Xcel Energy®

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L-PI-15-030
10 CFR 50.90

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

Prairie Island Nuclear Generating Plant Units 1 and 2
Dockets 50-282 and 50-306
Renewed License Nos. DPR-42 and DPR-60

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

Pursuant to 10 CFR 50.90, Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM"), hereby submits a request for an amendment to revise the Technical Specifications (TS) for Prairie Island Nuclear Generating Plant (PINGP), Units 1 and 2.

Attachment 1 provides a description and assessment of the proposed change. Attachment 2 provides the existing TS pages marked up to show the proposed change. Attachment 3 provides revised (clean) TS pages. Attachment 4 provides existing TS Bases pages marked to show the proposed change. Changes to the existing TS Bases, consistent with the technical and regulatory analyses, will be implemented under the Technical Specification Bases Control Program. They are provided in Attachment 4 for information only.

By letter dated January 15, 2015 (ML15015A404), NSPM committed to evaluate the impact of adopting Technical Specification Task Force (TSTF) Traveler 523 by June 30, 2015 and submit an LAR for its adoption if necessary. This submittal satisfies the commitment.

Approval of the proposed amendment is requested by June 30, 2016. Once approved, the amendment shall be implemented within 90 days.

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

A134
NRR

If there are any questions or if additional information is needed, please contact Mr. Bryan Willard at 651-267-6829.

Summary of Commitments

This letter contains no new commitments and no revisions to existing commitments.

I declare under penalty of perjury that the foregoing is true and correct.
Executed on June 29, 2015

Scott Sharp
Director Site Operations, Prairie Island Nuclear Generating Plant
Northern States Power Company - Minnesota

Attachments (4)

cc: Administrator, Region III, USNRC
Project Manager, PINGP, USNRC
Resident Inspector, PINGP, USNRC
State of Minnesota

ATTACHMENT 1

Description and Assessment

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

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

Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM"), has reviewed the model safety evaluation dated January 15, 2014 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, NSPM 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 Prairie Island Nuclear Generating Plant (PINGP), Units 1 and 2, and justify this amendment for the incorporation of the changes to the PINGP TS.

TSTF-523, Revision 2, and the model safety evaluation discuss the applicable regulatory requirements and guidance, including the 10 CFR 50, Appendix A, General Design Criteria (GDC). PINGP Units 1 and 2 were not licensed to the 10 CFR 50, Appendix A, GDC. The PINGP equivalent of the referenced GDC are discussed in the Updated Safety Evaluation Report (USAR) Section 1.2, Principal Design Criteria. The PINGP design criterion that equates to 10 CFR 50 Appendix A, GDC 1 is addressed in USAR Section 1.2.1, Overall Plant Requirements (GDC 1 – GDC 5) and the design criteria that equate to 10 CFR 50 Appendix A, GDC 34 through GDC 40 are addressed in USAR Section 1.2.6, Reactor Coolant Pressure Boundary (GDC 33 – GDC 36), and USAR Section 1.2.7, Engineered Safety Features (GDC 37 - GDC 65). This difference

does not alter the conclusion that the proposed change is applicable to PINGP, Units 1 and 2.

2.2 <u>Optional Changes and Variations</u>

NSPM proposes the following variations from the TS changes described in the TSTF-523, Revision 2, or the applicable parts of the NRC staff's model safety evaluation dated January 15, 2014.

The PINGP TS utilize different numbering than the NUREG-1431, Standard Technical Specifications (STS), on which TSTF-523, Revision 2, was based. PINGP TS do not have the existing TS 3.5.2, ECCS - Operating, Surveillance Requirements revised by TSTF-523, Revision 2. This difference does not affect the applicability of TSTF-523, Revision 2, to the PINGP TS. Specifically, numbering and content differences are provided in the following table.

NUREG-1431, STS	TSTF-523 Change	PINGP TS Change Differences
3.5.2, ECCS - Operating	Revise SR 3.5.2.3 and associated Bases.	Add new SR 3.5.2.4, SR 3.5.2.5, and new associated Bases. Renumber subsequent SRs.
3.5.3, ECCS - Shutdown	Revise LCO Bases only.	Revise SR 3.5.3.1 to include two additional SRs.
3.6.6A, Containment Spray and Cooling Systems	Add new SR 3.6.6A.4 and associated Bases.	Add new SR 3.6.5.3 and associated Bases.

With the exception of the SR 3.5.2.5 addition, these differences are administrative in nature. None of the proposed variations affect the applicability of TSTF-523 to the PINGP TS.

NSPM is proposing the addition of new SR 3.5.2.5, with an associated Frequency of "Prior to entering Mode 3 after exiting shutdown cooling" in lieu of the specified 31 day Frequency. The justification for the additional SR and extended Frequency is provided below:

- Safety injection system inaccessible location configuration

  The four inaccessible locations (two locations per unit) are designated 1SI-44, 1SI-45 for Unit 1 and 2SI-14A, 2SI-14B for Unit 2. The inaccessible locations are located on corresponding line numbers 2-SI-35A, 2-SI-35B, 2-2SI-35A and 2-2SI-35B. These locations are adjacent to the RCS first-off pressure isolation check valves and are inaccessible during normal operations due to dose and temperature concerns.

The Safety Injection system piping injects into each of the RCS cold legs through a single common pipe that branches into two separate 2" lines. On each of the 2" branches, there are two check valves installed that are the pressure boundary valves for the RCS. The first-off check valves (SI-9-1, SI-9-2, 2SI-9-1, and 2SI-9-2) are 6" swing disc check valves. The second-off check valves (SI-16-4, SI-16-5, 2SI-16-4, and 2SI-16-6) are 2" spring loaded piston type check valves.

The geometry of the four inaccessible locations consists of a vertically oriented 6" check valve that connects to the RCS loop piping with RCS pressure on the downstream side of the disc. These locations are all high points that would allow gas to accumulate inside the check valve on the upstream side of the disc.

The locations are inaccessible due to high dose rates during power operation and close proximity to the RCS loop piping. These areas are examined at the piping adjacent to the check valve due to the valve configuration and examination limitations.

- Gas intrusion source

The Safety Injection piping connects directly to a pressurized Reactor Coolant System. Dissolved gases in the reactor coolant are controlled by the Chemical and Volume Control System (VC) that maintains the concentration of hydrogen or nitrogen gas present through the Volume Control Tank (VCT). The current Gas Accumulation Management Program (GAMP) indicates if back-leakage were to occur, the lower pressure on the upstream side of the check valve would result in hydrogen gas coming out of solution and a void formation. Thus, these locations meet the definition of susceptible locations per the program documents.

Site engineering personnel have determined that a very specific leakage condition must exist for a void to form at the inaccessible locations. For void formation to occur, both the first-off and second-off pressure boundary check valves need to be leaking. If only a single check valve is leaking, a void cannot form due to pressurization between the check valves. If the first-off check valve is leaking at a rate that is greater than the second-off check valve, then the area between the check valves will pressurize and a void cannot form. A void will only form if the second-off check valve is leaking at a greater rate than the first-off check valve since that is the only condition that will simultaneously allow leakage from the RCS and also prevent pressure buildup between the check valves.

Per USAR Section 6, the design leakage limit for these valves is stated as 3 cc/hr per inch of nominal pipe size. This means that the 6" first-off check valves would have a design leakage rate of 18 cc/hr and the 2" second-off check valves would have a design leakage rate of 6 cc/hr. This design leakage rate is important to consider since it is impossible to design a zero leakage check valve with hard seats. Since the first-off check valves have a higher design leakage

rate than the second-off check valves, it supports the position that void formation is unlikely. This is because a higher leakage through the first-off check valves, when compared to the second-off check valves, would tend to pressurize the piping between the check valves, which would effectively prevent void formation.

- Alternative monitoring

PINGP will monitor the locations prior to entering Mode 3 after exiting shutdown cooling during startup in lieu of the specified 31 day frequency.

In addition to the proposed TS 3.2.5.2 Surveillance Frequency, the inaccessible locations are checked for voids at the earliest possible shutdown condition. This as-found testing occurs in accordance with the PINGP GAMP, under conditions that ensure the check valves at the inaccessible locations are properly seated.

During refueling outages, PINGP will verify the relative leakage rates of the check valves are maintained such that void formation during the cycle is mitigated. The check valve leakage rates will be validated to ensure no leakage is present, or the leakage rate of the first-off check valves (SI-9-1, SI-9-2, 2SI-9-1, and 2SI-9-2) is greater than the corresponding second-off check valves (SI-16-4, SI-16-5, 2SI-16-4, and 2SI-16-6).

By verifying the conditions necessary for void formation are not present, maintaining the as left condition during the cycle, and monitoring of the locations when accessible, reasonable assurance of safety is maintained for the system.

3.0 REGULATORY ANALYSIS

3.1 No Significant Hazards Consideration

Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM"), 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 Prairie Island Nuclear Generating Plant, Units 1 and 2, technical specifications (TS). The proposed change adds Surveillance Requirements to verify that the system locations susceptible gas accumulation are sufficiently filled with water and to provide allowances which permit performance of the verification.

Northern States Power Company, a Minnesota corporation (NSPM), evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, “Issuance of amendment,” as discussed below:

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

Response: No

The proposed change adds Surveillance Requirements (SRs) that require verification that the Emergency Core Cooling System (ECCS), the Residual Heat Removal (RHR) System, and the Containment Spray (CS) System 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 licensing basis change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

Response: No

The proposed change adds SRs that require verification that the ECCS, the RHR System, and the CS System 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 licensing basis change does not create the possibility of a new or different kind of accident from any previously evaluated.

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

Response: No

The proposed change adds SRs that require verification that the ECCS, the RHR System, and the CS System 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 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.

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

Based on the above, Northern States Power Company, a Minnesota corporation (NSPM), concludes that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c) and, accordingly, a finding of "no significant hazards consideration" is justified.

4.0 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 amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment 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 amendment.

ATTACHMENT 2

Technical Specification Pages (Markup)

3.4.6-3
3.4.7-4
3.4.8-3
3.5.2-2
3.5.2-3
3.5.2-4
3.5.3-2
3.6.5-3
3.6.5-4
3.9.5-3
3.9.6-3

11 pages follow

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.6.1	Verify required RHR or RCS loop is in operation.	12 hours
SR 3.4.6.2	Verify required SG capable of removing decay heat.	12 hours
SR 3.4.6.3	-------------------------NOTE------------------------- Not required to be performed until 24 hours after a required pump is not in operation. --- Verify correct breaker alignment and indicated power are available to each required pump.	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

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.7.1	Verify required RHR loop is in operation.	12 hours
SR 3.4.7.2	Verify required SG capable of removing decay heat.	12 hours
SR 3.4.7.3	-------------------------NOTE------------------------- Not required to be performed until 24 hours after a required pump is not in operation. --- Verify correct breaker alignment and indicated power are available to each required RHR pump.	7 days
SR 3.4.7.4	Verify required RHR loop locations susceptible to gas accumulation are sufficiently filled with water.	31 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.8.1	Verify required RHR loop is in operation.	12 hours
SR 3.4.8.2	-------------------------NOTE--------------------------- Not required to be performed until 24 hours after a required pump is not in operation. -- Verify correct breaker alignment and indicated power are available to each required RHR pump.	7 days
SR 3.4.8.3	Verify RHR loop locations susceptible to gas accumulation are sufficiently filled with water.	31 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.5.2.1 Verify the following valves are in the listed position.	12 hours

Unit 1 Valve Number	Westing-house Valve Number	Position	Function
32070	8801A	OPEN	SI Injection to RCS Cold Leg A
32068	8801B	OPEN	SI Injection to RCS Cold Leg B
32073	8806A	OPEN	SI Cold Leg Injection Line
32206	8816A	CLOSED	SI Pump Suction from RHR
32207	8816B	CLOSED	SI Pump Suction from RHR

Unit 2 Valve Number	Westing-house Valve Number	Position	Function
32173	8801A	OPEN	SI Injection to RCS Cold Leg A
32171	8801B	OPEN	SI Injection to RCS Cold Leg B
32176	8806A	OPEN	SI Cold Leg Injection Line
32208	8816A	CLOSED	SI Pump Suction from RHR
32209	8816B	CLOSED	SI Pump Suction from RHR

SURVEILLANCE	FREQUENCY
SR 3.5.2.2 ------------------------NOTE------------------------ Not required to be met for system vent flow paths opened under administrative control. --- 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.	31 days

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.2.3	Verify power to the valve operator has been removed for each valve listed in SR 3.5.2.1.	31 days
SR 3.5.2.4	Verify ECCS accessible locations susceptible to gas accumulation are sufficiently filled with water.	31 days
SR 3.5.2.5	Verify ECCS inaccessible locations susceptible to gas accumulation are sufficiently filled with water.	Prior to entering MODE 3 after exiting shutdown cooling
SR 3.5.2.64	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 3.5.2.75	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

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.2.8~~6~~	Verify each ECCS pump starts automatically on an actual or simulated actuation signal.	24 months
SR 3.5.2.9~~7~~	Verify each ECCS throttle valve listed below is in the correct position. Unit 1 Valve Number / Unit 2 Valve Number SI-15-6 / 2SI-15-6 SI-15-7 / 2SI-15-7 SI-15-8 / 2SI-15-8 SI-15-9 / 2SI-15-9	24 months
SR 3.5.2.10~~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

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Required Action and associated Completion Time of Condition B not met.	C.1 Be in MODE 5.	24 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.5.3.1 The following SRs are applicable for all equipment required to be OPERABLE: SR 3.5.2.1 SR 3.5.2.6~~7~~ SR 3.5.2.3 SR 3.5.2.9~~8~~ SR 3.5.2.4 SR 3.5.2.10 SR 3.5.2.5	In accordance with applicable SRs

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.5.1	-------------------------NOTE------------------------ Not required to be met for system vent flow paths opened under administrative control. --- 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
SR 3.6.5.2	Operate each containment fan coil unit on low motor speed for ≥ 15 minutes.	31 days
SR 3.6.5.3	Verify containment spray locations susceptible to gas accumulation are sufficiently filled with water.	31 days
SR 3.6.5.~~4~~3	Verify cooling water flow rate to each containment fan coil unit is ≥ 900 gpm.	24 months
SR 3.6.5.~~5~~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

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.5.6~~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 3.6.5.7~~6~~	Verify each containment spray pump starts automatically on an actual or simulated actuation signal.	24 months
SR 3.6.5.8~~7~~	Verify each containment cooling train starts automatically on an actual or simulated actuation signal.	24 months
SR 3.6.5.9~~8~~	Verify each spray nozzle is unobstructed.	Following maintenance which could result in nozzle blockage

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.9.5.1 Verify one RHR loop is in operation.	12 hours
SR 3.9.5.2 Verify required RHR loop locations susceptible to gas accumulation are sufficiently filled with water.	31 days

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.5.1 Close each penetration providing direct access from the containment atmosphere to the outside atmosphere with a manual or automatic isolation valve, or blind flange.	4 hours
	<u>OR</u>	
	B.5.2 Verify each penetration is capable of being closed by an OPERABLE Containment Ventilation Isolation System.	4 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.6.1	Verify one RHR loop is in operation.	12 hours
SR 3.9.6.2	Verify correct breaker alignment and indicated power available to the required RHR pump that is not in operation.	7 days
<u>SR 3.9.6.3</u>	<u>Verify RHR loop locations susceptible to gas accumulation are sufficiently filled with water.</u>	<u>31 days</u>

ATTACHMENT 3

Technical Specification Pages (Retyped)

3.4.6-3
3.4.7-4
3.4.8-3
3.5.2-2
3.5.2-3
3.5.2-4
3.5.3-2
3.6.5-3
3.6.5-4
3.9.5-3
3.9.6-3

11 pages follow

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.4.6.1	Verify required RHR or RCS loop is in operation.	12 hours
SR 3.4.6.2	Verify required SG capable of removing decay heat.	12 hours
SR 3.4.6.3	-------------------------NOTE------------------------- Not required to be performed until 24 hours after a required pump is not in operation. -- Verify correct breaker alignment and indicated power are available to each required pump.	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

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.7.1	Verify required RHR loop is in operation.	12 hours
SR 3.4.7.2	Verify required SG capable of removing decay heat.	12 hours
SR 3.4.7.3	-------------------------NOTE------------------------- Not required to be performed until 24 hours after a required pump is not in operation. --	
	Verify correct breaker alignment and indicated power are available to each required RHR pump.	7 days
SR 3.4.7.4	Verify required RHR loop locations susceptible to gas accumulation are sufficiently filled with water.	31 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.8.1	Verify required RHR loop is in operation.	12 hours
SR 3.4.8.2	--------------------------NOTE---------------------------- Not required to be performed until 24 hours after a required pump is not in operation. -- Verify correct breaker alignment and indicated power are available to each required RHR pump.	7 days
SR 3.4.8.3	Verify RHR loop locations susceptible to gas accumulation are sufficiently filled with water.	31 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.5.2.1 Verify the following valves are in the listed position.	12 hours

Unit 1 Valve Number	Westing-house Valve Number	Position	Function
32070	8801A	OPEN	SI Injection to RCS Cold Leg A
32068	8801B	OPEN	SI Injection to RCS Cold Leg B
32073	8806A	OPEN	SI Cold Leg Injection Line
32206	8816A	CLOSED	SI Pump Suction from RHR
32207	8816B	CLOSED	SI Pump Suction from RHR

Unit 2 Valve Number	Westing-house Valve Number	Position	Function
32173	8801A	OPEN	SI Injection to RCS Cold Leg A
32171	8801B	OPEN	SI Injection to RCS Cold Leg B
32176	8806A	OPEN	SI Cold Leg Injection Line
32208	8816A	CLOSED	SI Pump Suction from RHR
32209	8816B	CLOSED	SI Pump Suction from RHR

SURVEILLANCE	FREQUENCY
SR 3.5.2.2 ------------------NOTE------------------ Not required to be met for system vent flow paths opened under administrative control. -- 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.	31 days

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.2.3	Verify power to the valve operator has been removed for each valve listed in SR 3.5.2.1.	31 days
SR 3.5.2.4	Verify ECCS accessible locations susceptible to gas accumulation are sufficiently filled with water.	31 days
SR 3.5.2.5	Verify ECCS inaccessible locations susceptible to gas accumulation are sufficiently filled with water.	Prior to entering MODE 3 after exiting shutdown cooling
SR 3.5.2.6	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 3.5.2.7	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

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.2.8	Verify each ECCS pump starts automatically on an actual or simulated actuation signal.	24 months
SR 3.5.2.9	Verify each ECCS throttle valve listed below is in the correct position. <u>Unit 1 Valve Number</u> — <u>Unit 2 Valve Number</u> SI-15-6 — 2SI-15-6 SI-15-7 — 2SI-15-7 SI-15-8 — 2SI-15-8 SI-15-9 — 2SI-15-9	24 months
SR 3.5.2.10	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

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Required Action and associated Completion Time of Condition B not met.	C.1 Be in MODE 5.	24 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.3.1	The following SRs are applicable for all equipment required to be OPERABLE: SR 3.5.2.1 SR 3.5.2.6 SR 3.5.2.3 SR 3.5.2.9 SR 3.5.2.4 SR 3.5.2.10 SR 3.5.2.5	In accordance with applicable SRs

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.5.1	-------------------------NOTE------------------------- Not required to be met for system vent flow paths opened under administrative control. --- 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
SR 3.6.5.2	Operate each containment fan coil unit on low motor speed for ≥ 15 minutes.	31 days
SR 3.6.5.3	Verify containment spray locations susceptible to gas accumulation are sufficiently filled with water.	31 days
SR 3.6.5.4	Verify cooling water flow rate to each containment fan coil unit is ≥ 900 gpm.	24 months
SR 3.6.5.5	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

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.5.6	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 3.6.5.7	Verify each containment spray pump starts automatically on an actual or simulated actuation signal.	24 months
SR 3.6.5.8	Verify each containment cooling train starts automatically on an actual or simulated actuation signal.	24 months
SR 3.6.5.9	Verify each spray nozzle is unobstructed.	Following maintenance which could result in nozzle blockage

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.5.1	Verify one RHR loop is in operation.	12 hours
SR 3.9.5.2	Verify required RHR loop locations susceptible to gas accumulation are sufficiently filled with water.	31 days

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.5.1 Close each penetration providing direct access from the containment atmosphere to the outside atmosphere with a manual or automatic isolation valve, or blind flange.	4 hours
	<u>OR</u>	
	B.5.2 Verify each penetration is capable of being closed by an OPERABLE Containment Ventilation Isolation System.	4 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.6.1	Verify one RHR loop is in operation.	12 hours
SR 3.9.6.2	Verify correct breaker alignment and indicated power available to the required RHR pump that is not in operation.	7 days
SR 3.9.6.3	Verify RHR loop locations susceptible to gas accumulation are sufficiently filled with water.	31 days

ATTACHMENT 4

Technical Specification Bases (Markup)

B 3.4.6-3
B 3.4.6-6
B 3.4.6-7
B 3.4.6-8
B 3.4.7-4
B 3.4.7-7
B 3.4.7-8
B 3.4.8-2
B 3.4.8-4
B 3.4.8-5
B 3.4.8-6
B 3.5.2-6
B 3.5.2-10
B 3.5.2-11
B 3.5.2-12
B 3.5.2-13
B 3.5.2-14
B 3.5.3-2
B 3.6.5-6
B 3.6.5-11
B 3.6.5-12
B 3.6.5-13
B 3.6.5-14
B 3.6.5-15
B 3.9.5-2
B 3.9.5-5
B 3.9.5-6
B 3.9.5-7
B 3.9.6-2
B 3.9.6-6
B 3.9.6-7

31 pages follow

BASES

LCO (continued)

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 a steam or gas bubble in the pressurizer or that the secondary side water temperature of each SG be ≤ 50°F above each of the RCS cold leg temperatures before the start of an RCP with any RCS cold leg temperature ≤ the OPPS enable temperature specified in the PTLR. A steam or gas bubble ensures that the pressurizer will accommodate the swell resulting from an RCP start. Either of these restraints prevents a low temperature overpressure event due to a thermal transient when an RCP is started.

An OPERABLE RCS loop comprises an OPERABLE RCP and an OPERABLE SG which is capable of removing decay heat as specified in SR 3.4.6.2.

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. RCPs and RHR pumps are OPERABLE if they are capable of being powered and are able to provide forced flow if required. Management of gas voids is important to RHR System OPERABILITY.

APPLICABILITY

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.

Operation in other MODES is covered by:

LCO 3.4.4, "RCS Loops - MODES 1 and 2";
LCO 3.4.5, "RCS Loops - MODE 3";
LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled";
LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled";
LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation - High Water Level" (MODE 6); and

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.6.2

SR 3.4.6.2 requires verification that the required SG has the capability to remove decay heat. The ability to remove decay heat requires the ability to pressurize and control pressure in the RCS, sufficient secondary side water level in the SG relied on for decay heat removal, and an available supply of feedwater (Ref. 2). The ability of the SG to provide an adequate heat sink for decay heat removal further ensures that the SG tubes remain covered. The 12 hour Frequency is considered adequate in view of the other indications available in the control room to alert the operator to a loss of capability of the SG to remove decay heat.

SR 3.4.6.3

Verification that each 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 each required pump. Alternatively, verification that a pump is in operation also verifies proper breaker alignment and power availability. 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.

This SR is modified by a Note that states the SR is not required to be performed until 24 hours after a pump is not in operation.

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

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.6.4 (continued)

required RHR loop(s) and may also prevent water hammer, pump cavitation, and pumping of noncondensible 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

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.6.4 (continued)

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 SR can be met by virtue of having an RHR subsystem inservice in accordance with operating procedures.

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.

REFERENCES

1. License Amendment Request Dated November 19, 1999. (Approved by License Amendment 152/143, July 14, 2000.)

2. NRC Information Notice 95-35, "Degraded Ability of Steam Generator to Remove Decay Heat by Natural Circulation."

BASES

LCO (continued)

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.

RHR pumps are OPERABLE if they are capable of being powered and are able to provide flow if required. A SG is capable of removing decay heat via natural circulation when: 1) there is the ability to pressurize and control pressure in the RCS; 2) there is sufficient secondary side water level in the SG relied on for decay heat removal; and 3) there is an available supply of feedwater (Ref. 1). An OPERABLE SG can perform as a heat sink via natural circulation when it has the capability to remove decay heat as specified in SR 3.4.7.2. Management of gas voids is important to RHR System OPERABILITY.

APPLICABILITY

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. One loop of RHR provides sufficient circulation for these purposes. However, one additional RHR loop is required to be OPERABLE, or a SG is capable of removing decay heat.

Operation in other MODES is covered by:

LCO 3.4.4, "RCS Loops-MODES 1 and 2";
LCO 3.4.5, "RCS Loops-MODE 3";
LCO 3.4.6, "RCS Loops-MODE 4";
LCO 3.4.8, "RCS Loops-MODE 5, Loops Not Filled";
LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation-High Water Level" (MODE 6); and
LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation-Low Water Level" (MODE 6).

SURVEILLANCE REQUIREMENTS

SR 3.4.7.3 (continued)

controls available and has been shown to be acceptable by operating experience.

This SR is modified by a Note that states the SR is not required to be performed until 24 hours after a pump is not in operation.

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 noncondensible 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

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.7.4 (continued)

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 SR can be met by virtue of having an RHR subsystem inservice in accordance with operating procedures.

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.

REFERENCES

1. NRC Information Notice 95-35, "Degraded Ability of Steam Generators to Remove Decay Heat by Natural Circulation".

2. License Amendment Request Dated November 19, 1999. (Approved by License Amendment 152/143, July 14, 2000.)

BASES

LCO (continued)

Note 1 permits all RHR pumps to be de-energized ≤ 1 hour per 8 hour period. The circumstances for stopping both RHR pumps are to be limited to situations when the outage time is short and core outlet temperature is maintained > 10°F below saturation temperature. The Note prohibits boron dilution with coolant at boron concentrations less than required to assure SDM is maintained or draining operations when RHR forced flow is stopped.

Note 2 allows one RHR loop to be inoperable for a period of ≤ 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.

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

APPLICABILITY

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

Operation in other MODES is covered by:

LCO 3.4.4, "RCS Loops-MODES 1 and 2";
LCO 3.4.5, "RCS Loops-MODE 3";
LCO 3.4.6, "RCS Loops-MODE 4";
LCO 3.4.7, "RCS Loops-MODE 5, Loops Filled";
LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation-High Water Level" (MODE 6); and
LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation-Low Water Level" (MODE 6).

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.4.8.1

This SR requires verification every 12 hours that the required loop is in operation. Verification may include flow rate, temperature, or pump status monitoring, which helps 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 each required 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 each required pump. Alternatively, verification that a pump is in operation also verifies proper breaker alignment and power availability. 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.

This SR is modified by a Note that states the SR is not required to be performed until 24 hours after a pump is not in operation.

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 noncondensible 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

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.8.3 (continued)

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.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.8.3 (continued)

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 can be met by virtue of having an RHR subsystem inservice in accordance with operating procedures.

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.

REFERENCES None.

BASES

LCO (continued)

In MODES 1, 2, and 3, 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 taking suction from the RWST upon an SI signal and RHR capable of being transferred to take suction from containment Sump B.

During an event requiring ECCS actuation, a flow path is required to provide an abundant supply of water from the RWST to the RCS via the ECCS pumps and their respective supply headers to each of the two cold leg injection nozzles and the reactor vessel upper plenum. In the long term, this flow path may be switched to take its supply from the containment sump and to supply its flow to the RCS cold legs or directly into the reactor vessel upper plenum. Management of gas voids is important to ECCS OPERABILITY.

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

Manual valves that could, if improperly positioned, reduce injection flow below that assumed for accident analyses, are blocked and tagged or locked in the proper position for injection. Changes in valve position must be under direct administrative control.

A block is a device that can be unclipped or unsnapped to allow a status change of the component to which it is applied. A lock is a device that must be unlocked, destroyed or mechanically removed (such as a cap or blank) to allow a status change of the component to which it is applied.

As indicated in the LCO Note, the SI flow paths may be isolated for 2 hours in MODE 3, under controlled conditions, to perform pressure isolation valve testing per SR 3.4.15.1. The flow path is readily restorable from the control room.

BASES

SURVEILLANCE REQUIREMENTS (continued)

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 seal is a device that must be destroyed to allow a status change of the component to which it is applied). 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 would only affect a single train. This Frequency has been shown to be acceptable through operating experience.

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 3.5.2.3

Verification every 31 days that the motor control center supply breakers are physically locked in the off position 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. 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.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.2.4 and SR 3.5.2.5

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 noncondensible 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

BASES

SURVEILLANCE REQUIREMENTS

SR 3.5.2.4 and SR 3.5.2.5 (continued)

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.

Both the 31 day Frequency for accessible locations and event-based Frequency for inaccessible locations take into consideration the gradual nature of gas accumulation in the ECCS piping and the procedural controls governing system operation. Additionally, the Frequency for inaccessible locations allows this Surveillance to be performed under plant conditions that enable direct monitoring.

The as-found conditions of the inaccessible locations are monitored at the earliest possible shutdown condition according to the Gas Accumulation Management Program. In a rapid shutdown, there may be insufficient time to verify the as-found condition of the inaccessible locations prior to RCS depressurization.

SR 3.5.2.6

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 within the performance assumed in the plant safety analysis. SRs are specified in the Inservice Testing Program of the

SURVEILLANCE REQUIREMENTS

SR 3.5.2.6 (continued)

ASME Code. The ASME Code provides the activities and Frequencies necessary to satisfy the requirements.

SR 3.5.2.75 and SR 3.5.2.86

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 test is met when control board indications and visual observations indicate that all components have received the safety injection signal in the proper sequence and timing, the appropriate pump breakers have opened and closed, and all automatic valves have been placed in the proper position required to establish a safety injection flow path to the reactor coolant system.

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 Engineered Safety Feature (ESF) Actuation System testing, and equipment performance is monitored as part of the Inservice Testing Program.

SR 3.5.2.97

Surveillance Requirements on ECCS throttle valves provide assurance that proper ECCS flows are maintained in the event of a LOCA. Proper flow resistance and pressure drop in the piping system to each injection point in the SI System is necessary to: 1) prevent total pump flow from exceeding runout conditions when the system is in its minimum resistance configuration;

BASES

SURVEILLANCE REQUIREMENTS

SR 3.5.2. 97 (continued)

2) provide the proper flow split between injection points in accordance with the assumptions used in the ECCS LOCA analyses; and 3) provide an acceptable level of total ECCS flow to all injection points equal to or above that assumed in the ECCS LOCA analyses. The 24 month Frequency is based on the same reasons as those stated in SR 3.5.2.75 and SR 3.5.2.86.

SR 3.5.2.108

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 allows this Surveillance to be performed under the conditions that apply during a plant outage. This Frequency has been found to be sufficient to detect abnormal degradation and is confirmed by operating experience.

BASES

REFERENCES

1. AEC "General Design Criteria for Nuclear Power Plant Construction Permits," Criterion 44, issued for comment July 10, 1967, as referenced in USAR Section 1.2.

2. USAR, Section 6.2.

3. USAR, Section 14.

4. NRC Memorandum to V. Stello, Jr., from R.L. Baer, "Recommended Interim Revisions to LCOs for ECCS Components," December 1, 1975.

5. IE Information Notice No. 87-01.

BASES (continued)

LCO

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 a DBA.

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 taking suction from the RWST and transferring suction to the containment sump.

During an event requiring ECCS actuation, a flow path is required to provide an abundant supply of water from the RWST to the RCS via the SI subsystem capable (through manual actions) of injecting into each of the cold leg injection nozzles and reactor vessel upper plenum nozzles. In the long term, a flow path is required to provide recirculation flow via the RHR subsystem from the containment sump into each of the reactor vessel upper plenum nozzles. Management of gas voids is important to ECCS OPERABILITY.

This LCO is modified by two Notes. Note 1 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.

Note 2 allows an SI train to be considered OPERABLE when the pump is capable of being manually started for ECCS injection from the control room.

APPLICABILITY

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

In MODE 4 with RCS temperature below 350°F and both RCS cold leg temperatures above the SI pump disable temperature specified in the PTLR, 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

APPLICABLE SAFETY ANALYSES (continued)

Containment Cooling System air and safety grade cooling water flow. The Containment Cooling System total response time incorporates delays to account for load restoration and motor windup (Ref. 3).

The Containment Spray System and the Containment Cooling System satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

During a LOCA or SLB, a minimum of one containment cooling train and one containment spray train are required to maintain the containment peak pressure and temperature below the design limits (Ref. 4). Additionally, one containment spray train is also required to supply sufficient sodium hydroxide to containment to ensure that the pH of the sump liquid is alkaline. To ensure that these requirements are met, two containment spray trains and two containment cooling trains must be OPERABLE. Therefore, in the event of an accident, at least one train in each system operates, assuming 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 RWST upon a containment spray actuation signal. Manual valves in this system that could, if improperly positioned, reduce the spray flow below that assumed for accident analysis, are blocked and tagged in the proper position and maintained under administrative control. Containment Spray System motor operated valves, MV-32096 and MV-32097 (Unit 1), and MV-32108 and MV-32109 (Unit 2) are closed with the motor control center supply breakers in the off position. Management of gas voids is important to Containment Spray System OPERABILITY.

Each Containment Cooling System typically includes cooling coils, dampers, fans, and controls to ensure an OPERABLE flow path. With one CL strainer isolated, the containment cooling train on the associated CL header is OPERABLE at CL supply temperatures

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.5.12 (continued)

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 3.6.5.2

Operating each containment fan coil unit on low motor speed for ≥ 15 minutes ensures that all trains are OPERABLE and that all associated controls are functioning properly.

Motor current is measured and compared to the nominal current expected for the test condition. It also ensures that blockage, fan or motor failure, or excessive vibration can be detected for corrective action. The 31 day Frequency was developed considering the known reliability of the fan coil units and controls, the two train redundancy available, and the low probability of significant degradation of the containment cooling train occurring between Surveillances. It has also been shown to be acceptable through operating experience.

SR 3.6.5.3

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,

BASES

SURVEILLANCE REQUIREMENTS

SR 3.6.5.3 (continued)

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

BASES

SURVEILLANCE REQUIREMENTS

SR 3.6.5.3 (continued)

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.

SR 3.6.5.4

Verifying that cooling water flow rate to each containment fan coil unit is ≥ 900 gpm provides assurance that the design flow rate assumed in the safety analyses will be achieved (Ref. 4).

Terminal temperatures of each fan coil unit are also observed. This test includes verifying operation of all essential features including low motor speed, cooling water valves and normal ventilation system dampers. The 24 month Frequency is based on; the need to perform these Surveillances under the conditions that apply during a plant outage; the known reliability of the Cooling Water System; the two train redundancy available; and, the low probability of a significant degradation of flow occurring between Surveillances.

SR 3.6.5.54

Verifying each containment spray 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. Flow and differential pressure are normal tests of centrifugal pump performance required by the ASME Code (Ref. 6). Since the

SURVEILLANCE REQUIREMENTS

SR 3.6.5.54 (continued)

containment spray 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 tests confirm component OPERABILITY, trend performance, and detect incipient failures by abnormal performance. The Frequency of the SR is in accordance with the Inservice Testing Program.

SR 3.6.5.65 and SR 3.6.5.76

These SRs require verification that each automatic containment spray valve actuates to its correct position and that each containment spray pump starts upon receipt of an actual or simulated actuation of a containment High-High pressure signal. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. To prevent inadvertent spray in containment, containment spray pump testing with a simulated actuation signal will be performed with the isolation valves in the spray supply lines at the containment and the spray additive tank isolation valves blocked closed. These tests will be considered satisfactory if visual observations indicate all components have operated satisfactorily. 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. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.5.8~~7~~

This SR requires verification that each containment cooling train actuates upon receipt of an actual or simulated safety injection signal. The 24 month Frequency is based on engineering judgment. See SR 3.6.5.6~~5~~ and SR 3.6.5.7~~6~~, above, for further discussion of the basis for the 24 month Frequency.

SR 3.6.5.9~~8~~

With the spray header drained, low pressure air or smoke can be blown through test connections. 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, confirmation of operability following maintenance activities that can result in obstruction of spray is considered adequate to detect obstruction of the nozzles. Confirmation that the spray nozzles are unobstructed may be obtained by such means as foreign materials exclusion (FME) controls during maintenance, a visual inspection of the affected portions of the system, or by an air or smoke test following maintenance involving opening portions of the system downstream of the containment isolation valves, or by draining and flushing the filled portions of the system inside containment, as appropriate. Maintenance that could result in nozzle blockage is generally a result of a loss of FME control or a flow of borated water through a nozzle. Should either of these events occur, an engineering evaluation will be performed to determine whether nozzle blockage is a possible result of the event.

If loss of FME control occurs, an inspection or flush of the affected portions of the system should be adequate to confirm that the spray nozzles are unobstructed since water flow would be required to transport any debris to the spray nozzles. An air flow or smoke test may be appropriate when borated water has inadvertently flowed through a nozzle.

BASES (continued)

LCO

Only one RHR loop is required for decay heat removal in MODE 6, with the water level ≥ 20 ft above the top of the reactor vessel flange. Only one RHR loop is required to be OPERABLE, because the volume of water above the reactor vessel flange provides backup decay heat removal capability.

At least one RHR loop must be OPERABLE and in operation to provide:

a. Removal of decay heat;

b. Mixing of borated coolant to minimize the possibility of criticality; and

c. Indication of reactor coolant temperature.

An OPERABLE RHR loop includes a RHR pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the low end temperature. The flow path starts in one of the RCS hot legs and is returned to a RCS cold leg. Management of gas voids is important to RHR System OPERABILITY.

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 RCS boron concentration is maintained, 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 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.

BASES

ACTIONS

A.4, A.5, A.6.1, and A.6.2 (continued)

b. One door in each air lock must be closed; and

c. Each penetration providing direct access from the containment atmosphere to the outside atmosphere must be either closed by a manual or automatic isolation valve, blind flange, or equivalent, or verified to be capable of being closed by an OPERABLE Containment Ventilation Isolation System.

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

The Completion Time of 4 hours allows adequate time to fulfill the Required Actions and not exceed dose limits.

SURVEILLANCE REQUIREMENTS

SR 3.9.5.1

This Surveillance demonstrates that the RHR loop is in operation in order 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 RHR System.

SR 3.9.5.2

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

BASES

SURVEILLANCE REQUIREMENTS

SR 3.9.5.2 (continued)

RHR loops and may also prevent water hammer, pump cavitation, and pumping of noncondensible 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

BASES

SURVEILLANCE REQUIREMENTS

SR 3.9.5.2 (continued)

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 can be met by virtue of having an RHR subsystem inservice in accordance with operating procedures.

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.

REFERENCES

None.

BASES

LCO (continued)

a. Removal of decay heat;

b. Mixing of borated coolant to minimize the possibility of criticality; and

c. Indication of reactor coolant temperature.

An OPERABLE RHR loop consists of an RHR pump, a heat exchanger, valves, piping, instruments and controls to ensure an OPERABLE flow path and to determine the low end temperature. The flow path starts in one of the RCS hot legs and is returned to the RCS cold leg. Management of gas voids is important to RHR System OPERABILITY.

Either RHR pump may be aligned to the Refueling Water Storage Tank (RWST) to support filling or draining the refueling cavity or for performance of required testing.

The LCO contains two Notes which provide clarification of the LCO.

Note 1 permits the RHR pumps to be de-energized for up to 1 hour per 8 hour period. The circumstances for stopping both RHR pumps are to be limited to situations when the outage time is short and the core outlet temperature is maintained > 10 degrees F below saturation temperature. The Note prohibits boron dilution or draining operations when RHR forced flow is stopped.

Note 2 allows one RHR loop to be inoperable for a period of 2 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.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.9.6.3

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 noncondensible 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

BASES

SURVEILLANCE REQUIREMENTS

SR 3.9.6.3 (continued)

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 can be met by virtue of having an RHR subsystem inservice in accordance with operating procedures.

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.

REFERENCES None.