TSTF
TECHNICAL SPECIFICATIONS TASK FORCE
A JOINT OWNERS GROUP ACTIVITY

June 29, 2009

TSTF-09-14
PROJ0753

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

SUBJECT: Resubmittal of Response to May 6, 2009 Request for Additional Information Regarding TSTF-513, Revision 1, "Revise PWR Operability Requirements and Actions for RCS Leakage Instrumentation"

REFERENCE: Letter from Joseph F. Williams (NRC) to the Technical Specifications Task Force, "Request for Additional Information Regarding TSTF-513 On Reactor Coolant System Leakage Instrumentation," dated May 6, 2009.

Dear Sir or Madam:

On July 18, the TSTF submitted a response to the referenced letter which included a revision to TSTF-513. Following submittal, the TSTF discovered errors in the TSTF-513 revision. The RAI responses were not affected. This letter supersedes the July 18 letter in its entirety. We apologize for any inconvenience this has caused.

In the referenced letter, the NRC provided a Request for Additional Information (RAI) regarding TSTF-513, Revision 1, "Revise PWR Operability Requirements and Actions for RCS Leakage Instrumentation." This letter responds to the NRC's request.

TSTF-513 is revised to incorporate information requested in the RAI. TSTF-513, Revision 2, is attached.

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

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Enclosure

cc: Robert Elliott, Technical Specifications Branch, NRC
Joseph Williams, Special Projects Branch, NRC

Response to May 6, 2009 Request for Additional Information Regarding TSTF-513, Revision 1, "Revise PWR Operability Requirements and Actions for RCS Leakage Instrumentation"

The NRC provided the following Request for Additional Information:

The proposed change to the Improved Standard Technical Specification (ISTS) 3.4.15, "RCS [Reactor Coolant System] Leakage Detection Instrumentation," for pressurized water reactors (PWRs) revises the Bases to clearly define the RCS leakage detection instrumentation operability requirements, modifies the actions to be taken when the containment atmosphere gaseous radioactivity monitor is the only operable monitor, and modifies the actions taken when there are no operable RCS leakage detection monitors. However, the staff determined that the following additional information is necessary to more clearly define the attributes of an operable RCS leakage detection system:

1. As described in Section 4.0 of the ISTS Change Traveler, "Technical Analysis," RCS leakage monitoring instrumentation is typically set to provide the most sensitive response without distracting the reactor operators with unnecessary alarms. This capability is consistent with the discussion in Section B of Regulatory Guide 1.45, Rev. 0, which states that it is essential that leakage detection systems have the capability to detect significant reactor coolant pressure boundary (RCPB) degradation as soon after occurrence as practical to minimize the potential for a gross boundary failure. Information regarding monitoring instrumentation alarm setpoint establishment, particularly for the containment gaseous and particulate monitors, is often described in the safety analysis report or other licensing basis document. However, the proposed limiting condition of operation (LCO) Bases information does not include a provision to describe plant-specific RCS leakage alarm setpoint establishment information. Please provide revised LCO Bases that include provisions for this plant-specific information or justify its exclusion.

Response

As stated in the "Proposed Change" section of the justification of TSTF-513, Revision 1, a primary purpose of the proposed change is to clearly define the RCS leakage detection instrumentation Operability requirements in the LCO Bases and to eliminate discussion from the Bases that could be erroneously construed as Operability requirements. The operational practice of setting the alarms on RCS leakage monitoring instrumentation to be as sensitive as practicable without causing spurious actuations is not a requirement for Operability and, therefore, inconsistent to the purpose of the LCO Bases discussion of the Operability requirements.

For those plant designs which include alarms on the RCS leakage detection instrumentation, the establishment of RCS leakage detection monitor setpoints, including periodic evaluation of those setpoints, is under licensee control. The RAI acknowledged that this information may appear in the licensee controlled documents, such as the updated final safety analysis report or licensing basis documents. As stated in 10 CFR 50.36(a), the purpose of the Bases is to provide a summary of the reasons for the specifications. Describing in the Bases the RCS leakage alarm setpoint establishment, which is not required by the Technical Specifications, is inappropriate.

However, the Background section of the Bases is intended to describe the system, including its operational aspects. The proposed Background section currently states that an early indication or warning signal is necessary to permit proper evaluation of all unidentified leakage. Therefore, the TSTF agrees to modify the proposed Background section of the Bases to amplify the existing statement with the following, "[In addition to meeting the OPERABILITY requirements, the monitors are typically set to provide the most sensitive response without causing an excessive number of spurious alarms.]" The statement is in brackets, indicating that it is plant-specific, as not all plant designs include alarms on these instruments.

2. The proposed LCO Bases describe that the monitor on the containment sump detects [level or flow rate or the operating frequency of a pump] and is instrumented to detect when there is an increase above the normal value by 1 gpm. This information is inconsistent with the design of many PWR sump monitoring instrumentation that provides an alarm based on the absolute rate of water volume change in the monitored sump. Also, plant-specific information may specify a value less than 1 gpm. Please provide revised LCO Bases that include provisions for this plant-specific information or justify its exclusion.

Response

The TSTF agrees to modify the proposed Bases to provide the requested provisions for reflecting the plant-specific system design. In addition, the Bases are revised to provide provisions for description of containments with more than one sump.

The LCO Bases are revised to state, "The containment sump is used to collect unidentified LEAKAGE. [The containment sump consists of the normal sump and the emergency sump. The LCO requirements apply to the total amount of unidentified LEAKAGE collected in [the][both] sump[s].] The monitor on the containment sump detects [level or flow rate or the operating frequency of a pump] and is instrumented to detect when there is [leakage of] [an increase above the normal value by] 1 gpm. The identification of [an increase in] unidentified LEAKAGE will be delayed by the time required for the unidentified LEAKAGE to travel to the containment sump and it may take longer than one hour to detect a 1 gpm increase in unidentified LEAKAGE, depending on the origin and magnitude of the LEAKAGE. This sensitivity is acceptable for containment sump monitor OPERABILITY."

Technical Specification Task Force
Improved Standard Technical Specifications Change Traveler

Revise PWR Operability Requirements and Actions for RCS Leakage Instrumentation

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

Classification 1) Technical Change Recommended for CLIIP?: Yes

Correction or Improvement: Improvement NRC Fee Status: Exempt

Benefit: Avoids Future Amendments

Industry Contact: Ken Schrader, (805) 545-4328, kjse@pge.com

See attached.

Revision History

OG Revision 0 Revision Status: Closed

Revision Proposed by: PWROG

Revision Description:
Original Issue

Owners Group Review Information

Date Originated by OG: 13-Oct-08

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 31-Oct-08

TSTF Review Information

TSTF Received Date: 07-Nov-08 Date Distributed for Review 07-Nov-08

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:
(No Comments)

TSTF Resolution: Approved Date: 14-Nov-08

NRC Review Information

NRC Received Date: 14-Nov-08

NRC Comments:

1/8/09 - The NRC requested that the TSTF revise TSTF-513 to clarify the Bases description of the Operability requirements. In addition, a Condition Note was added to new Condition D to clarify the applicability of the Condition.

Final Resolution: NRC Requests Changes: TSTF Will Revise Final Resolution Date: 08-Jan-09

TSTF Revision 1 Revision Status: Closed

Revision Proposed by: NRC

Revision Description:
TSTF-513 was revised to address NRC comments and to clarify the application of the specifications.
* Clarified the Bases description of the Operability requirements.
* A Condition Note was added to new Condition D (NUREG-1431 & -1432, Condition C in NUREG-1430) to clarify the applicability of the Condition.
* Incorrect usage of the word "required" was eliminated.
* Consistent use of brackets for plant-specific designs was applied.

Owners Group Review Information

Date Originated by OG: 14-Jan-09

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 28-Jan-09

TSTF Review Information

TSTF Received Date: 14-Jan-09 Date Distributed for Review 06-Feb-09

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:
(No Comments)

TSTF Resolution: Approved Date: 28-Feb-09

NRC Review Information

NRC Received Date: 18-Feb-09

NRC Comments:
Fee exemption granted on 3/30/09.

NRC provided an RAI on 5/6/09. TSTF-513 was revised to address the RAI questions.

Final Resolution: Superceded by Revision

TSTF Revision 2 Revision Status: Active

Revision Proposed by: NRC

Revision Description:
TSTF-513 is revised in response to the NRC's May 6, 2009 RAI.

The Background Bases are revised to state that the RCS leakage detection monitor setpoints are typically set to be as sensitive as practicable while minimizing spurious alarms. The statement is bracketed as not all plants have alarmed RCS leakage instrumentation.

The LCO Bases of the containment sump are revised to provide additional provisions to describe plant-specific designs.

TSTF Revision 2 **Revision Status: Active**

Owners Group Review Information

Date Originated by OG: 30-May-09

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 18-Jun-09

TSTF Review Information

TSTF Received Date: 30-May-09 Date Distributed for Review 30-May-09

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:
(No Comments)

TSTF Resolution: Approved Date: 18-Jun-09

NRC Review Information

NRC Received Date: 26-Jun-09

Affected Technical Specifications

Bkgnd 3.4.13 Bases	RCS Leakage Detection Instrumentation	
LCO 3.4.13 Bases	RCS Leakage Detection Instrumentation	
Action 3.4.13.C	RCS Leakage Detection Instrumentation	NUREG(s)- 1430 Only
	Change Description: Deleted	
Action 3.4.13.C	RCS Leakage Detection Instrumentation	NUREG(s)- 1430 Only
	Change Description: New Condition	
Action 3.4.13.C Bases	RCS Leakage Detection Instrumentation	NUREG(s)- 1430 Only
	Change Description: Deleted	
Action 3.4.13.C Bases	RCS Leakage Detection Instrumentation	NUREG(s)- 1430 Only
	Change Description: New Condition	
Action 3.4.13.D	RCS Leakage Detection Instrumentation	NUREG(s)- 1430 Only
Action 3.4.13.D Bases	RCS Leakage Detection Instrumentation	NUREG(s)- 1430 Only
Action 3.4.13.E	RCS Leakage Detection Instrumentation	NUREG(s)- 1430 Only
	Change Description: New Action	

Action 3.4.13.E Bases	RCS Leakage Detection Instrumentation Change Description: New Action	NUREG(s)- 1430 Only
Action 3.4.13.D	RCS Leakage Detection Instrumentation Change Description: New Condition	NUREG(s)- 1431 1432 Only
Action 3.4.13.D	RCS Leakage Detection Instrumentation Change Description: Relabeled E	NUREG(s)- 1431 1432 Only
Action 3.4.13.D Bases	RCS Leakage Detection Instrumentation Change Description: Relabeled E	NUREG(s)- 1431 1432 Only
Action 3.4.13.D Bases	RCS Leakage Detection Instrumentation Change Description: New Condition	NUREG(s)- 1431 1432 Only
Action 3.4.13.E	RCS Leakage Detection Instrumentation Change Description: Deleted	NUREG(s)- 1431 1432 Only
Action 3.4.13.E Bases	RCS Leakage Detection Instrumentation Change Description: Deleted	NUREG(s)- 1431 1432 Only
Action 3.4.13.F	RCS Leakage Detection Instrumentation	NUREG(s)- 1431 1432 Only
Action 3.4.13.F Bases	RCS Leakage Detection Instrumentation	NUREG(s)- 1431 1432 Only
Action 3.4.13.G	RCS Leakage Detection Instrumentation Change Description: New Action	NUREG(s)- 1431 1432 Only
Action 3.4.13.G Bases	RCS Leakage Detection Instrumentation Change Description: New Action	NUREG(s)- 1431 1432 Only

1.0 Description

Specification 3.4.15, "RCS Leakage Detection Instrumentation," requires instrumentation to detect significant reactor coolant pressure boundary (RCPB) degradation as soon after occurrence as practical to minimize the potential for propagation to a gross failure. The Improved Standard Technical Specifications (ISTS) require one containment sump monitor (for Westinghouse plants, level or discharge flow), one containment atmosphere radioactivity monitor (gaseous or particulate), and (optionally for Westinghouse and Combustion Engineering plants) one containment air cooler condensate flow rate monitor.

Questions have been raised regarding the Operability requirements for these instruments. In particular, improvements in plant fuel integrity have resulted in a reduction of the Reactor Coolant System (RCS) activity. As a result, the containment atmosphere radioactivity monitors may not be capable of promptly detecting an increase in RCS leakage.

The proposed change revises the Bases to clearly define the RCS leakage detection instrumentation Operability requirements and to modify the Actions to be taken when the containment atmosphere gaseous radioactivity monitor is the only Operable monitor to require additional, more frequent monitoring of other indications of RCS leakage and to shorten the time allowed to restore another monitor to Operable status. In addition, the Actions taken when there are no Operable RCS leakage detection monitors are modified to require frequent indirect monitoring of RCS leakage and to provide a limited period of time to restore at least one monitor to Operable status prior to requiring a shutdown.

2.0 Proposed Change

Specification 3.4.15, "RCS Leakage Detection Instrumentation," is revised to add a new Condition. New Condition D (Condition C in NUREG-1430) is applicable when the containment atmosphere gaseous radioactivity monitor is the only Operable monitor (i.e., all other monitors are inoperable). The Required Actions require analyzing grab samples of the containment atmosphere every 12 hours and restoring another monitor within 7 days.

Existing Condition F (Condition D for NUREG-1430) applies when all required monitors are inoperable and requires immediate entry into LCO 3.0.3. This Condition is revised to require obtaining and analyzing a containment atmosphere grab sample and performance of an RCS water inventory balance every 6 hours. At least one RCS leakage detection monitor must be restored within 72 hours or a plant shutdown is required.

Existing Condition E (Condition C for NUREG-1430) applies when the Required Actions and associated Completion Times are not met. It is moved to the last Condition and applies to all the previous Conditions.

The Bases are revised to clearly define the RCS leakage detection instrumentation Operability requirements in the LCO Bases and to eliminate discussion from the Bases that could be erroneously construed as Operability requirements. The Bases are also

revised to reflect the changes to the Technical Specifications and to more accurately reflect the existing Technical Specifications.

Three corrections are made:

- In several locations in all three NUREGs, the specifications incorrectly refer to a "required" containment sump monitor or "required" containment air cooler flow rate monitor when the LCO does not provide for more than one monitor. The term "required" is reserved for situations in which there are multiple ways to meet the LCO, such as the requirement for either a gaseous or particulate radiation monitor. The incorrect use of the term "required" is removed.

- The Note, "Not required until 12 hours after establishment of steady state operation," is currently incorrectly placed on Required Action C.1 (Perform SR 3.4.15.1, Channel Check) instead of Required Action C.2 (Perform SR 3.4.13.1, RCS mass balance) as in the other ISTS NUREGs. The Note is moved to Required Action C.2. The Bases correctly state that the Note applies to performance of SR 3.4.13.1.

- In NUREG-1431 and NUREG-1432, the containment air cooler condensate flow rate monitor is plant-specific, and therefore bracketed in the NUREG. The specifications and Bases are revised to consistently bracket references to this monitor.

3.0 Background

General Design Criterion (GDC) 30 of Appendix A to 10 CFR 50 requires means for detecting and, to the extent practical, identifying the location of the source of RCS Leakage. Regulatory Guide (RG) 1.45, Revision 0, "Reactor Coolant Pressure Boundary Leakage Detection Systems," May 1973, describes acceptable methods for selecting leakage detection systems. Revision 1 of RG 1.45 was issued in May 2008. However, operating nuclear power plants are not committed to Revision 1 of RG 1.45.

NRC Information Notice (IN) 2005-24, "Non-conservatism in Leakage Detection Sensitivity," (ADAMS Accession No. ML051780073) pointed out that the reactor coolant activity assumptions used for designing the containment radiation gaseous radiation monitor may be greater than the RCS radioactivity level present during normal operation. As a result, the containment gas channel may not be able to detect a 1 gpm leak within 1 hour at the current RCS radioactivity level.

RG 1.45, Rev. 0, Regulatory Position C.2 states that "Leakage to the primary reactor containment from unidentified sources should be collected and the flow rate monitored with an accuracy of one gallon per minute (gpm) or better." Regulatory Position C.3 states, "At least three separate detection methods should be employed and two of these methods should be (1) sump level and flow monitoring and (2) airborne particulate radioactivity monitoring. The third method may be selected from the following: a. monitoring of condensate flow rate from air coolers, b. monitoring of airborne gaseous radioactivity. Humidity, temperature, or pressure monitoring of the containment atmosphere should be considered as alarms or indirect indication of leakage to the

containment." Regulatory Position C.5 states, "The sensitivity and response time of each leakage detection system in regulatory position [C.]3. above employed for unidentified leakage should be adequate to detect a leakage rate, or its equivalent, of one gpm in less than one hour." RG 1.45, Rev. 0, states, "In analyzing the sensitivity of leak detection systems using airborne particulate or gaseous radioactivity, a realistic primary coolant radioactivity concentration assumption should be used. The expected values used in the plant environmental report would be acceptable." Many plants pre-date the issuance of RG 1.45 and their plant-specific licensing basis is described in their UFSAR. In either case, the appropriate sensitivity of the atmospheric radiation monitors is dependent on the design assumptions and the plant licensing basis of each licensee.

The ISTS Specification 3.4.15 Bases do not clearly define the basis for Operability for the RCS Leakage Instrumentation. Operability requirements should be defined in the LCO section of the Bases. However, the current Bases contain information that could be construed as Operability requirements in the Background, Applicable Safety Analysis, and LCO sections. In addition, the current Bases do not accurately describe the Operability of a detector as being based on the design assumptions and licensing basis for the plant.

Because the containment atmosphere gaseous radiation monitor cannot always detect an RCS leak at a rate of 1 gpm within 1 hour, some plants have removed the monitor from the Technical Specification list of required monitors. However, experience has shown that the containment atmosphere gaseous radiation monitor is often the first monitor to indicate an increase in RCS leak rate. Therefore, the preferred solution is to retain the containment atmosphere gaseous radiation monitor in the LCO 3.4.15 list of required equipment, and to revise the Actions to require additional monitoring and to provide less time before a plant shutdown is required when the containment atmosphere gaseous radiation monitor is the only Operable monitor.

A large increase in RCS leakage is a rare occurrence, but could be associated with a rapid change in plant conditions such as a plant shutdown. This would argue that it is detrimental to safety to require an immediate plant shutdown when all required RCS leakage monitoring instrumentation is inoperable without providing a limited period of time to allow restoration of an instrument.

4.0 Technical Analysis

This change will reduce the number of unnecessary MODE changes and requests for enforcement discretion by clarifying the Operability requirements for the RCS leakage detection instrumentation and by allowing a limited time to repair one or more of the inoperable monitors. A plant shut down solely as a result of the loss of the preferred TS monitoring capability could be avoided. The use of alternate leakage detection monitoring for a limited time is an appropriate response to this condition.

The proposed Bases changes will clarify the Operability requirements of the RCS leakage detection instrumentation. Phrases that are not consistent with RG 1.45, Rev. 0, such as "a high degree of confidence" and "extremely small leaks" are eliminated or replaced

with terminology that accurately describes the design assumptions of the system. All reference to RG 1.45 are revised to reference Revision 0 of the RG. Information in the Background and Applicable Safety Analysis sections of the Bases that could be construed as Operability requirements is deleted. The LCO section of the Bases is expanded to provide a detailed discussion of the Operability requirements for each of the required instruments. For the containment atmosphere radioactivity monitors, the Bases clearly relate Operability to the design assumptions and licensing basis for the plant and a reference to the Final Safety Analysis Report description of the design basis of the monitors is included.

As described in 10 CFR 50.36(c)(2)(i), the Limiting Condition for Operation and associated Operability requirements represent the lowest functional capability or performance levels of equipment required for safe operation of the facility. In practice, the leakage monitoring instrumentation is typically set to provide the most sensitive response without distracting the reactor operators with unnecessary alarms.

When the containment atmosphere gaseous radiation monitor is the only Operable monitor, the current Technical Specifications require performance of SR 3.4.13.1 (mass balance) once per 24 hours (Condition A) and restoration of the inoperable sump monitor within 30 days (Condition C in NUREG-1431 and NUREG-1432). The proposed change requires analyzing grab samples from the containment atmosphere and restoration of at least one additional monitor within 7 days. The RCS mass balance is sensitive enough to detect a one gpm leak rate in one hour and is the primary method used to verify compliance with the RCS leakage limits. However, an RCS mass balance calculation requires a relatively lengthy period of steady state operation to provide accurate results. The ability to perform grab sampling during periods of power change is desirable and provides an additional compensatory method to the currently required RCS mass balance. A containment grab sample is comparable to the containment particulate radiation monitor with respect to the ability to detect RCS leakage. Due to the time to take and analyze the grab sample, this is not a continuous monitoring method. However, by reducing the time between grab samples there will be no significant loss of monitoring capability during the limited time period allowed by the proposed change. The 12 hour (once per shift) performance of containment grab samples is reasonable given the availability of the containment atmosphere gaseous radiation monitor. The 7 day Completion Time to restore another monitor is reasonable given the diverse methods available to detect an RCS leak and the low probability of a large RCS leak during this period.

When all RCS leakage detection monitors are inoperable, the current Technical Specifications require entry into LCO 3.0.3. The proposed change requires analyzing grab samples from the containment atmosphere and performing a mass balance every 6 hours. The containment grab samples will identify an increase in RCS leak rate which could then be quantified by the RCS water inventory balance. The RCS water inventory balance is capable of identifying a one gpm RCS leak rate. Unlike the other Specification 3.4.15 Required Actions, the mass balance must be performed regardless of the plant conditions. If plant conditions are not sufficiently stable to perform an RCS mass balance, a plant shutdown is required. The combination of the frequent containment

atmosphere grab samples and RCS mass balance calculations provides reasonable assurance that any significant RCS pressure boundary degradation will be detected soon after leak occurrence and therefore minimize the potential for subsequent growth propagation to a gross failure. This is consistent with the requirements of GDC 30 and also Criterion 1 of 10 CFR 50.36(c)(2)(ii) which requires installed instrumentation to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant pressure boundary. The RCS water inventory balance calculation determines the magnitude of RCS unidentified leakage by use of instrumentation readily available to the control room operators. There are also other non-Technical Specification indications of RCS leakage available to the operator, such as containment humidity and temperature, tank levels, and mismatched letdown and charging.

A large increase in RCS leakage is a rare occurrence, but is most likely associated with a rapid change in plant conditions such as a plant shutdown. Providing a limited Completion Time to restore at least one RCS leakage monitor may avoid a plant shutdown with no Operable RCS leakage monitoring instrumentation.

The NRC approved a similar change for the condition of no Operable RCS leakage detection instrumentation for the Millstone Units 2 and 3 plants (ADAMS Accession No.: ML082261529) on September 30, 2008.

Most licensees have been licensed for Leak-Before-Break (LBB). The basic concept of leak-before-break (LBB) is that certain piping material has sufficient fracture toughness (i.e., ductility) to resist rapid flaw propagation. A postulated flaw in such piping would not lead to pipe rupture and potential damage to adjacent safety related systems, structures and components before the plant could be placed in a safe, shutdown condition. Before pipe rupture, the postulated flaw would lead to limited but detectable leakage which would be identified by the leak detection systems in time for the operator to take action. The NRC staff reviews the application of LBB methodology to primary system piping to ensure that certain safety margins are satisfied to assure the structural integrity of the pipe. There is significant conservatism in this evaluation. SRP Section 3.6.3 specifies a margin of the square-root of 2 be applied to the loads to assure that leakage-size flaws are stable at the normal load plus safe-shutdown earthquake load. A margin of 10 is to be applied to leakage so that detection of leakage from the postulated flaw size is ensured when the pipe is subjected to normal operational loads. In addition, the critical flaw size should be twice as large as the leakage flaw size (i.e., a margin of 2 on leakage flaw size).

The low probability of a significant RCS leak during the limited 72 hour period that operation is allowed with no RCS leakage instrumentation and the 6 hour monitoring period required in this condition lead to the conclusion that it is highly unlikely that a crack in the RCS piping would appear and grow undetected to the size that would challenge the structural integrity of the piping.

5.0 Regulatory Analysis

5.1 No Significant Hazards Consideration

The Technical Specification Task Force (TSTF) has evaluated whether or not a significant hazards consideration is involved with the proposed generic change by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

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

   Response: No.

   The proposed change clarifies the Operability requirements for the Reactor Coolant System (RCS) leakage detection instrumentation and reduces the time allowed for the plant to operate when the only Operable RCS leakage instrumentation monitor is the containment atmosphere gaseous radiation monitor. The proposed change also extends the allowed operating time when all RCS leakage instrumentation is inoperable. The monitoring of RCS leakage is not a precursor to any accident previously evaluated. The monitoring of RCS leakage is not used to mitigate the consequences of any accident previously evaluated.

   Therefore, it is concluded that this 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 clarifies the Operability requirements for the Reactor Coolant System (RCS) leakage detection instrumentation and reduces the time allowed for the plant to operate when the only Operable RCS leakage instrumentation monitor is the containment atmosphere gaseous radiation monitor. The proposed change also extends the allowed operating time when all RCS leakage instrumentation is inoperable. The proposed change does not involve a physical alteration of the plant (no new or different type of equipment will be installed) or a change in the methods governing normal plant operation.

   Therefore, it is concluded that this 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 clarifies the Operability requirements for the Reactor Coolant System (RCS) leakage detection instrumentation and reduces the time allowed for the plant to operate when the only Operable RCS leakage instrumentation monitor is the containment atmosphere gaseous radiation monitor. The proposed change also extends the allowed operating time when all RCS leakage instrumentation is inoperable. Reducing the amount of time the plant is allowed to operate with only the containment atmosphere gaseous radiation monitor Operable increases the margin of safety by increasing the likelihood that an increase in RCS leakage will be detected before it potentially results in gross failure. Allowing a limited period of time to restore at least one RCS leakage monitoring instrument to Operable status before requiring a plant shutdown avoids the situation of putting the plant through a thermal transient without RCS leakage monitoring.

Therefore, it is concluded that this change does not involve a significant reduction in a margin of safety.

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

5.2 Applicable Regulatory Requirements/Criteria

10 CFR 50, Appendix A, "General Design Criteria for Nuclear Power Plants," Criterion 30, "Quality of reactor coolant pressure boundary," requires that means be provided for detecting and, to the extent practical, identifying the location of the source of reactor coolant leakage. The specific attributes of the reactor coolant leakage detection systems are outlined in Regulatory Positions 1 through 9 of Regulatory Guide 1.45, Rev. 0.

10 CFR 50, Appendix A, "General Design Criteria for Nuclear Power Plants," Criterion 4, "Environmental and Dynamic Effects Design Bases," requires components to be designed to accommodate dynamic effects associated with postulated pipe ruptures. However, these dynamic effects may be excluded if the Commission approves analyses demonstrating that the probability of fluid system piping rupture is extremely low under conditions consistent with the design basis for the piping. Most licensees have been licensed for Leak-Before-Break (LBB). The NRC staff reviews the application of LBB methodology to primary system piping to ensure that certain safety margins are satisfied to assure the structural integrity of the pipe. The low probability of a significant RCS leak during the limited 72 hour period that operation is allowed with no RCS leakage instrumentation and the 6 hour monitoring period required in this condition lead to the conclusion that it is highly unlikely that a crack in the RCS piping would appear and grow undetected to the size that would challenge the structural integrity of the piping.

10 CFR 50.36, "Technical Specifications," paragraph (c)(2)(ii)(A), specifies that a Limiting Condition for Operation be established for installed instrumentation that is used to detect and indicate in the control room a significant abnormal degradation of the reactor coolant pressure boundary. This instrumentation is required by Specification

3.4.15, "RCS Leakage Detection Instrumentation." The modification of the Actions in Specification 3.4.15 is not in conflict with the 10 CFR 50.36 requirements. The proposed changes do not adversely impact the ability of the Reactor Coolant System leakage detection system to function as designed and do not impact conformance to the applicable GDCs. Therefore, the proposed changes are consistent with all applicable regulatory requirements or criteria.

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 approval of the proposed change will not be inimical to the common defense and security or to the health and safety of the public.

6.0 Environmental Consideration

A review has determined that 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 effluent 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.

7.0 References

None.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.15 RCS Leakage Detection Instrumentation

LCO 3.4.15 The following RCS leakage detection instrumentation shall be OPERABLE:

a. One containment sump monitor and

b. One containment atmosphere radioactivity monitor (gaseous or particulate).

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. ~~Required~~ Containment sump monitor inoperable.	A.1 ----------NOTE---------- Not required until 12 hours after establishment of steady state operation. ---------- Perform SR 3.4.13.1.	Once per 24 hours
	AND	
	A.2 Restore ~~required~~ containment sump monitor to OPERABLE status.	30 days
B. Required containment atmosphere radioactivity monitor inoperable.	B.1.1 Analyze grab samples of the containment atmosphere.	Once per 24 hours
	OR	

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	B.1.2 ----------NOTE---------- Not required until 12 hours after establishment of steady state operation. ---------- Perform SR 3.4.13.1.	Once per 24 hours
	AND	
	B.2 Restore required containment atmosphere radioactivity monitor to OPERABLE status.	30 days
---------- NOTE ---------- Only applicable when the containment atmosphere gaseous radiation monitor is the only OPERABLE monitor. ---------- C Containment sump monitor inoperable.	C.1 Analyze grab samples of the containment atmosphere.	Once per 12 hours
	AND	
	C.2 Restore containment sump monitor to OPERABLE status.	7 days
~~C. Required Action and associated Completion Time not met.~~	~~C.1 Be in MODE 3.~~	~~6 hours~~
	~~AND~~	
	~~C.2 Be in MODE 5.~~	~~36 hours~~
D. ~~Both~~ All required monitors inoperable.	D.1 Analyze grab samples of the containment atmosphere.	Once per 6 hours
	AND	
	D.2 Perform SR 3.4.13.1.	Once per 6 hours
	AND	
	D.3 Restore at least one RCS	72 hours

	leakage detection monitor to OPERABLE status. ~~D.1 Enter LCO 3.0.3.~~	~~Immediately~~
E. Required Action and associated Completion Time not met.	E.1 Be in MODE 3. AND E.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.15.1	Perform CHANNEL CHECK of required containment atmosphere radioactivity monitor.	12 hours
SR 3.4.15.2	Perform CHANNEL FUNCTIONAL TEST of required containment atmosphere radioactivity monitor.	92 days

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.4.15.3	Perform CHANNEL CALIBRATION of required containment sump monitor.	[18] months
SR 3.4.15.4	Perform CHANNEL CALIBRATION of required containment atmosphere radioactivity monitor.	[18] months

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.15 RCS Leakage Detection Instrumentation

BASES

BACKGROUND

GDC 30 of Appendix A to 10 CFR 50 (Ref. 1) requires means for detecting and, to the extent practical, identifying the location of the source of RCS LEAKAGE. Regulatory Guide 1.45, Revision 0, (Ref. 2) describes acceptable methods for selecting leakage detection systems.

Leakage detection systems must have the capability to detect significant reactor coolant pressure boundary (RCPB) degradation as soon after occurrence as practical to minimize the potential for propagation to a gross failure. Thus, an early indication or warning signal is necessary to permit proper evaluation of all unidentified LEAKAGE. [In addition to meeting the OPERABILITY requirements, the monitors are typically set to provide the most sensitive response without causing an excessive number of spurious alarms.]

~~Industry practice has shown that water flow changes of 0.5 to 1.0 gpm can readily be detected in contained volumes by monitoring changes in water level, in flow rate, or in the operating frequency of a pump.~~ The containment sump used to collect unidentified LEAKAGE is instrumented to alarm for increases above ~~of 0.5 to 1.0 gpm in~~ the normal flow rates. ~~This sensitivity is acceptable for detecting increases in unidentified LEAKAGE.~~

The reactor coolant contains radioactivity that, when released to the containment, may ~~can~~ be detected by radiation monitoring instrumentation. ~~Reactor coolant radioactivity levels will be low during initial reactor startup and for a few weeks thereafter until activated corrosion products have been formed and fission products appear from fuel element cladding contamination or cladding defects. Instrument sensitivities of 10^{-9} µCi/cc radioactivity for particulate monitoring and of 10^{-6} µCi/cc radioactivity for gaseous monitoring are practical for these leakage detection systems.~~ Radioactivity detection systems are included for monitoring both particulate and gaseous activities because of their sensitivities and rapid responses to RCS LEAKAGE.

Other indications may be used to detect an increase in unidentified LEAKAGE; however, they are not required to be OPERABLE by this LCO. An increase in humidity of the containment atmosphere would indicate release of water vapor to the containment. Dew point temperature measurements can thus be used to monitor humidity levels of the containment atmosphere as an indicator of potential RCS LEAKAGE. ~~A 1°F increase in dew point is well within the sensitivity range of available instruments.~~

BASES

BACKGROUND (continued)

Since the humidity level is influenced by several factors, a quantitative evaluation of an indicated leakage rate by this means may be questionable and should be compared to observed increases in liquid flow into or from the containment sump [and condensate flow from air coolers]. Humidity level monitoring is considered most useful as an indirect alarm or indication to alert the operator to a potential problem. Humidity monitors are not required for this LCO.

Air temperature and pressure monitoring methods may also be used to infer unidentified LEAKAGE to the containment. Containment temperature and pressure fluctuate slightly during plant operation, but a rise above the normally indicated range of values may indicate RCS LEAKAGE into the containment. The relevance of temperature and pressure measurements ~~are~~ is affected by containment free volume and, for temperature, detector location. Alarm signals from these instruments can be valuable in recognizing rapid and sizable leakage to the containment. Temperature and pressure monitors are not required by this LCO.

The above-mentioned LEAKAGE detection methods or systems differ in sensitivity and response time. [Some of these systems could serve as early alarm systems signaling the operators that closer examination of other detection systems is necessary to determine the extent of any corrective action that may be required.]

APPLICABLE SAFETY ANALYSES

The need to evaluate the severity of an alarm or an indication is important to the operators, and the ability to compare and verify with indications from other systems is necessary. ~~The system response times and sensitivities are described in the FSAR (Ref. 3). Multiple instrument locations are utilized, if needed, to ensure the transport delay time of the leakage from its source to an instrument location yields an acceptable overall response time.~~

The safety significance of RCS LEAKAGE varies widely depending on its source, rate, and duration. Therefore, detecting and monitoring reactor coolant LEAKAGE into the containment area are necessary. Quickly separating the identified LEAKAGE from the unidentified LEAKAGE provides quantitative information to the operators, allowing them to take corrective action should a leak occur detrimental to the safety of the unit and the public.

RCS leakage detection instrumentation satisfies Criterion 1 of 10 CFR 50.36(c)(2)(ii).

BASES

LCO

~~One method of protecting against large RCS LEAKAGE derives from the ability of instruments to rapidly detect extremely small leaks.~~ This LCO requires instruments of diverse monitoring principles to be OPERABLE to provide ~~a high degree of~~ confidence that small amounts of unidentified LEAKAGE ~~extremely small leaks~~ are detected in time to allow actions to place the plant in a safe condition when RCS LEAKAGE indicates possible RCPB degradation.

The LCO requires two instruments to be OPERABLE.

The containment sump is used to collect unidentified LEAKAGE. [The containment sump consists of the normal sump and the emergency sump. The LCO requirements apply to the total amount of unidentified LEAKAGE collected in [the][both] sump[s].] The monitor on the containment sump detects [level or flow rate or the operating frequency of a pump] and is instrumented to detect when there is [leakage of] [an increase above the normal value by] 1 gpm. The identification of [an increase in] unidentified LEAKAGE will be delayed by the time required for the unidentified LEAKAGE to travel to the containment sump and it may take longer than one hour to detect a 1 gpm increase in unidentified LEAKAGE, depending on the origin and magnitude of the LEAKAGE. This sensitivity is acceptable for containment sump monitor OPERABILITY.

The reactor coolant contains radioactivity that, when released to the containment, can be detected by the gaseous or particulate containment atmosphere radioactivity monitor. Only one of the two detectors is required to be OPERABLE. Radioactivity detection systems are included for monitoring both particulate and gaseous activities because of their sensitivities and rapid responses to RCS LEAKAGE, but have recognized limitations. Reactor coolant radioactivity levels will be low during initial reactor startup and for a few weeks thereafter, until activated corrosion products have been formed and fission products appear from fuel element cladding contamination or cladding defects. If there are few fuel element cladding defects and low levels of activation products, it may not be possible for the gaseous or particulate containment atmosphere radioactivity monitors to detect a 1 gpm increase within 1 hour during normal operation. However, the gaseous or particulate containment atmosphere radioactivity monitor is OPERABLE when it is capable of detecting a 1 gpm increase in unidentified LEAKAGE within 1 hour given an RCS activity equivalent to that assumed in the design calculations for the monitors (Reference 3).

The LCO requirements are satisfied when monitors of diverse measurement means are available. Thus, the containment sump monitor, in combination with a particulate or gaseous radioactivity monitor, provides an acceptable minimum.

APPLICABILITY

Because of elevated RCS temperature and pressure in MODES 1, 2, 3, and 4, RCS leakage detection instrumentation is required to be OPERABLE.

In MODE 5 or 6, the temperature is ≤ 200°F and pressure is maintained low or at atmospheric pressure. Since the temperatures and pressures are far lower than those for MODES 1, 2, 3, and 4, the likelihood of leakage and crack propagation is much smaller. Therefore, the requirements of this LCO are not applicable in MODES 5 and 6.

ACTIONS

A.1 and A.2

With the ~~required~~ containment sump monitor inoperable, no other form of sampling can provide the equivalent information.

However, the containment atmosphere activity monitor will provide indications of changes in leakage. Together with the containment atmosphere radioactivity monitor, the periodic surveillance for RCS inventory balance, SR 3.4.13.1, water inventory balance, must be performed at an increased frequency of 24 hours to provide information that is adequate to detect leakage. A Note is added allowing that SR 3.4.13.1 is not required to be performed until 12 hours after establishing steady state operation (stable temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and [RCP seal injection and return flows]). The 12 hour allowance provides sufficient time to collect and process all necessary data after stable plant conditions are established.

Restoration of the ~~required~~ sump monitor to OPERABLE status is required to regain the function in a Completion Time of 30 days after the monitor's failure. This time is acceptable considering the frequency and adequacy of the RCS water inventory balance required by Required Action A.1.

BASES

ACTIONS (continued)

B.1.1, B.1.2, and B.2

With required gaseous or particulate containment atmosphere radioactivity monitoring instrumentation channels inoperable, alternative action is required. Either grab samples of the containment atmosphere must be taken and analyzed or water inventory balances, in accordance with SR 3.4.13.1, must be performed to provide alternate periodic information. With a sample obtained and analyzed or a water inventory balance performed every 24 hours, the reactor may be operated for up to 30 days to allow restoration of at least one of the radioactivity monitors.

The 24 hour interval provides periodic information that is adequate to detect leakage. A Note is added allowing that SR 3.4.13.1 is not required to be performed until 12 hours after establishing steady state operation (stable temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and [RCP seal injection and return flows]). The 12 hour allowance provides sufficient time to collect and process all necessary data after stable plant conditions are established. The 30 day Completion Time recognizes at least one other form of leak detection is available.

C.1 and C.2

With the containment sump monitor inoperable, the only means of detecting LEAKAGE is the required containment atmosphere radiation monitor. A Note clarifies that this Condition is only applicable when the only OPERABLE monitor is the required containment atmosphere gaseous radiation monitor. In addition, this configuration does not provide the required diverse means of leakage detection. Indirect methods of monitoring RCS leakage must be implemented. Grab samples of the containment atmosphere must be taken and analyzed to provide alternate periodic information. The 12 hour interval is sufficient to detect increasing RCS leakage. The Required Action provides 7 days to restore another RCS leakage monitor to OPERABLE status to regain the intended leakage detection diversity. The 7 day Completion Time ensures that the plant will not be operated in a degraded configuration for a lengthy time period.

~~C.1 and C.2~~

~~If a Required Action of Condition A or B cannot be met within the required Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit 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.~~

D.1, D.2, and D.3

With ~~both~~ all required monitors inoperable, no automatic means of monitoring leakage are available. Frequent use of indirect methods of monitoring RCS leakage must be implemented. Grab samples of the containment atmosphere must be taken and analyzed and a water inventory balance (SR 3.4.13.1) must be performed every 6 hours to provide alternate periodic information.

With a sample obtained and analyzed and a water inventory balance performed every 6 hours, 72 hours is provided to restore at least one RCS leakage detection monitor. The 72 hour Completion Time is reasonable, considering the low probability of a significant RCS leakage occurring during this time and the avoidance of a plant shutdown in response to the loss of monitoring equipment, while providing a reasonable time to restore a monitor to OPERABLE status.
~~, and immediate plant shutdown in accordance with LCO 3.0.3 is required.~~

E.1 and E.2

If a Required Action cannot be met within the associated Completion Time, the plant must be brought to a MODE in which the requirement 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.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.15.1

SR 3.4.15.1 requires the performance of a CHANNEL CHECK of the required containment atmosphere radioactivity monitor. The check gives reasonable confidence that each channel is operating properly. The Frequency of 12 hours is based on instrument reliability and is reasonable for detecting off normal conditions.

SR 3.4.15.2

SR 3.4.15.2 requires the performance of a CHANNEL FUNCTIONAL TEST of the required containment atmosphere radioactivity monitor. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. The test ensures that the monitor can perform its function in the desired manner. The test verifies the alarm setpoint and relative accuracy of the instrument string. The Frequency of 92 days considers instrument reliability, and operating experience has shown it proper for detecting degradation.

SR 3.4.15.3 and SR 3.4.15.4

These SRs require the performance of a CHANNEL CALIBRATION for each of the required RCS leakage detection instrumentation channels. The calibration verifies the accuracy of the instrument string, including the instruments located inside containment. The Frequency of [18] months is a typical refueling cycle and considers channel reliability. Again, operating experience has proven this Frequency is acceptable.

REFERENCES

1. 10 CFR 50, Appendix A, Section IV, GDC 30.

2. Regulatory Guide 1.45, Revision 0, "Reactor Coolant Pressure Boundary Leakage Detection Systems," May 1973.

3. FSAR, Section [ ] .

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.15 RCS Leakage Detection Instrumentation

LCO 3.4.15 The following RCS leakage detection instrumentation shall be OPERABLE:

a. One containment sump (level or discharge flow) monitor,

b. One containment atmosphere radioactivity monitor (gaseous or particulate), and

[c. One containment air cooler condensate flow rate monitor.]

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

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Required containment sump monitor inoperable.	A.1	----------NOTE---------- Not required until 12 hours after establishment of steady state operation. ----------	
		Perform SR 3.4.13.1.	Once per 24 hours
	AND		
	A.2	Restore required containment sump monitor to OPERABLE status.	30 days

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required containment atmosphere radioactivity monitor inoperable.	B.1.1 Analyze grab samples of the containment atmosphere. OR B.1.2 ----------NOTE---------- Not required until 12 hours after establishment of steady state operation. ---------- Perform SR 3.4.13.1. [AND B.2.1 Restore required containment atmosphere radioactivity monitor to OPERABLE status. OR [B.2.2 Verify containment air cooler condensate flow rate monitor is OPERABLE.	Once per 24 hours Once per 24 hours 30 days 30 days]
C. [Required cContainment air cooler condensate flow rate monitor inoperable.	C.1 Perform SR 3.4.15.1. OR C.2 ----------NOTE---------- Not required until 12 hours after establishment of steady state operation. ---------- Perform SR 3.4.13.1.	Once per 8 hours Once per 24 hours]

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
---------- NOTE ---------- Only applicable when the containment atmosphere gaseous radiation monitor is the only OPERABLE monitor. ---------- D. Required containment sump monitor inoperable. AND [Containment air cooler condensate flow rate monitor inoperable.]	D.1 Analyze grab samples of the containment atmosphere. AND D.2.1 Restore required containment sump monitor to OPERABLE status. OR [D.2.2 Restore containment air cooler condensate flow rate monitor to OPERABLE status.]	Once per 12 hours 7 days 7 days
~~D~~E.[Required containment atmosphere radioactivity monitor inoperable. AND [~~Required c~~Containment air cooler condensate flow rate monitor inoperable.]	~~D~~E.1 Restore required containment atmosphere radioactivity monitor to OPERABLE status. OR [~~D~~E.2 Restore ~~required~~ containment air cooler condensate flow rate monitor to OPERABLE status.]	30 days 30 days]
~~E. Required Action and associated Completion Time not met.~~	~~E.1 Be in MODE 3.~~ ~~AND~~ ~~E.2 Be in MODE 5.~~	~~6 hours~~ ~~36 hours~~
F. All required monitors inoperable.	~~F.1 Enter LCO 3.0.3.~~ F.1 Analyze grab samples of the containment atmosphere. AND	~~Immediately~~ Once per 6 hours

	F.2 Perform SR 3.4.13.1. AND F.3 Restore at least one RCS leakage detection monitor to OPERABLE status.	Once per 6 hours 72 hours
G. Required Action and associated Completion Time not met.	G.1 Be in MODE 3. AND G.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.15.1	Perform CHANNEL CHECK of the required containment atmosphere radioactivity monitor.	12 hours
SR 3.4.15.2	Perform COT of the required containment atmosphere radioactivity monitor.	92 days
SR 3.4.15.3	Perform CHANNEL CALIBRATION of the required containment sump monitor.	[18] months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.4.15.4	[Perform CHANNEL CALIBRATION of the required containment atmosphere radioactivity monitor.	[18] months]
SR 3.4.15.5	[Perform CHANNEL CALIBRATION of the required containment air cooler condensate flow rate monitor.	[18] months]

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.15 RCS Leakage Detection Instrumentation

BASES

BACKGROUND

GDC 30 of Appendix A to 10 CFR 50 (Ref. 1) requires means for detecting and, to the extent practical, identifying the location of the source of RCS LEAKAGE. Regulatory Guide 1.45, Revision 0, (Ref. 2) describes acceptable methods for selecting leakage detection systems.

Leakage detection systems must have the capability to detect significant reactor coolant pressure boundary (RCPB) degradation as soon after occurrence as practical to minimize the potential for propagation to a gross failure. Thus, an early indication or warning signal is necessary to permit proper evaluation of all unidentified LEAKAGE. [In addition to meeting the OPERABILITY requirements, the monitors are typically set to provide the most sensitive response without causing an excessive number of spurious alarms.]

~~Industry practice has shown that water flow changes of 0.5 to 1.0 gpm can be readily detected in contained volumes by monitoring changes in water level, in flow rate, or in the operating frequency of a pump.~~ The containment sump used to collect unidentified LEAKAGE [is] [(or) and the containment air cooler condensate flow rate monitor] [are] instrumented to alarm for increases ~~of 0.5 to 1.0 gpm in~~above the normal flow rates. ~~This sensitivity is acceptable for detecting increases in unidentified LEAKAGE.~~

The reactor coolant contains radioactivity that, when released to the containment, ~~can~~ may be detected by radiation monitoring instrumentation. ~~Reactor coolant radioactivity levels will be low during initial reactor startup and for a few weeks thereafter, until activated corrosion products have been formed and fission products appear from fuel element cladding contamination or cladding defects. Instrument sensitivities of 10^{-9} µCi/cc radioactivity for particulate monitoring and of 10^{-6} µCi/cc radioactivity for gaseous monitoring are practical for these leakage detection systems.~~ Radioactivity detection systems are included for monitoring both particulate and gaseous activities because of their sensitivities and rapid responses to RCS LEAKAGE.

Other indications may be used to detect an increase in unidentified LEAKAGE; however, they are not required to be OPERABLE by this LCO. An increase in humidity of the containment atmosphere would indicate release of water vapor to the containment. Dew point temperature measurements can thus be used to monitor humidity levels of the containment atmosphere as an indicator of potential RCS LEAKAGE. ~~A 1°F increase in dew point is well within the sensitivity range of available instruments.~~

BASES

BACKGROUND (continued)

Since the humidity level is influenced by several factors, a quantitative evaluation of an indicated leakage rate by this means may be questionable and should be compared to observed increases in liquid flow into or from the containment sump [and condensate flow from air coolers]. Humidity level monitoring is considered most useful as an indirect alarm or indication to alert the operator to a potential problem. Humidity monitors are not required by this LCO.

Air temperature and pressure monitoring methods may also be used to infer unidentified LEAKAGE to the containment. Containment temperature and pressure fluctuate slightly during plant operation, but a rise above the normally indicated range of values may indicate RCS leakage into the containment. The relevance of temperature and pressure measurements ~~are~~ is affected by containment free volume and, for temperature, detector location. [Alarm signals from these instruments can be valuable in recognizing rapid and sizable leakage to the containment. Temperature and pressure monitors are not required by this LCO.]

The above-mentioned LEAKAGE detection methods or systems differ in sensitivity and response time. [Some of these systems could serve as early alarm systems signaling the operators that closer examination of other detection systems is necessary to determine the extent of any corrective action that may be required.]

APPLICABLE SAFETY ANALYSES

The need to evaluate the severity of an alarm or an indication is important to the operators, and the ability to compare and verify with indications from other systems is necessary. ~~The system response times and sensitivities are described in the FSAR (Ref. 3). Multiple instrument locations are utilized, if needed, to ensure that the transport delay time of the leakage from its source to an instrument location yields an acceptable overall response time.~~

The safety significance of RCS LEAKAGE varies widely depending on its source, rate, and duration. Therefore, detecting and monitoring RCS LEAKAGE into the containment area is necessary. Quickly separating the identified LEAKAGE from the unidentified LEAKAGE provides quantitative information to the operators, allowing them to take corrective action should a leakage occur detrimental to the safety of the unit and the public.

RCS leakage detection instrumentation satisfies Criterion 1 of 10 CFR 50.36(c)(2)(ii).

LCO

~~One method of protecting against large RCS leakage derives from the ability of instruments to rapidly detect extremely small leaks.~~ This LCO

requires instruments of diverse monitoring principles to be OPERABLE to provide ~~a high degree of~~ confidence that small amounts of unidentified LEAKAGE ~~extremely small leaks~~ are detected in time to allow actions to place the plant in a safe condition, when RCS LEAKAGE indicates possible RCPB degradation.

BASES

LCO (continued)

The LCO requires [three] instruments to be OPERABLE.

The containment sump is used to collect unidentified LEAKAGE. [The containment sump consists of the normal sump and the emergency sump. The LCO requirements apply to the total amount of unidentified LEAKAGE collected in [the][both] sump[s].] The monitor on the containment sump detects [level or flow rate or the operating frequency of a pump] and is instrumented to detect when there is [leakage of] [an increase above the normal value by] 1 gpm. The identification of [an increase in] unidentified LEAKAGE will be delayed by the time required for the unidentified LEAKAGE to travel to the containment sump and it may take longer than one hour to detect a 1 gpm increase in unidentified LEAKAGE, depending on the origin and magnitude of the LEAKAGE. This sensitivity is acceptable for containment sump monitor OPERABILITY.

The reactor coolant contains radioactivity that, when released to the containment, can be detected by the gaseous or particulate containment atmosphere radioactivity monitor. Only one of the two detectors is required to be OPERABLE. Radioactivity detection systems are included for monitoring both particulate and gaseous activities because of their sensitivities and rapid responses to RCS LEAKAGE, but have recognized limitations. Reactor coolant radioactivity levels will be low during initial reactor startup and for a few weeks thereafter, until activated corrosion products have been formed and fission products appear from fuel element cladding contamination or cladding defects. If there are few fuel element cladding defects and low levels of activation products, it may not be possible for the gaseous or particulate containment atmosphere radioactivity monitors to detect a 1 gpm increase within 1 hour during normal operation. However, the gaseous or particulate containment atmosphere radioactivity monitor is OPERABLE when it is capable of detecting a 1 gpm increase in unidentified LEAKAGE within 1 hour given an RCS activity equivalent to that assumed in the design calculations for the monitors (Reference 3).

[An increase in humidity of the containment atmosphere could indicate the release of water vapor to the containment. Condensate flow from air coolers is instrumented to detect when there is an increase above the normal value by 1 gpm. The time required to detect a 1 gpm increase above the normal value varies based on environmental and system conditions and may take longer than 1 hour. This sensitivity is acceptable for containment air cooler condensate flow rate monitor OPERABILITY.]

The LCO is satisfied when monitors of diverse measurement means are available. Thus, the containment sump monitor, in combination with a

gaseous or particulate radioactivity monitor [and a containment air cooler condensate flow rate monitor], provides an acceptable minimum.

APPLICABILITY

Because of elevated RCS temperature and pressure in MODES 1, 2, 3, and 4, RCS leakage detection instrumentation is required to be OPERABLE.

In MODE 5 or 6, the temperature is to be ≤ 200°F and pressure is maintained low or at atmospheric pressure. Since the temperatures and pressures are far lower than those for MODES 1, 2, 3, and 4, the likelihood of leakage and crack propagation are much smaller. Therefore, the requirements of this LCO are not applicable in MODES 5 and 6.

ACTIONS

A.1 and A.2

With the required containment sump monitor inoperable, no other form of sampling can provide the equivalent information; however, the containment atmosphere radioactivity monitor will provide indications of changes in leakage. Together with the containment atmosphere radioactivity monitor, the periodic surveillance for RCS water inventory balance, SR 3.4.13.1, must be performed at an increased frequency of 24 hours to provide information that is adequate to detect leakage. A Note is added allowing that SR 3.4.13.1 is not required to be performed until 12 hours after establishing steady state operation (stable temperature, power level, pressurizer and makeup tank levels, makeup and letdown, [and RCP seal injection and return flows]). The 12 hour allowance provides sufficient time to collect and process all necessary data after stable plant conditions are established.

Restoration of the required sump monitor to OPERABLE status within a Completion Time of 30 days is required to regain the function after the monitor's failure. This time is acceptable, considering the Frequency and adequacy of the RCS water inventory balance required by Required Action A.1.

BASES

ACTIONS (continued)

B.1.1, B.1.2, B.2.1, and B.2.2

With both gaseous and particulate containment atmosphere radioactivity monitoring instrumentation channels inoperable, alternative action is required. Either grab samples of the containment atmosphere must be taken and analyzed or water inventory balances, in accordance with SR 3.4.13.1, must be performed to provide alternate periodic information.

With a sample obtained and analyzed or water inventory balance performed every 24 hours, the reactor may be operated for up to 30 days to allow restoration of the required containment atmosphere radioactivity monitors. [Alternatively, continued operation is allowed if the air cooler condensate flow rate monitoring system is OPERABLE, provided grab samples are taken or water inventory balances performed every 24 hours.]

The 24 hour interval provides periodic information that is adequate to detect leakage. A Note is added allowing that SR 3.4.13.1 is not required to be performed until 12 hours after establishing steady state operation (stable temperature, power level, pressurizer and makeup tank levels, makeup and letdown, [and RCP seal injection and return flows]). The 12 hour allowance provides sufficient time to collect and process all necessary data after stable plant conditions are established. The 30 day Completion Time recognizes at least one other form of leakage detection is available.

[C.1 and C.2

With the ~~required~~ containment air cooler condensate flow rate monitor inoperable, alternative action is again required. Either SR 3.4.15.1 must be performed or water inventory balances, in accordance with SR 3.4.13.1, must be performed to provide alternate periodic information. Provided a CHANNEL CHECK is performed every 8 hours or a water inventory balance is performed every 24 hours, reactor operation may continue while awaiting restoration of the containment air cooler condensate flow rate monitor to OPERABLE status.

The 24 hour interval provides periodic information that is adequate to detect RCS LEAKAGE. A Note is added allowing that SR 3.4.13.1 is not required to be performed until 12 hours after establishing steady state operation (stable temperature, power level, pressurizer and makeup tank levels, makeup and letdown, [and RCP seal injection and return flows]). The 12 hour allowance provides sufficient time to collect and process all necessary data after stable plant conditions are established.]

BASES

ACTIONS (continued)

D.1, D.2.1, and D.2.2

With the required containment sump monitor [and the containment air cooler condensate flow rate monitor] inoperable, the only means of detecting LEAKAGE is the required containment atmosphere radiation monitor. A Note clarifies that this Condition is only applicable when the only OPERABLE monitor is the required containment atmosphere gaseous radiation monitor. The containment atmosphere gaseous radioactivity monitor typically cannot detect a 1 gpm leak within one hour when RCS activity is low. In addition, this configuration does not provide the required diverse means of leakage detection. Indirect methods of monitoring RCS leakage must be implemented. Grab samples of the containment atmosphere must be taken to provide alternate periodic information. The 12 hour interval is sufficient to detect increasing RCS leakage. The Required Action provides 7 days to restore another RCS leakage monitor to OPERABLE status to regain the intended leakage detection diversity. The 7 day Completion Time ensures that the plant will not be operated in a degraded configuration for a lengthy time period.

[~~DE~~.1 and ~~DE~~.2

With the required containment atmosphere radioactivity monitor [and the ~~required~~ containment air cooler condensate flow rate monitor] inoperable, the only means of detecting leakage is the containment sump monitor. This Condition does not provide the required diverse means of leakage detection. The Required Action is to restore either of the inoperable required monitors to OPERABLE status within 30 days to regain the intended leakage detection diversity. The 30 day Completion Time ensures that the plant will not be operated in a reduced configuration for a lengthy time period.]

~~E.1 and E.2~~

~~If a Required Action of Condition A, B, [C], or [D] cannot be met, the plant must be brought to a MODE in which the requirement 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, F.2, and F.3

With all required monitors inoperable, no automatic means of monitoring leakage are available. Frequent use of indirect methods of monitoring RCS leakage must be implemented. Grab samples of the containment atmosphere must be taken and analyzed and a water inventory balance (SR 3.4.13.1) must be performed every 6 hours to provide alternate periodic information.

With a sample obtained and analyzed and a water inventory balance performed every 6 hours, 72 hours is provided to restore at least one RCS leakage detection monitor. The 72 hour Completion Time is reasonable, considering the low probability of a significant RCS leakage occurring during this time and the avoidance of a plant shutdown in response to the loss of monitoring equipment, while providing a reasonable time to restore a monitor to OPERABLE status.
~~, and immediate plant shutdown in accordance with LCO 3.0.3 is required.~~

G.1 and G.2

If a Required Action cannot be met within the associated Completion Time, the plant must be brought to a MODE in which the requirement 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.

SURVEILLANCE REQUIREMENTS

SR 3.4.15.1

SR 3.4.15.1 requires the performance of a CHANNEL CHECK of the required containment atmosphere radioactivity monitor. The check gives reasonable confidence that the channel is operating properly. The Frequency of 12 hours is based on instrument reliability and is reasonable for detecting off normal conditions.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.15.2

SR 3.4.15.2 requires the performance of a COT on the required containment atmosphere radioactivity monitor. The test ensures that the monitor can perform its function in the desired manner. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable COT of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. The test verifies the alarm setpoint and relative accuracy of the instrument string. The Frequency of 92 days considers instrument reliability, and operating experience has shown that it is proper for detecting degradation.

SR 3.4.15.3, [SR 3.4.15.4, and SR 3.4.15.5]

These SRs require the performance of a CHANNEL CALIBRATION for each of the RCS leakage detection instrumentation channels. The calibration verifies the accuracy of the instrument string, including the instruments located inside containment. The Frequency of [18] months is a typical refueling cycle and considers channel reliability. Again, operating experience has proven that this Frequency is acceptable.

REFERENCES

1. 10 CFR 50, Appendix A, Section IV, GDC 30.

2. Regulatory Guide 1.45, Revision 0, "Reactor Coolant Pressure Boundary Leakage Detection Systems," May 1973.

3. FSAR, Section [ ].

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.15 RCS Leakage Detection Instrumentation

LCO 3.4.15 [Two of] the following RCS leakage detection instrumentation shall be OPERABLE:

a. One containment sump monitor,

b. One containment atmosphere radioactivity monitor (gaseous or particulate), and

[c. One containment air cooler condensate flow rate monitor.]

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

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. ~~Required C~~containment sump monitor inoperable.	A.1	----------NOTE---------- Not required until 12 hours after establishment of steady state operation. ---------- Perform SR 3.4.13.1.	Once per 24 hours
	AND		
	A.2	Restore containment sump monitor to OPERABLE status.	30 days

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Required containment atmosphere radioactivity monitor inoperable.	B.1.1 Analyze grab samples of the containment atmosphere.	Once per 24 hours
	OR	
	B.1.2 ----------NOTE---------- Not required until 12 hours after establishment of steady state operation. ----------	
	Perform SR 3.4.13.1.	Once per 24 hours
	AND	
	B.2.1 Restore required containment atmosphere radioactivity monitor to OPERABLE status.	30 days
	OR	
	[B.2.2 [Verify containment air cooler condensate flow rate monitor is OPERABLE.	30 days]
C. [~~Required~~ containment air cooler condensate flow rate monitor inoperable.	C.1 ~~----------NOTE---------- Not required until 12 hours after establishment of steady state operation. ----------~~	
	Perform SR 3.4.15.1.	Once per 8 hours
	OR	
	C.2 ----------NOTE---------- Not required until 12 hours after establishment of steady state operation. ----------	
	Perform SR 3.4.13.1.	Once per 24 hours]

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
---------- NOTE ---------- Only applicable when the containment atmosphere gaseous radiation monitor is the only OPERABLE monitor. ---------- D. Containment sump monitor inoperable. AND [Containment air cooler condensate flow rate monitor inoperable.]	D.1 Analyze grab samples of the containment atmosphere. AND D.2.1 Restore containment sump monitor to OPERABLE status. OR [D.2.2 Restore containment air cooler condensate flow rate monitor to OPERABLE status.]	Once per 12 hours 7 days 7 days
~~D~~E.[Required containment atmosphere radioactivity monitor inoperable. AND [~~Required~~ Ccontainment air cooler condensate flow rate monitor inoperable.]	ED.1 Restore required containment atmosphere radioactivity monitor to OPERABLE status. OR [E~~D~~.2 Restore ~~required~~ containment air cooler condensate flow rate monitor to OPERABLE status.]	30 days 30 days]
~~E. Required Action and associated Completion Time not met.~~	~~E.1 Be in MODE 3.~~ ~~AND~~ ~~E.2 Be in MODE 5.~~	~~6 hours~~ ~~36 hours~~
F. All required monitors inoperable.	F.1 Analyze grab samples of the containment atmosphere. AND F.2 Perform SR 3.4.13.1.	Once per 6 hours Once per 6 hours

	AND F.3 Restore at least one RCS leakage detection monitor to OPERABLE status. ~~F.1 Enter LCO 3.0.3.~~	72 hours ~~Immediately~~
G. Required Action and associated Completion Time not met.	G.1 Be in MODE 3. AND G.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.15.1	Perform CHANNEL CHECK of the required containment atmosphere radioactivity monitor.	[12] hours
SR 3.4.15.2	Perform CHANNEL FUNCTIONAL TEST of the required containment atmosphere radioactivity monitor.	92 days
SR 3.4.15.3	Perform CHANNEL CALIBRATION of the required containment sump monitor.	[18] months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.4.15.4	Perform CHANNEL CALIBRATION of the required containment atmosphere radioactivity monitor.	[18] months
SR 3.4.15.5	[Perform CHANNEL CALIBRATION of the required containment air cooler condensate flow rate monitor.	[18] months]

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.15 RCS Leakage Detection Instrumentation

BASES

BACKGROUND

GDC 30 of Appendix A to 10 CFR 50 (Ref. 1) requires means for detecting and, to the extent practical, identifying the location of the source of RCS LEAKAGE. Regulatory Guide 1.45, Revision 0, (Ref. 2) describes acceptable methods for selecting leakage detection systems.

Leakage detection systems must have the capability to detect significant reactor coolant pressure boundary (RCPB) degradation as soon after occurrence as practical to minimize the potential for propagation to a gross failure. Thus, an early indication or warning signal is necessary to permit proper evaluation of all unidentified LEAKAGE. [In addition to meeting the OPERABILITY requirements, the monitors are typically set to provide the most sensitive response without causing an excessive number of spurious alarms.]

~~Industry practice has shown that water flow changes of 0.5 gpm to 1.0 gpm can readily be detected in contained volumes by monitoring changes in water level, in flow rate, or in the operating frequency of a pump.~~ The containment sump used to collect unidentified LEAKAGE [is] [(or) and the containment air cooler condensate flow rate monitor] [are] instrumented to alarm for increases ~~of 0.5 gpm to 1.0 gpm~~ above in the normal flow rates. ~~This sensitivity is acceptable for detecting increases in unidentified LEAKAGE.~~

The reactor coolant contains radioactivity that, when released to the containment, may ~~can~~ be detected by radiation monitoring instrumentation. ~~Reactor coolant radioactivity levels will be low during initial reactor startup and for a few weeks thereafter until activated corrosion products have been formed and fission products appear from fuel element cladding contamination or cladding defects. Instrument sensitivities of 10^{-9} µCi/cc radioactivity for particulate monitoring and of 10^{-6} µCi/cc radioactivity for gaseous monitoring are practical for these leakage detection systems.~~ Radioactivity detection systems are included for monitoring both particulate and gaseous activities, because of their sensitivities and rapid responses to RCS LEAKAGE.

Other indications may be used to detect an increase in unidentified LEAKAGE; however, they are not required to be OPERABLE by this LCO. An increase in humidity of the containment atmosphere would indicate release of water vapor to the containment. Dew point temperature measurements can thus be used to monitor humidity levels of the containment atmosphere as an indicator of potential RCS LEAKAGE. ~~A 1°F increase in dew point is well within the sensitivity range of available instruments.~~

BASES

BACKGROUND (continued)

Since the humidity level is influenced by several factors, a quantitative evaluation of an indicated leakage rate by this means may be questionable and should be compared to observed increases in liquid flow into or from the containment sump [and condensate flow from air coolers]. Humidity level monitoring is considered most useful as an indirect alarm or indication to alert the operator to a potential problem. Humidity monitors are not required by this LCO.

Air temperature and pressure monitoring methods may also be used to infer unidentified LEAKAGE to the containment. Containment temperature and pressure fluctuate slightly during plant operation, but a rise above the normally indicated range of values may indicate RCS LEAKAGE into the containment. The relevance of temperature and pressure measurements ~~are~~ is affected by containment free volume and, for temperature, detector location. Alarm signals from these instruments can be valuable in recognizing rapid and sizable leakage to the containment. Temperature and pressure monitors are not required by this LCO.

The above-mentioned LEAKAGE detection methods or systems differ in sensitivity and response time. [Some of these systems could serve as early alarm systems signaling the operators that closer examination of other detection systems is necessary to determine the extent of any corrective action that may be required.]

APPLICABLE SAFETY ANALYSES

The need to evaluate the severity of an alarm or an indication is important to the operators, and the ability to compare and verify with indications from other systems is necessary. ~~The system response times and sensitivities are described in the FSAR (Ref. 3). Multiple instrument locations are utilized, if needed, to ensure the transport delay time of the LEAKAGE from its source to an instrument location yields an acceptable overall response time.~~

The safety significance of RCS LEAKAGE varies widely depending on its source, rate, and duration. Therefore, detecting and monitoring RCS LEAKAGE into the containment area are necessary. Quickly separating the identified LEAKAGE from the unidentified LEAKAGE provides quantitative information to the operators, allowing them to take corrective action should leakage occur detrimental to the safety of the facility and the public.

RCS leakage detection instrumentation satisfies Criterion 1 of 10 CFR 50.36(c)(2)(ii).

BASES

LCO

~~One method of protecting against large RCS LEAKAGE derives from the ability of instruments to rapidly detect extremely small leaks.~~ This LCO requires instruments of diverse monitoring principles to be OPERABLE to provide ~~a high degree of~~ confidence that small amounts of unidentified LEAKAGE ~~extremely small leaks~~ are detected in time to allow actions to place the plant in a safe condition when RCS LEAKAGE indicates possible RCPB degradation.

The LCO requires [three] instruments to be OPERABLE.

The containment sump is used to collect unidentified LEAKAGE. [The containment sump consists of the normal sump and the emergency sump. The LCO requirements apply to the total amount of unidentified LEAKAGE collected in [the][both] sump[s].] The monitor on the containment sump detects [level or flow rate or the operating frequency of a pump] and is instrumented to detect when there is [leakage of] [an increase above the normal value by] 1 gpm. The identification of [an increase in] unidentified LEAKAGE will be delayed by the time required for the unidentified LEAKAGE to travel to the containment sump and it may take longer than one hour to detect a 1 gpm increase in unidentified LEAKAGE, depending on the origin and magnitude of the LEAKAGE. This sensitivity is acceptable for containment sump monitor OPERABILITY.

The reactor coolant contains radioactivity that, when released to the containment, can be detected by the gaseous or particulate containment atmosphere radioactivity monitor. Only one of the two detectors is required to be OPERABLE. Radioactivity detection systems are included for monitoring both particulate and gaseous activities because of their sensitivities and rapid responses to RCS LEAKAGE, but have recognized limitations. Reactor coolant radioactivity levels will be low during initial reactor startup and for a few weeks thereafter, until activated corrosion products have been formed and fission products appear from fuel element cladding contamination or cladding defects. If there are few fuel element cladding defects and low levels of activation products, it may not be possible for the gaseous or particulate containment atmosphere radioactivity monitors to detect a 1 gpm increase within 1 hour during normal operation. However, the gaseous or particulate containment atmosphere radioactivity monitor is OPERABLE when it is capable of detecting a 1 gpm increase in unidentified LEAKAGE within 1 hour given an RCS activity equivalent to that assumed in the design calculations for the monitors (Reference 3).

[An increase in humidity of the containment atmosphere could indicate the release of water vapor to the containment. Condensate flow from air coolers is instrumented to detect when there is an increase above the normal value by 1 gpm. The time required to detect a 1 gpm increase above the normal value varies based on environmental and system

conditions and may take longer than 1 hour. This sensitivity is acceptable for containment air cooler condensate flow rate monitor OPERABILITY.]

The LCO is satisfied when monitors of diverse measurement means are available. Thus, the containment sump monitor, in combination with a particulate or gaseous radioactivity monitor [and a containment air cooler condensate flow rate monitor], provides an acceptable minimum.

APPLICABILITY

Because of elevated RCS temperature and pressure in MODES 1, 2, 3, and 4, RCS leakage detection instrumentation is required to be OPERABLE.

In MODE 5 or 6, the temperature is ≤ 200°F and pressure is maintained low or at atmospheric pressure. Since the temperatures and pressures are far lower than those for MODES 1, 2, 3, and 4, the likelihood of leakage and crack propagation is much smaller. Therefore, the requirements of this LCO are not applicable in MODES 5 and 6.

ACTIONS

A.1 and A.2

If the containment sump monitor is inoperable, no other form of sampling can provide the equivalent information.

However, the containment atmosphere radioactivity monitor will provide indications of changes in leakage. Together with the containment atmosphere radioactivity monitor, the periodic surveillance for RCS water inventory balance, SR 3.4.13.1, must be performed at an increased frequency of 24 hours to provide information that is adequate to detect leakage. A Note is added allowing that SR 3.4.13.1 is not required to be performed until 12 hours after establishing steady state operation (stable temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and [RCP seal injection and return flows]). The 12 hour allowance provides sufficient time to collect and process all necessary data after stable plant conditions are established.

Restoration of the sump monitor to OPERABLE status is required to regain the function in a Completion Time of 30 days after the monitor's failure. This time is acceptable considering the frequency and adequacy of the RCS water inventory balance required by Required Action A.1.

BASES

ACTIONS (continued)

B.1.1, B.1.2, B.2.1, and B.2.2

With both gaseous and particulate containment atmosphere radioactivity monitoring instrumentation channels inoperable, alternative action is required. Either grab samples of the containment atmosphere must be taken and analyzed, or water inventory balances, in accordance with SR 3.4.13.1, must be performed to provide alternate periodic information. With a sample obtained and analyzed or an inventory balance performed every 24 hours, the reactor may be operated for up to 30 days to allow restoration of at least one of the radioactivity monitors.

[Alternatively, continued operation is allowed if the air cooler condensate flow rate monitoring system is OPERABLE, provided grab samples are taken or water inventory balance performed every 24 hours.]

The 24 hour interval provides periodic information that is adequate to detect leakage. A Note is added allowing that SR 3.4.13.1 is not required to be performed until 12 hours after establishing steady state operation (stable temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and [RCP seal injection and return flows]). The 12 hour allowance provides sufficient time to collect and process all necessary data after stable plant conditions are established. The 30 day Completion Time recognizes at least one other form of leakage detection is available.

[C.1 and C.2

If the ~~required~~ containment air cooler condensate flow rate monitor is inoperable, alternative action is again required. Either SR 3.4.15.1 must be performed, or water inventory balances, in accordance with SR 3.4.13.1, must be performed to provide alternate periodic information. Provided a CHANNEL CHECK is performed every 8 hours or an inventory balance is performed every 24 hours, reactor operation may continue while awaiting restoration of the containment air cooler condensate flow rate monitor to OPERABLE status.

The 24 hour interval provides periodic information that is adequate to detect RCS LEAKAGE. A Note is added allowing that SR 3.4.13.1 is not required to be performed until 12 hours after establishing steady state operation (stable temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and [RCP seal injection and return flows]). The 12 hour allowance provides sufficient time to collect and process all necessary data after stable plant conditions are established.

BASES

ACTIONS (continued)

D.1, D.2.1, and D.2.2

With the containment sump monitor, [and the containment air cooler condensate flow rate monitor] inoperable, the only means of detecting LEAKAGE is the required containment atmosphere radiation monitor. A Note clarifies that this Condition is only applicable when the only OPERABLE monitor is the required containment atmosphere gaseous radiation monitor. The containment atmosphere gaseous radioactivity monitor typically cannot detect a 1 gpm leak within one hour when RCS activity is low. In addition, this configuration does not provide the required diverse means of leakage detection. Indirect methods of monitoring RCS leakage must be implemented. Grab samples of the containment atmosphere must be taken and analyzed must be performed every 12 hours to provide alternate periodic information. The 12 hour interval is sufficient to detect increasing RCS leakage. The Required Action provides 7 days to restore another RCS leakage monitor to OPERABLE status to regain the intended leakage detection diversity. The 7 day Completion Time ensures that the plant will not be operated in a degraded configuration for a lengthy time period.

~~E~~D.1 and ~~E~~D.2

If the required containment atmosphere radioactivity monitor [and the containment air cooler condensate flow rate monitor] are inoperable, the only means of detecting leakage is the containment sump monitor. This Condition does not provide the required diverse means of leakage detection. The Required Action is to restore either of the inoperable monitors to OPERABLE status within 30 days to regain the intended leakage detection diversity. The 30 day Completion Times ensure that the plant will not be operated in a reduced configuration for a lengthy time period.]

~~E.1 and E.2~~

~~If any Required Action of Condition A, B, [C], or [D] cannot be met 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 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, F.2, and F.3

If all required monitors are inoperable, no automatic means of monitoring leakage are available. Frequent use of indirect methods of monitoring RCS leakage must be implemented. Grab samples of the containment atmosphere must be taken and analyzed and a water inventory balance must be performed every 6 hours to provide alternate periodic information.

With a sample obtained and analyzed and a water inventory balance (SR 3.4.13.1) performed every 6 hours, 72 hours is provided to restore at least one RCS leakage detection monitor. The 72 hour Completion Time is reasonable, considering the low probability of a significant RCS leakage occurring during this time and the avoidance of a plant shutdown in response to the loss of monitoring equipment, while providing a reasonable time to restore a monitor to OPERABLE status.
~~and immediate plant shutdown in accordance with LCO 3.0.3 is required.~~

G.1 and G.2

If a Required Action cannot be met within the associated Completion Time, the plant must be brought to a MODE in which the requirement 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.

SURVEILLANCE REQUIREMENTS

SR 3.4.15.1

SR 3.4.15.1 requires the performance of a CHANNEL CHECK of the required containment atmosphere radioactivity monitors. The check gives reasonable confidence the channel is operating properly. The Frequency of [12] hours is based on instrument reliability and is reasonable for detecting off normal conditions.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.15.2

SR 3.4.15.2 requires the performance of a CHANNEL FUNCTIONAL TEST of the required containment atmosphere radioactivity monitors. The test ensures that the monitor can perform its function in the desired manner. The test verifies the alarm setpoint and relative accuracy of the instrument string. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. The Frequency of 92 days considers instrument reliability, and operating experience has shown it proper for detecting degradation.

SR 3.4.15.3, SR 3.4.15.4, and [SR 3.4.15.5]

These SRs require the performance of a CHANNEL CALIBRATION for each of the RCS leakage detection instrumentation channels. The calibration verifies the accuracy of the instrument string, including the instruments located inside containment. The Frequency of [18] months is a typical refueling cycle and considers channel reliability. Operating experience has shown this Frequency is acceptable.

REFERENCES

1. 10 CFR 50, Appendix A, Section IV, GDC 30.

2. Regulatory Guide 1.45, Revision 0, "Reactor Coolant Pressure Boundary Leakage Detection Systems," May 1973.

3. FSAR, Section [ ].