characteristic curve. This verifies both that the measured performance is within an acceptable tolerance of the original pump baseline performance and that the performance at the test flow is greater than or equal to the performance assumed in the plant safety analysis. SRs are specified in the Inservice Testing Program, which encompasses the ASME Code. The ASME Code provides the activities and Frequencies necessary to satisfy the requirements.

SR 3.5.2.5

These Surveillances demonstrate that each automatic ECCS valve actuates to the required position on an actual or simulated SI signal and that each ECCS pump starts on receipt of an actual or simulated SI signal. This surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. The 24 month Frequency is based on the need to perform these Surveillances under the conditions that apply during a plant outage and the potential for unplanned plant transients if the Surveillances were performed with the reactor at power. The 24 month Frequency is also acceptable based on consideration of the design reliability (and confirming operating experience) of the equipment. The actuation logic is tested as part of ESF Actuation System testing, and equipment performance is monitored as part of the Inservice Testing Program.

SR 3.5.2.6

See SR 3.5.2.5

SR 3.5.2.7

Periodic inspections of the containment sump suction inlet to the RHR System ensure that it is unrestricted and stays in proper operating condition. The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage, and the need to have access to the location. This Frequency has been found to be sufficient to detect abnormal degradation and is confirmed by operating experience.

Insert 4

REFERENCES

1. Letter from R. A. Purple, NRC, to L. D. White, RG&E, Subject: "Issuance of Amendment 7 to Provisional Operating License No. DPR-18," dated May 14, 1975.
2. Branch Technical Position (BTP) ICSB-18, "Application of the Single Failure Criterion to Manually-Controlled Electrically Operated Valves."
3. Letter from A. R. Johnson, NRC, to R. C. Mcreddy, RG&E, Subject: "Issuance of Amendment No. 42 to Facility Operating License No. DPR-18, R. E. Ginna Nuclear Power Plant (TAC No. 79829)," dated June 3, 1991.
4. Letter from D. M. Crutchfield, NRC, to J. E. Maier, RG&E, Subject: "SEP Topic VI-7.B: ESF Switchover from Injection to Recirculation Mode, Automatic ECCS Realignment, Ginna," dated December 31, 1981.
5. NUREG-0821.
6. UFSAR, Section 6.3.
7. Not Used
8. Atomic Industrial Forum (AIF) GDC 44, Issued for comment July 10, 1967.
9. 10 CFR 50.46.
10. UFSAR, Section 15.6.
11. UFSAR, Section 6.2.

Insert 4

SR 3.5.2.8

ECCS piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the ECCS and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of ECCS locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The ECCS is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the ECCS is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

ECCS locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the ECCS piping and the procedural controls governing system operation.

12. NRC Memorandum to V. Stello, Jr., from R.L Baer, "Recommended Interim Revisions to LCOs for ECCS Components," December 1, 1975.
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Table B 3.5.2-1
EMERGENCY CORE COOLING SYSTEM INOPERABILITY MATRIX, Page 1 of 2

	RHR Pump A	RHR Pump B	HX A	HX B	852A	852B	857A or 857C	857B	SI Pump A	SI Pump B	SI Pump C	896A or 896B	878B	878D
RHR A	A	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
RHR B	All	B	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
HX A	A	All-1	A	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
HX B	All-1	B	All	B	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
852A	A	AB	A	AB	A	-----	-----	-----	-----	-----	-----	-----	-----	-----
852B	AB	B	AB	B	All	B	-----	-----	-----	-----	-----	-----	-----	-----
857A or 857C	A	All-1	A	All	A	AB	A	-----	-----	-----	-----	-----	-----	-----
857B	All-1	B	All	B	AB	B	All	B	-----	-----	-----	-----	-----	-----
SI A	A	AB	A	AB	A	AB	A	AB	A	-----	-----	-----	-----	-----
SI B	AB	B	AB	B	AB	B	AB	B	All	B	-----	-----	-----	-----
SI C	AB-1	AB-1	AB-1	AB-1	AB-1	AB-1	AB-1	AB-1	All-3	All-3	AB-1	-----	-----	-----
896A or 896B	All-2	All-2	All-2	All-2	All-2	All-2	All-2	All-2	All-2	All-2	All-2	-----	-----	-----
878B	A	AB	A	AB	A	AB	A	AB	A	All	All-3	All	A	-----
878D	AB	B	AB	B	AB	B	AB	B	All	B	All-3	All	All	B

Table B 3.5.2-1 (Note)
EMERGENCY CORE COOLING SYSTEM INOPERABILITY MATRIX, Page 2 of 2

----- NOTE -----

Notes (see also LCO Bases and Table B 3.5.2-1):

1. This matrix was generated assuming all required support systems are OPERABLE. If support systems are inoperable, their effect must be cascaded to the ECCS in order to use this matrix.
2. If only one component is inoperable, use the box corresponding to the intersection of that component on the x and y axis (e.g., if RHR Pump A is inoperable, use box in upper left hand corner of matrix to identify that ECCS Train A is inoperable). If multiple components are inoperable, use the box corresponding to their intersection, not the individual boxes (e.g., if RHR Pump A and MOV 852B were inoperable, the intersection of these two components is ECCS Train AB, not ECCS Train A and ECCS Train B).

DEFINITIONS:

- | | |
|-------|---|
| A | Fails ECCS Train A; Condition A must be entered. |
| B | Fails ECCS Train B; Condition A must be entered. |
| AB | Fails one (1) ECCS train, but a second 100% capacity train comprised of components from both Trains A and B remains; Condition A must be entered. |
| AB-1 | If only one (1) SI Pump C breaker is inoperable, declare affected ECCS train inoperable (e.g., if breaker from Bus 14 is inoperable, this is the same as declaring SI Pump A inoperable and the SI Pump A column may be used in place of the Pump C column for inoperability evaluation). If SI Pump C or both breakers are inoperable, then Note AB applies. |
| All | Both ECCS Trains are inoperable. |
| All-1 | Both trains of ECCS are inoperable unless manual valves 709C and 709D are opened and it can be demonstrated that sufficient flow is available through this 8" line. |
| All-2 | Both ECCS trains are inoperable. Also must enter LCO 3.6.6, Condition H for two CS trains inoperable. |
| All-3 | Both ECCS trains are inoperable unless only one (1) SI Pump C breaker is inoperable whereby Note AB-1 would apply. |

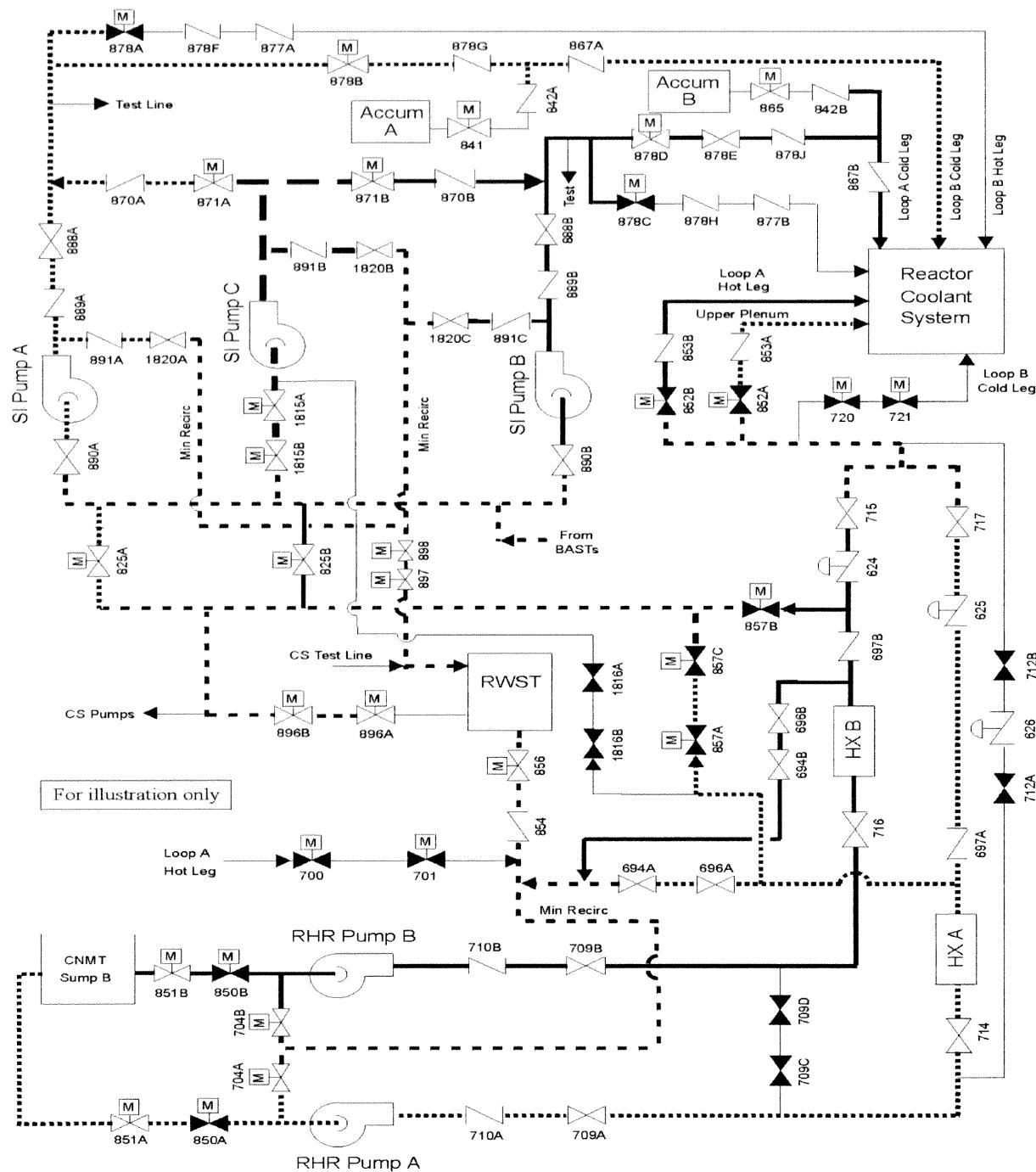


Figure B 3.5.2-1A
Emergency Core Cooling System, Page 1 of 2

Notes:

1. The RWST up to, but not including MOV 896A, is addressed by LCO 3.5.4.
2. SI check valves 877A, 877B, 878F, and 878H are only addressed by LCO 3.4.14. RHR check valves 853A and 853B, SI check valves 867A, 867B, 878G, and 878J and SI MOVs 878A and 878C are also addressed by LCO 3.4.14.
3. MOVs 896A and 896B are also addressed by LCO 3.6.6.
4. Accumulators A and B up to and including MOVs 841 and 865 are only addressed by LCO 3.5.1. Check valves 842A, 842B, 867A, and 867B are also addressed by LCO 3.5.1 (note - failure of check valves 842A and 842B can create a possible diversion of SI flow).

Legend:

- ECCS Train A
- ECCS Train B
- — ECCS Train AB (SI Pump C)
- - - Both ECCS Trains
- Not in LCO 3.5.2

Figure B 3.5.2-1B
Emergency Core Cooling System, Page 2 of 2

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.3 ECCS-MODE 4

BASES

BACKGROUND The Background section for Bases 3.5.2, "ECCS-MODES 1, 2, and 3," is applicable to these Bases, with the following modifications.

In MODE 4, the required ECCS train consists of two separate subsystems: safety injection (SI) and residual heat removal (RHR).

The ECCS flow paths consist of piping, valves, heat exchangers, and pumps such that water from the refueling water storage tank (RWST) can be injected into the Reactor Coolant System (RCS). The RHR subsystem must also be capable of taking suction from containment Sump B to provide recirculation.

APPLICABLE SAFETY ANALYSES There are no Applicable Safety Analyses which apply to the ECCS in MODE 4 due to the stable conditions associated with operation in MODE 4 and the reduced probability of occurrence of a Design Basis Accident (DBA). Therefore, the ECCS operational requirements are reduced in MODE 4. It is understood in these reductions that certain automatic SI actuations are not available. In this MODE, sufficient time is expected for manual actuation of the required ECCS to mitigate the consequences of a DBA. This time is also required since the RHR System may be aligned to provide normal shutdown cooling while the SI System may be isolated from the RCS due to low temperature overpressure protection (LTOP) concerns. Therefore, only one train of ECCS is required for MODE 4. This requirement dictates that single failures are not considered for this LCO due to the time available for operators to respond to an accident.

Even though there are no DBAs in MODE 4, after the initiation of RHR shutdown cooling, there is a temperature range during which, if a shutdown loss-of-coolant-accident (LOCA) occurred, the RHR subsystem may not be fully capable of delivering water from the RWST to the reactor core. That is, when the temperature in the RCS is above the saturation temperature associated with the RWST at the suction to the pump, RHR suction pipe flashing could occur when the RHR suction is transferred from the RCS to the RWST. Consequently, the SI subsystem must have two injection paths available to deliver water to the reactor. This will ensure that, should an unisolable LOCA occur in MODE 4, regardless of break location, the reactor fuel will remain cooled. Calculations show that one SI pump will provide sufficient core cooling through injecting the contents of the RWST via two injection paths.

The duration of time that passes while injecting the RWST contents down to the level (28%) where switchover to containment Sump B begins is long enough to allow the RHR suction pipe to cool to a temperature where the RHR system can be re-aligned and the pump re-started, taking suction from Sump B. In the event that a LOCA were to occur following RHR cooldown of the RCS to below the saturation temperature associated with the RWST, the suction of the RHR pump may be transferred to the RWST for use in providing ECCS capability. However, this flow path is not specifically credited in the definition of an RHR train while in MODE 4.

The ECCS trains satisfy Criterion 4 of the NRC Policy Statement.

LCO	<p>In MODE 4, one of the two independent (and redundant) ECCS trains is required to be OPERABLE to ensure that sufficient ECCS flow is available to the core following an accident.</p> <p>In MODE 4, an ECCS train consists of an SI subsystem and an RHR subsystem. Each train includes the piping, instruments, and controls to ensure an OPERABLE flow path capable of providing cooling to the reactor. The major components of an ECCS train during MODE 4 consists of an RHR pump and heat exchanger, capable of taking suction from Containment Sump B, and able to inject through one of two isolation valves to the reactor vessel upper plenum. Also included within the ECCS train are at least one of three SI pumps capable of taking suction from the RWST and injecting through the RCS injection lines. Specifically, when the RCS is above the saturation temperature of the RWST at the suction of the RHR pumps, two SI injection paths through any combination of the two RCS cold and the two RCS hot leg injection lines must be OPERABLE. Below the saturation temperature of the RWST, only one of the four available SI injection paths must be OPERABLE, along with the RHR flowpath.</p> <p>The high-head recirculation flow path from RHR to the SI pumps is not required in MODE 4 since there is no accident scenario which prevents depressurization to the RHR pump shutoff head prior to depletion of the RWST. Also, SI Pump minimum recirculation lines are not required due to the low RCS pressure in MODE 4; however, they must be capable of being isolated during the recirculation phase.</p>
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Based on the expected time available to respond to accident conditions during MODE 4, and the configuration of the RHR and SI trains, ECCS components are OPERABLE if they are capable of being reconfigured to the injection mode (remotely or locally) within 10 minutes. This includes taking credit for an RHR pump and heat exchanger as being OPERABLE if they are being used for shutdown cooling purposes. LCO 3.4.12, "LTOP System" contains additional requirements for the configuration of the SI system. Limited access to Containment Sump B is allowed provided that the sump integrity can be restored in less than 10 minutes.

Management of gas voids is important to ECCS OPERABILITY.

APPLICABILITY

In MODES 1, 2, and 3, the OPERABILITY requirements for ECCS are covered by LCO 3.5.2.

In MODE 4, one OPERABLE ECCS train is acceptable without single failure consideration, on the basis of the stable reactivity of the reactor and the limited core cooling requirements.

In MODES 5 and 6, plant conditions are such that the probability of an event requiring ECCS injection is extremely low. Core cooling requirements in MODE 5 are addressed by LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled," and LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled." MODE 6 core cooling requirements are addressed by LCO 3.9.4, "Residual Heat Removal (RHR) and Coolant Circulation-Water Level \geq 23 Ft," and LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation-Water Level < 23 Ft."

ACTIONS

A.1

With no ECCS RHR subsystem OPERABLE, the plant is not prepared to respond to a loss of coolant accident or to continue a cooldown using the RHR pumps and heat exchangers. The Completion Time of immediately to initiate actions that would restore at least one ECCS RHR subsystem to OPERABLE status ensures that prompt action is taken to restore the required cooling capacity. Normally, in MODE 4, reactor decay heat is removed from the RCS by an RHR loop. If no RHR loop is OPERABLE for this function, reactor decay heat must be removed by some alternate method, such as use of the steam generators. The alternate means of heat removal must continue until the inoperable RHR loop components can be restored to operation so that decay heat removal is continuous.

With both RHR pumps and heat exchangers inoperable, it would be unwise to require the plant to go to MODE 5, where the only available heat removal system is the RHR subsystem. Therefore, the appropriate action is to initiate measures to restore one ECCS RHR subsystem and

to continue the actions until the subsystem is restored to OPERABLE status.

B.1

With no ECCS SI subsystem OPERABLE, due to the inoperability of the SI pump or flow path from the RWST, the plant is not prepared to provide high pressure response to an accident requiring SI. The 1 hour Completion Time to restore at least one SI subsystem to OPERABLE status ensures that prompt action is taken to provide the required cooling capacity or to initiate actions to place the plant in MODE 5, where an ECCS train is not required.

Condition B is modified by a Note which prohibits the application of LCO 3.0.4.b. to an inoperable ECCS SI subsystem when entering MODE 4. There is an increased risk associated with entering MODE 4 from MODE 5 with an inoperable ECCS SI subsystem and the provisions of LCO 3.0.4.b, which allow entry into a MODE or other specified condition in the Applicability with the ECCS not met after performance of a risk assessment addressing inoperable systems and components, should not be applied in this circumstance

C.1

When the Required Actions of Condition B cannot be completed within the required Completion Time, a controlled shutdown should be initiated. Twenty-four hours is a reasonable time, based on operating experience, to reach MODE 5 in an orderly manner and without challenging plant systems or operators.

SURVEILLANCE
REQUIREMENTS

SR 3.5.3.1

The applicable Surveillance description from Bases 3.5.2 apply. This SR is modified by a Note that allows an RHR train to be considered OPERABLE during alignment and operation for decay heat removal, if capable of being manually realigned (remote or local) to the ECCS mode of operation and not otherwise inoperable. This allows operation in the RHR mode during MODE 4, if necessary.

REFERENCES

1. None.
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B 3.6 CONTAINMENT SYSTEMS

B 3.6.6 Containment Spray (CS), Containment Recirculation Fan Cooler (CRFC) and NaOH Systems

BASES

BACKGROUND

The CS and CRFC systems provide containment atmosphere cooling to limit post accident pressure and temperature in containment to less than the design values. Reduction of containment pressure and the iodine removal capability of the CS System and the NaOH System reduces the release of fission product radioactivity from containment to the environment, in the event of a Design Basis Accident (DBA), to within limits. The CS, CRFC and NaOH are designed to meet the requirements of Atomic Industry Forum (AIF) GDC 49, 52, 58, 59, 60, and 61 (Ref. 1). The CS and NaOH also are designed to limit offsite doses following a DBA within 10 CFR <50.67 guidelines.

The CRFC System, CS System and NaOH System are Engineered Safety Feature (ESF) systems. They are designed to ensure that the heat removal capability required during the post accident period can be attained and reduce the potential release of radioactive material, principally iodine, from the containment to the outside environment. The CS System, CRFC System and NaOH System provide redundant methods to limit and maintain post accident conditions to less than the containment design values.

Containment Spray and NaOH Systems

The CS System consists of two redundant, 100% capacity trains. Each train includes a pump, spray headers, spray eductors, nozzles, valves, and piping (see Figure B 3.6.6-1). Each train is powered from a separate ESF bus. The refueling water storage tank (RWST) supplies borated water to the CS System during the injection phase of operation through a common supply header shared by the safety injection (SI) system. In the recirculation mode of operation, CS pump suction can be transferred from the RWST to Containment Sump B via the residual heat removal (RHR) system.

The CS System provides a spray of cold borated water mixed with sodium hydroxide (NaOH) from the spray additive tank into the upper regions of containment to reduce the containment pressure and temperature and to scavenge fission products from the containment atmosphere during a DBA. The RWST solution temperature is an important factor in determining the heat removal capability of the CS System during the injection phase. In the recirculation mode of operation, heat is removed from the containment sump water by the residual heat removal coolers. However, the CS System can provide additional containment heat removal capability if required. Each train of the CS System provides adequate spray coverage to meet the system design requirements for containment heat removal.

The NaOH mixture is injected into the CS flowpath via a liquid eductor during the injection phase of an accident. The eductors ensure that the pH of the spray mixture is a caustic solution. The NaOH added in the spray ensures an alkaline pH for the solution recirculated in the containment sump. The alkaline pH of the containment sump water minimizes the evolution of iodine and minimizes the occurrence of chloride and caustic stress corrosion on mechanical systems and components exposed to the fluid (Ref. 2).

The CS System is actuated either automatically by a containment Hi-Hi pressure signal or manually. DBAs which can generate an automatic actuation signal include the loss of coolant accident (LOCA) and steam line break (SLB). An automatic actuation opens the CS pump motor operated discharge valves (860A, 860B, 860C, and 860D), opens NaOH addition valves 836A and 836B, starts the two CS pumps, and begins the injection phase. A manual actuation of the CS System requires the operator to actuate two separate pushbuttons simultaneously on the main control board to begin the same sequence. The injection phase continues until an RWST low level alarm is received signaling the start of the recirculation phase of the accident.

During the recirculation phase of LOCA recovery, RHR pump suction is manually transferred to Containment Sump B (Refs. 3 and 4). This transfer is accomplished by stopping the RHR pumps, isolating RHR from the RWST by closing motor operated valve 856, opening the Containment Sump B motor operated isolation valves to RHR (850A and 850B) and then starting the RHR pumps. The SI and CS pumps are then stopped and the RWST isolated by closing motor operated isolation valve 896A or 896B for the SI and CS pump common supply header and closing motor operated isolation valve 897 or 898 for the SI pumps recirculation line.

The RHR pumps then supply the SI pumps if the RCS pressure remains above the RHR pump shutoff head as correlated through core exit temperature, containment pressure, and reactor vessel level indications (Ref. 5). This high-head recirculation path is provided through RHR motor operated isolation valves 857A, 857B, and 857C. These isolation valves are interlocked with 896A, 896B, 897, and 898. This interlock prevents opening of the RHR high head recirculation isolation valves unless either 896A or 896B are closed and either 897 or 898 are closed. If RCS pressure is such that RHR provides adequate injection flow for core cooling, the SI pumps remain in pull-stop.

The CS System is only used during the recirculation phase if containment pressure increases above a pressure at which containment integrity is potentially challenged. Otherwise, the containment heat removal provided by the CRFC units and Containment Sump B (via the RHR system) is adequate to support containment heat removal needs and the limits on sump pH (Refs. 2 and 6).

Operation of the CS System in the recirculation mode is controlled by the operator in accordance with the emergency operating procedures.

Containment Recirculation Fan Cooler System

The CRFC System consists of four fan units (A, B, C, and D). Each cooling unit consists of a motor, fan, cooling coils, dampers, moisture separators, high efficiency particulate air (HEPA) filters, duct distributors and necessary instrumentation and controls (see Figure B 3.6.6-2). CRFC units A and D are supplied by one ESF bus while CRFC units B and C are supplied by a redundant ESF bus. All four CRFC units are supplied cooling water by the Service Water (SW) System via a common loop header. Air is drawn into the coolers through the fan and discharged into the containment atmosphere including the various compartments (e.g., steam generator and pressurizer compartments). Although the charcoal filters associated with the A and C CRFC's are aligned during an SI, they are not credited for iodine removal in the dose analysis.

During normal operation, at least two fan units are typically operating. The CRFC System, operating in conjunction with other containment ventilation and air conditioning systems, is designed to limit the ambient containment air temperature during normal plant operation to less than the limit specified in LCO 3.6.5, "Containment Air Temperature." This temperature limitation ensures that the containment temperature does not exceed the initial temperature conditions assumed for the DBAs.

In post accident operation following a SI actuation signal, the CRFC System fans are designed to start automatically if not already running. The temperature of the cooling water supplied by SW System (LCO 3.7.8) is an important factor in the heat removal capability of the fan units.

APPLICABLE
SAFETY
ANALYSES

The CS System and CRFC System limit the temperature and pressure that could be experienced following a DBA. The limiting DBAs considered are the LOCA and the SLB which are analyzed using computer codes designed to predict the resultant containment pressure and temperature transients. No two DBAs are assumed to occur simultaneously or consecutively. The postulated DBAs are analyzed with regard to containment ESF systems, assuming the worst case single active failure.

The operability requirements for the CS System and the CRFC System are based on the following LOCA long-term containment response assumptions:

- a. A LOCA mass and energy event with a loss of offsite power, and a single failure of an EDG, which causes the loss of one of two containment spray pumps and two of four fan coolers; and
- b. For the LOCA long-term containment response the containment spray is credited only during the injection phase of the transient and is terminated during the transition to sump recirculation.

The analysis and evaluation show that under the worst case scenario, the highest peak containment pressure is 59.6 psig and the peak containment temperature is 358°F (both experienced during an SLB). Both results meet the intent of the design basis. (See the Bases for LCO 3.6.4, "Containment Pressure," and LCO 3.6.5, "Containment Temperature," for a detailed discussion.) The analyses and evaluations assume a plant specific power level of 1817MWt, one CS train and one containment cooling train operating, and initial (pre-accident) containment conditions of 120°F and 1.0 psig. The analyses also assume a response time delayed initiation to provide conservative peak calculated containment pressure and temperature responses.

For certain aspects of transient accident analyses, maximizing the calculated containment pressure is not conservative. In particular, the effectiveness of the Emergency Core Cooling System during the core reflood phase of a LOCA analysis increases with increasing containment backpressure. For these calculations, the containment backpressure is calculated in a manner designed to conservatively minimize, rather than maximize, the containment pressure response in accordance with 10 CFR 50, Appendix K (Ref. 7).

The effect of an inadvertent CS actuation is not considered since there is no single failure, including the loss of offsite power, which results in a spurious CS actuation.

The modeled CS System actuation for the containment analysis is based on a response time associated with exceeding the containment Hi-Hi pressure setpoint to achieving full flow through the CS nozzles. To increase the response of the CS System, the injection lines to the spray headers are maintained filled with water. The CS System total response time is 28.5 seconds for one pump to the upper spray header and 26.5 seconds for two pumps (average time between upper and lower spray headers). These total response times (assuming the containment Hi-Hi pressure is reached at time zero) include opening of the required motor operated isolation valve, containment spray pump startup, and spray line filling (Ref. 8).

The modeled CRFC System actuation for the containment analysis is based upon a response time associated with exceeding the SI actuation levels to achieving full CRFC System air and safety grade cooling water flow. The CRFC System total response time of 44 seconds, includes signal delay, DG startup (for loss of offsite power), and service water pump and CRFC unit startup times (Ref. 9).

During a SLB or LOCA, a minimum of two CRFC units and one CS train are required to maintain containment peak pressure and temperature below the design limits.

The CS and NaOH Systems operate to reduce the release of fission product radioactivity from containment to the outside environment in the event of a DBA. The DBAs that result in a release of radioactive iodine within containment are the LOCA or a rod ejection accident (REA). In the analysis for each of these accidents, it is assumed that adequate containment leak tightness is intact at event initiation to limit potential leakage to the environment. Additionally, it is assumed that the amount of radioactive iodine released is limited by reducing the iodine concentration present in the containment atmosphere.

The required iodine removal capability of the CS and NaOH Systems is established by the consequences of the limiting DBA, which is a LOCA. The accident analyses (Ref. 10) assume that one train of CS (taking suction from the NaOH System), and one CRFC train operate to remove radioactive iodine from the containment atmosphere.

The CS System, CRFC System and NaOH System satisfy Criterion 3 of the NRC Policy Statement.

LCO

During a DBA, a minimum of 2 CRFC units and one CS train are required to maintain the containment peak pressure and temperature below the design limits (Ref. 8). Additionally, one CS train taking suction from the NaOH System and two CRFC units are also required to remove iodine from the containment atmosphere and maintain concentrations below those assumed in the safety analysis. To ensure that these requirements are met, two CS trains, four CRFC units, and the NaOH System must be OPERABLE. Therefore, in the event of an accident, at least one CS train, the NaOH System, and two CRFC units operate, assuming the worst case single active failure occurs.

Each CS train includes a spray pump, spray headers, nozzles, valves, spray eductors, piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWST upon an ESF actuation signal and manually transferring suction to Containment Sump B via the RHR pumps. Only the CS pump motor operated discharge valves that are powered by the same electrical train (860A and 860D) that powers the respective CS pump are required to be operable. The redundant discharge valves (860B and 860C) are not assumed to open following a DBA.

Management of gas voids is important to CS System OPERABILITY.

For the NaOH System to be OPERABLE, the volume and concentration of spray additive solution in the tank must be within limits and air operated valves 836A and 836B must be OPERABLE.

Each CRFC unit includes a motor, fan cooling coils, dampers, moisture separators, HEPA filters, duct distributors, instruments, and controls to ensure an OPERABLE flow path.

The LCO is modified by a Note which states that in MODE 4, both CS pumps may be placed in pull-stop, with power restored to motor operated valves 896A and 896B and the valves placed in the closed position for interlock and valve testing of motor operated valves 857A, 857B, and 857C. This Note provides 2 hours for each test of each motor operated valve 857A, 857B, and 857C. The Note is required since the installed interlocks on 857A, 857B, and 857C require closure of valves 896A and 896B while other valve testing (e.g., differential pressure tests) require a pressurized RHR system. Performance of these tests in MODEs 5 and 6 would render the RHR system inoperable when it is required for core cooling.

APPLICABILITY	<p>In MODES 1, 2, 3, and 4, a DBA could cause a release of radioactive material to containment and an increase in containment pressure and temperature requiring the operation of the CS System, CRFC System and NaOH System.</p> <p>In MODES 5 and 6, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODES. Thus, the CS System, CRFC System and NaOH System are not required to be OPERABLE in MODES 5 and 6.</p>
ACTIONS	<p><u>A.1</u></p> <p>With one CS train inoperable, the inoperable CS train must be restored to OPERABLE status within 72 hours. In this Condition, the remaining OPERABLE spray and CRFC units are adequate to perform the iodine removal and containment cooling functions. The 72 hour Completion Time takes into account the redundant heat and iodine removal capability afforded by the CRFCs, reasonable time for repairs, and low probability of a DBA occurring during this period.</p> <p><u>B.1</u></p> <p>With the NaOH System inoperable, OPERABLE status must be restored within 72 hours. The pH adjustment of the Containment Spray System flow for corrosion protection and iodine removal enhancement is reduced in this condition. The Containment Spray System would still be available and would remove some iodine from the containment atmosphere in the event of a DBA. The 72 hour completion time takes into account the redundant flow path capabilities and the low probability of the worst case DBA occurring during this period.</p> <p><u>C.1 and C.2</u></p> <p>If the inoperable CS train or the NaOH System cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 84 hours. The allowed Completion Time of 6 hours is reasonable, based on operating experience, to reach MODE 3 from full power conditions in an orderly manner and without challenging plant systems. The extended interval to reach MODE 5 allows additional time for attempting restoration of the inoperable component(s) and is reasonable when considering the driving force for a release of radioactive material from the Reactor Coolant System is reduced in MODE 3.</p>

D.1

With one or two CRFC units inoperable, the inoperable CRFC unit(s) must be restored to OPERABLE status within 7 days. The inoperable CRFC units provided up to 100% of the containment heat removal needs. The 7 day Completion Time is justified considering the redundant heat removal capabilities afforded by combinations of the CS System and CRFC System and the low probability of DBA occurring during this period.

E.1 and E.2

If the Required Action and associated Completion Time of Condition D of this LCO are not met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

F.1

With two CS trains inoperable, or three or more CRFC units inoperable, the plant is in a condition outside the accident analysis. Therefore, LCO 3.0.3 must be entered immediately.

SURVEILLANCE
REQUIREMENTS

The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.

SR 3.6.6.1

The applicable SR descriptions from Bases 3.5.2 apply. This SR is required since the OPERABILITY of valves 896A and 896B is also required for the CS System.

SR 3.6.6.2

Verifying the correct alignment for manual, power operated, and automatic valves in the CS flow path provides assurance that the proper flow paths will exist for CS System operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these were verified to be in the correct position prior to locking, sealing, or securing. This SR does not require any testing or valve manipulation. Rather, it involves verification, through a system walkdown, that those valves outside containment (there are no valves inside containment) and capable of potentially being mispositioned are in the correct position.

SR 3.6.6.3

Verifying the correct alignment for manual, power operated, and automatic valves in the NaOH System flow path provides assurance that the proper flow paths will exist for NaOH System operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these were verified to be in the correct position prior to locking, sealing, or securing. This SR does not require any testing or valve manipulation. Rather, it involves verification, through a system walkdown, that those valves outside containment (there are no valves inside containment) and capable of potentially being mispositioned are in the correct position.

SR 3.6.6.4

Operating each CRFC unit for \geq 15 minutes once every 31 days ensures that all CRFC units are OPERABLE and that all associated controls are functioning properly. It also ensures that blockage, fan or motor failure, damper failures, or excessive vibration can be detected for corrective action. The A and C CRFC units must be operated with their respective charcoal filter train in the post accident alignment. The 31 day Frequency was developed considering the known reliability of the fan units and controls, the redundancy available, and the low probability of significant degradation of the CRFC units occurring between surveillances. It has also been shown to be acceptable through operating experience.

SR 3.6.6.5

Verifying cooling water (i.e., SW) flow to each CRFC unit provides assurance that the energy removal capability of the CRFC assumed in the accident analyses will be achieved (Ref. 11). The minimum and maximum SW flows are not required to be specifically determined by this SR due to the potential for a containment air temperature transient. Instead, this SR verifies that SW flow is available to each CRFC unit. The 31 day Frequency was developed considering the known reliability of the SW System, the two CRFC train redundancy available, and the low probability of a significant degradation of flow occurring between surveillances.

SR 3.6.6.6

Verifying each CS pump's developed head at the flow test point is greater than or equal to the required developed head ensures that spray pump performance has not degraded during the cycle. Flow and differential pressure are normal tests of centrifugal pump performance required by the ASME Code (Ref. 12). Since the CS pumps cannot be tested with flow through the spray headers, they are tested on recirculation flow. This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice testing confirms component

OPERABILITY, trends performance, and detects incipient failures by abnormal performance. The Frequency of the SR is in accordance with the Inservice Testing Program.

SR 3.6.6.7

To provide effective iodine removal, the containment spray must be an alkaline solution. Since the RWST contents are normally acidic, the spray additive tank must provide a sufficient volume of spray additive to adjust pH for all water that is injected. This SR is performed to verify the availability of sufficient NaOH solution in the spray additive tank. The 184 day Frequency was developed based on the low probability of an undetected change in tank volume occurring during the SR interval since the tank is normally isolated. Tank level is also indicated and alarmed in the control room, so that there is high confidence that a substantial change in level would be detected.

SR 3.6.6.8

This SR provides verification of the NaOH concentration in the spray additive tank and is sufficient to ensure that the spray solution being injected into containment is at the correct pH level. The 184 day Frequency is sufficient to ensure that the concentration level of NaOH in the spray additive tank remains within the established limits. This is based on the low likelihood of an uncontrolled change in concentration since the tank is normally isolated and the probability that any substantial variance in tank volume will be detected.

SR 3.6.6.9

This SR verifies that the required CRFC unit testing is performed in accordance with the VFTP. The VFTP includes testing HEPA filter performance. The minimum required flow rate through each of the four CRFC units is 33,000 cubic feet per minute at accident conditions (or 38,500 cubic feet per minute at normal operating conditions). Specific test frequencies and additional information are discussed in detail in the VFTP. However, the maximum surveillance interval for refueling outage tests is based on 24 month refueling cycles and not 18 month cycles as defined by Regulatory Guide 1.52 (Ref. 13).

SR 3.6.6.10

These SRs require verification that each automatic CS valve in the flowpath (860A and 860D) actuates to its correct position and that each CS pump starts upon receipt of an actual or simulated actuation of a containment High pressure signal. This surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. The 24 month Frequency is based on the need to perform these Surveillances under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillances were performed with the reactor at power. Operating

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

SR 3.6.6.11

See SR 3.6.6.10

SR 3.6.6.12

This SR requires verification that each CRFC unit, and the charcoal filter train associated with the A and C units, actuates upon receipt of an actual or simulated safety injection signal. The 24 month Frequency is based on engineering judgment and has been shown to be acceptable through operating experience. See SR 3.6.6.10 and SR 3.6.6.11, above, for further discussion of the basis for the 24 month Frequency.

SR 3.6.6.13

This SR provides verification that each automatic valve in the NaOH System flow path that is not locked, sealed, or otherwise secured in position (836A and 836B) actuates to its correct position upon receipt of an actual or simulated actuation of a containment Hi-Hi pressure signal. The 24 month frequency is based on engineering judgement and has been shown to be acceptable through operating experience. See SR 3.6.6.10 and SR 3.6.6.11, above, for further discussion of the basis for the 24 month Frequency.

SR 3.6.6.14

To ensure that the correct pH level is established in the borated water solution provided by the CS System, flow through the eductor is verified once every 5 years. This SR in conjunction with SR 3.6.6.13 provides assurance that NaOH will be added into the flow path upon CS initiation. A minimum flow of 20 gpm through the eductor must be established as assumed in the accident analyses. A flow path must also be verified from the NaOH tank to the eductors. Due to the passive nature of the spray additive flow controls, the 5 year Frequency is sufficient to identify component degradation that may affect flow injection.

SR 3.6.6.15

With the CS inlet valves closed and the spray header drained of any solution, low pressure air or smoke can be blown through test connections. As an alternative, a visual inspection (e.g. boroscope) of the nozzles or piping could be utilized in lieu of an air or smoke test if a visual inspection is determined to provide an equivalent or a more effective post-maintenance test. A visual inspection may be more effective if the potential for material intrusion is localized and the affected area is accessible. This SR ensures that each spray nozzle is unobstructed and provides assurance that spray coverage of the

containment during an accident is not degraded. Due to the passive design of the nozzle, and the corrosion resistant design of the system, a test performed following maintenance which could result in nozzle blockage is considered adequate to detect obstruction of the nozzles. Maintenance that could result in nozzle blockage would be those maintenance activities where the Foreign Material Exclusion program controls were deemed ineffective. For activities, such as valve repair/replacement, a visual inspection would be the preferred post-maintenance test since small debris in a localized area is the most likely concern. A smoke or air test may be appropriate following an event where a large amount of debris potentially entered the system or borated water was actually discharged through the spray nozzles.

REFERENCES

1. Atomic Industry Forum (AIF) GDC 49, 52, 58, 59, 60, and 61, issued for comment July 10, 1967.
 2. Branch Technical Position MTEB 6-1, "pH For Emergency Coolant Water For PWRs."
 3. Letter from D. M. Crutchfield, NRC, to J. E. Maier, RG&E, Subject: "SEP Topic VI-7.B: ESF Automatic Switchover from Injection to Recirculation Mode, Automatic ECCS Realignment, Ginna," dated December 31, 1981.
 4. NUREG-0821.
 5. UFSAR, Section 6.3.
 6. UFSAR, Section 6.1.2.4.
 7. 10 CFR 50, Appendix K.
 8. UFSAR, Section 6.2.1.2.
 9. UFSAR, Section 6.2.2.2.
 10. UFSAR, Section 6.5.
 11. UFSAR, Section 6.2.2.1.
 12. ASME Code for Operation and Maintenance of Nuclear Power Plants.
 13. Regulatory Guide 1.52, Revision 2.
 14. Design Analysis DA-NS-2001-087, Large Break LOCA Offsite and Control Room Doses.
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Insert 5

Insert 5

SR 3.6.6.16

Containment Spray System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the containment spray trains and may also prevent water hammer and pump cavitation.

Selection of Containment Spray System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The Containment Spray System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the Containment Spray System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

Containment Spray System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the Containment Spray System piping and the procedural controls governing system operation.

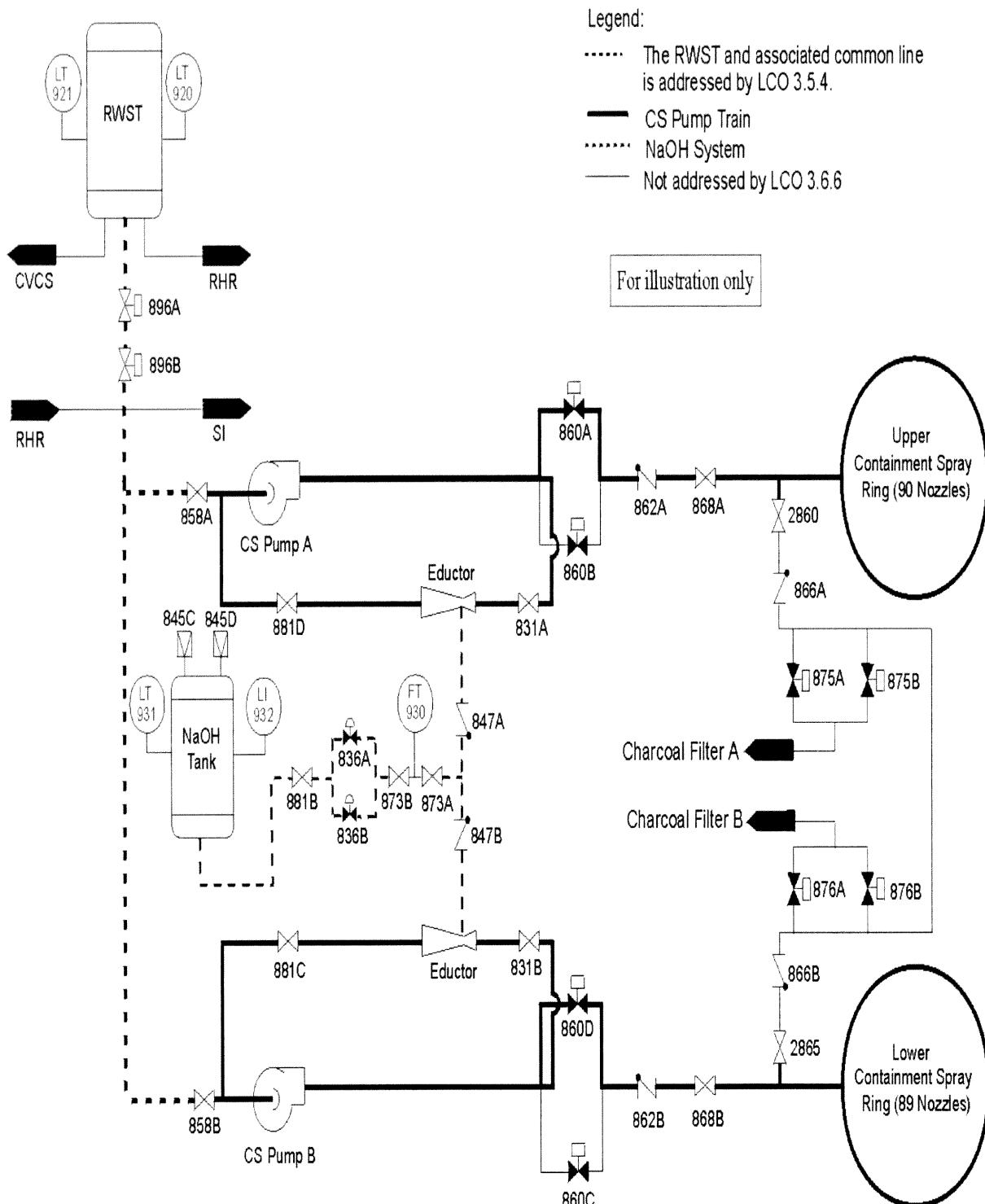
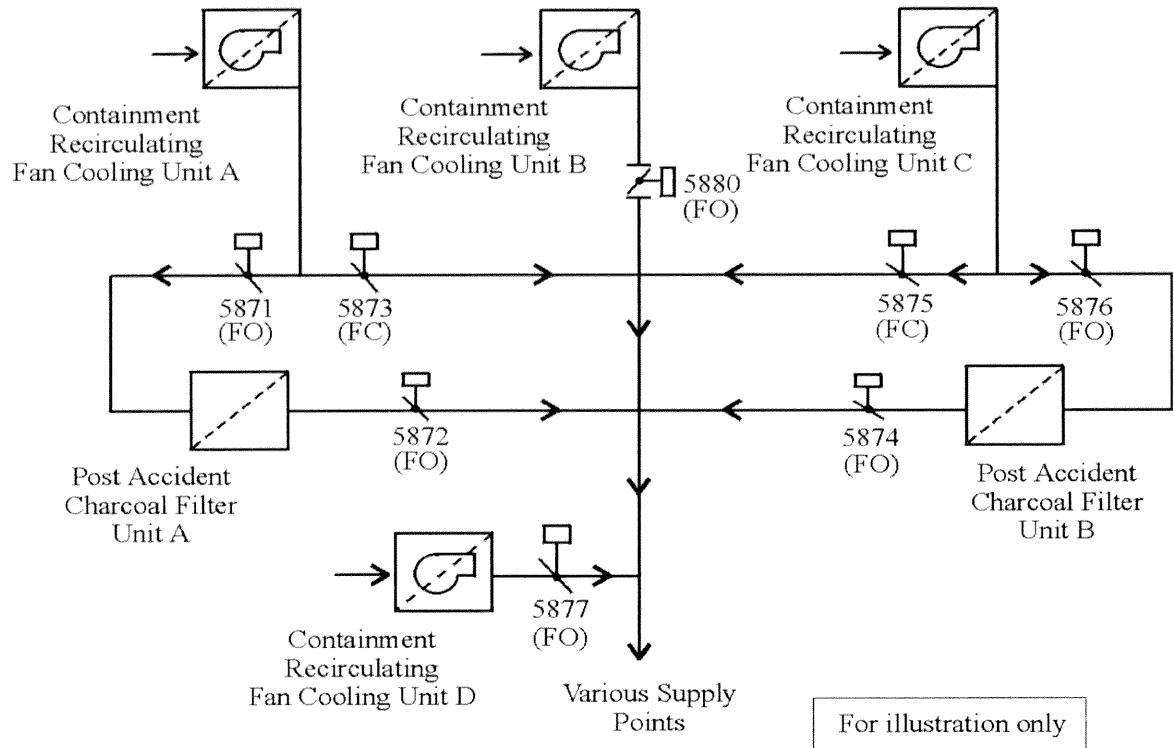


Figure B 3.6.6-1
Containment Spray and NaOH Systems



Notes:

1. Dampers 5871 and 5872 are associated with Post Accident Charcoal Filter Unit A
2. Dampers 5874 and 5876 are associated with Post Accident Charcoal Filter Unit B
3. Damper 5873 is associated with both CRFC Unit A and Post Accident Charcoal Filter Unit A
4. Damper 5875 is associated with both CRFC Unit C and Post Accident Charcoal Filter Unit B

Figure B 3.6.6-2
CRFC and Containment Post-Accident Charcoal Systems

B 3.9 REFUELING OPERATIONS

B 3.9.4 Residual Heat Removal (RHR) and Coolant Circulation-Water Level \geq 23 Ft

BASES

BACKGROUND The purpose of the RHR System in MODE 6 is to remove decay heat and sensible heat from the Reactor Coolant System (RCS), and to provide mixing of the borated coolant to prevent thermal and boron stratification (Ref. 1). Heat is removed from the RCS by circulating reactor coolant through the RHR heat exchanger(s) where the heat is transferred to the Component Cooling Water System. The coolant is then returned to the RCS via the RCS loop "B" cold leg. Operation of the RHR System for normal cooldown or decay heat removal is manually accomplished from the control room. The heat removal rate is adjusted by controlling the flow of reactor coolant through the RHR heat exchanger(s) and bypass line(s). Mixing of the reactor coolant is maintained by this continuous circulation of reactor coolant through the RHR System.

APPLICABLE SAFETY ANALYSES The safety analysis for the boron dilution event during refueling assumes one RHR loop is in operation (Ref. 2). This initial assumption ensures continuous mixing of the borated coolant in the reactor vessel. The analysis also assumes the RCS is at equilibrium boron concentration and dilution occurs uniformly throughout the system. Therefore, thermal or boron stratification is not postulated. In order to ensure adequate mixing of the borated coolant, one loop of the RHR System is required to be OPERABLE, and in operation while in MODE 6, with water level \geq 23 ft above the top of the reactor vessel flange.

While there is no explicit analysis assumption for the decay heat removal function of the RHR System in MODE 6, if the reactor coolant temperature is not maintained, boiling of the coolant could result. Due to the water volume available in the RCS with a water level \geq 23 ft above the top of the reactor vessel flange, a significant amount of time exists before boiling of the coolant would occur following a loss of the required RHR pump. Since the loss of the required RHR pump results in the requirement to suspend operations involving a reduction in reactor coolant boron concentration, a boron dilution event is very unlikely. Therefore, this requirement dictates that single failures are not considered for this LCO due to the time available to operators to respond to a loss of the operating RHR pump.

The LCO permits de-energizing the required RHR pump for short durations provided no operations are permitted that would cause a reduction in the RCS boron concentration. This conditional de-energizing of the required RHR pump does not result in a challenge to the fission product barrier or result in coolant stratification.

RHR and Coolant Circulation-Water Level \geq 23 Ft satisfies criterion 2 of the NRC Policy Statement.

LCO	<p>Only one RHR loop is required for decay heat removal in MODE 6, with the water level \geq 23 ft above the top of the reactor vessel flange, because the volume of water above the reactor vessel flange provides backup decay heat removal capability. One RHR loop is required to be OPERABLE and in operation to provide mixing of borated coolant to minimize the possibility of criticality.</p> <p>An OPERABLE RHR loop includes an RHR pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path. The flow path starts in the RCS loop "A" hot leg and is returned to the RCS loop "B" cold leg. Also included are all necessary support systems not addressed by applicable LCOs (e.g., component cooling water and service water).</p> <p>Management of gas voids is important to RHR System OPERABILITY.</p> <p>The LCO is modified by a Note that allows the required operating RHR loop to be removed from service for up to 1 hour per 8 hour period provided no operations are permitted that would dilute the RCS boron concentration with coolant at boron concentrations less than required to meet the minimum boron concentration of LCO 3.9.1. Boron concentration reduction with coolant at boron concentrations less than required to assure the minimum required RCS boron concentration is maintained is prohibited because uniform concentration distribution cannot be ensured without forced circulation. This allows the operator to view the core and permits operations such as core mapping or alterations in the vicinity of the reactor vessel hot leg nozzles. This also permits operations such as RCS to RHR isolation valve testing. During this 1 hour period, decay heat is removed by natural convection to the large mass of water in the refueling cavity. Should both RHR loops become inoperable at anytime during operation in accordance with this Note, the Required Actions of this LCO should be immediately taken.</p>
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APPLICABILITY	One RHR loop must be OPERABLE and in operation in MODE 6, with the water level \geq 23 ft above the top of the reactor vessel flange, to provide decay heat removal and mixing of the borated coolant. The 23 ft water level was selected because it corresponds to the 23 ft requirement established for fuel movement in LCO 3.9.6, "Refueling Cavity Water Level."
	Requirements for the RHR System in MODES 1, 2, 3, 4, and 5 are covered by LCO 3.4.6, "RCS Loops - MODE 4;" LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled;" LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled", LCO 3.5.2, "ECCS-MODES 1, 2, and 3," and LCO 3.5.3, "ECCS-MODE 4". The RHR loop requirements in MODE 6 with the water level $<$ 23 ft are located in LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation-Water Level < 23 Ft."
ACTIONS	<p><u>A.1, A.2, and A.3</u></p> <p>If RHR loop requirements are not met, there will be no forced circulation to provide mixing to establish uniform boron concentrations. Suspending positive reactivity additions that could result in failure to meet the minimum boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that required in the RCS for minimum refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation.</p> <p>With no forced circulation cooling, decay heat removal from the core occurs by natural convection to the heat sink provided by the water above the core. A minimum refueling water level of 23 ft above the reactor vessel flange provides an adequate available heat sink. Suspending any operation that would increase decay heat load, such as loading a fuel assembly, is a prudent action under this condition. Therefore, actions shall be taken immediately to suspend loading irradiated fuel assemblies in the core.</p> <p>With the plant in MODE 6 and the refueling water level \geq 23 ft above the top of the reactor vessel flange, removal of decay heat is by ambient losses only. Therefore, corrective actions shall be initiated immediately and shall continue until RHR loop requirements are satisfied.</p>

A.4

If RHR loop requirements are not met, all containment penetrations providing direct access from the containment atmosphere to the outside atmosphere must be closed within 4 hours. With the RHR loop requirements not met, the potential exists for the coolant to boil and release radioactive gas to the containment atmosphere. Closing containment penetrations that are open to the outside atmosphere ensures dose limits are not exceeded.

The Completion Time of 4 hours is reasonable, based on the low probability of the coolant boiling in that time.

SURVEILLANCE
REQUIREMENTS

SR 3.9.4.1

This SR requires verification every 12 hours that one RHR loop is in operation and circulating reactor coolant. Verification includes flow rate, temperature, or pump status monitoring, which help ensure that forced flow is providing decay heat removal capability and mixing of the borated coolant to prevent thermal and boron stratification in the core. The Frequency of 12 hours is sufficient considering other indications and alarms available to the operator in the control room to monitor RHR loop performance.

REFERENCES

1. UFSAR, Section 5.4.5.
 2. UFSAR, Section 15.4.4.2.
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Insert 6

Insert 6

SR 3.9.4.2

RHR System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RHR loops and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RHR System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits. RHR System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR System piping and the procedural controls governing system operation.

B 3.9 REFUELING OPERATIONS

B 3.9.5 Residual Heat Removal (RHR) and Coolant Circulation-Water Level < 23 Ft

BASES

BACKGROUND The purpose of the RHR System in MODE 6 is to remove decay heat and sensible heat from the Reactor Coolant System (RCS), and to provide mixing of the borated coolant to prevent thermal and boron stratification (Ref. 1). Heat is removed from the RCS by circulating reactor coolant through the RHR heat exchanger(s) where the heat is transferred to the Component Cooling Water System. The coolant is then returned to the RCS via the RCS loop "B" cold leg. Operation of the RHR System for normal cooldown or decay heat removal is manually accomplished from the control room. The heat removal rate is adjusted by controlling the flow of reactor coolant through the RHR heat exchanger(s) and bypass line(s). Mixing of the reactor coolant is maintained by this continuous circulation of reactor coolant through the RHR System.

APPLICABLE SAFETY ANALYSES The safety analysis for the boron dilution event during refueling assumes one RHR loop is in operation (Ref. 2). This initial assumption ensures continuous mixing of the borated coolant in the reactor vessel. The analysis also assumes the RCS is at equilibrium boron concentration and dilution occurs uniformly throughout the system. Therefore, thermal or boron stratification is not postulated.

While there is no explicit analysis assumption for the decay heat removal function of the RHR System in MODE 6, if the reactor coolant temperature is not maintained, boiling of the coolant could result. This could lead to a loss of coolant in the reactor vessel. In addition, boiling of the coolant could lead to a reduction in boron concentration in the coolant due to boron plating out on components near the areas of the boiling activity. The loss of coolant and the reduction of boron concentration in the reactor coolant could eventually challenge the integrity of the fuel cladding, which is a fission product barrier.

In order to prevent a challenge to fuel cladding and to ensure adequate mixing of the borated coolant, two loops of the RHR System are required to be OPERABLE, and one loop in operation while in MODE 6, with the water level < 23 ft above the top of the reactor vessel flange.

RHR and Coolant Circulation-Water Level < 23 Ft satisfies criterion 4 of the NRC Policy Statement.

LCO Both RHR loops must be OPERABLE in MODE 6, with the water level < 23 ft above the top of the reactor vessel flange. In addition, one RHR loop must be in operation in order to remove decay heat and provide mixing of borated coolant to minimize the possibility of criticality.

An OPERABLE RHR loop includes an RHR pump, a heat exchanger, valves, piping, instruments and controls to ensure an OPERABLE flow path. The flow path starts in the RCS loop "A" hot leg and is returned to the RCS loop "B" cold leg. Also included are all necessary support systems not addressed by applicable LCOs (e.g., component cooling water and service water).

Management of gas voids is important to RHR System OPERABILITY.

The RHR flow path described above is considered OPERABLE if modified during filling of the refueling canal or in order to perform surveillance tests during this time. This modified flow path starts from either the RCS Loop "A" hot leg or the RWST, is pumped through the RHR bypass line, and is returned to the reactor vessel through the deluge valves. This flow path is acceptable provided operations involving a reduction of boron concentration are not conducted or the source of the injection has a boron concentration greater than the requirements of LCO 3.9.1; "Boron Concentration", and during surveillance testing when only one deluge valve is open the duration is \leq 1 hour.

APPLICABILITY Two RHR loops are required to be OPERABLE, and one RHR loop must be in operation in MODE 6, with the water level < 23 ft above the top of the reactor vessel flange, to provide decay heat removal and mixing of the borated coolant.

Requirements for the RHR System in MODES 1, 2, 3, 4, and 5 are covered by LCO 3.4.6, "RCS Loops - MODE 4;" LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled;" LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled;" LCO 3.5.2, "ECCS-MODES 1, 2, and 3," and LCO 3.5.3, "ECCS-MODE 4". The RHR loop requirements in MODE 6 with the water level \geq 23 ft are located in LCO 3.9.4, "Residual Heat Removal (RHR) and Coolant Circulation-Water Level \geq 23 Ft."

ACTIONS

A.1 and A.2

If less than the required number of RHR loops are OPERABLE, action shall be immediately initiated and continued until the RHR loop is restored to OPERABLE status or until \geq 23 ft of water level is established above the reactor vessel flange. When the water level is \geq 23 ft above the reactor vessel flange, the Applicability changes to that of LCO 3.9.4, and only one RHR loop is required to be OPERABLE and in operation. An immediate Completion Time is necessary for an operator to initiate corrective actions.

B.1 and B.2

If no RHR loop is in operation, there will be no forced circulation to provide mixing to establish uniform boron concentrations. Suspending positive reactivity additions that could result in failure to meet the minimum boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that required in the RCS for minimum refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation. Actions shall also be initiated immediately, and continued, to restore one RHR loop to operation. Since the plant is in Conditions A and B concurrently, the restoration of two OPERABLE RHR loops and one operating RHR loop should be accomplished expeditiously.

B.3

If no RHR loop is in operation, all containment penetrations providing direct access from the containment atmosphere to the outside atmosphere must be closed within 4 hours. With the RHR loop requirements not met, the potential exists for the coolant to boil and release radioactive gas to the containment atmosphere. Closing containment penetrations that are open to the outside atmosphere ensures that dose limits are not exceeded.

The Completion Time of 4 hours is reasonable, based on the low probability of the coolant boiling in that time.

SURVEILLANCE
REQUIREMENTS

SR 3.9.5.1

This SR requires verification every 12 hours that one RHR loop is in operation and circulating reactor coolant. Verification includes flow rate, temperature, or pump status monitoring, which help ensure that forced flow is providing decay heat removal capability and mixing of the borated coolant to prevent thermal and boron stratification in the core. The Frequency of 12 hours is sufficient considering other indications and alarms available to the operator in the control room to monitor RHR loop performance.

SR 3.9.5.2

Verification that a second RHR pump is OPERABLE ensures that an additional pump can be placed in operation, if needed, to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available to the standby pump. The Frequency of 7 days is considered reasonable in view of other administrative controls available and has been shown to be acceptable by operating experience.

REFERENCES

1. UFSAR, Section 5.4.5.
 2. UFSAR, Section 15.4.4.
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Insert 7

Insert 7

SR 3.9.5.3

RHR System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the RHR loops and may also prevent water hammer, pump cavitation, and pumping of noncondensable gas into the reactor vessel.

Selection of RHR System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

The RHR System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The 31 day Frequency takes into consideration the gradual nature of gas accumulation in the RHR System piping and the procedural controls governing system operation.