TSTF
TECHNICAL SPECIFICATIONS TASK FORCE
A JOINT OWNERS GROUP ACTIVITY

September 8, 2009

TSTF-09-18
PROJ0753

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

SUBJECT: Response to June 11, 2009 Request for Additional Information Regarding TSTF-514, Revision 0, "Revise BWR 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-514 On Reactor Coolant System Leakage Instrumentation," dated June 11, 2009.

Dear Sir or Madam:

In the referenced letter, the NRC provided a Request for Additional Information (RAI) regarding TSTF-514, Revision 0, "Revise BWR Operability Requirements and Actions for RCS Leakage Instrumentation." This letter responds to the NRC's request.

TSTF-514 is revised to incorporate information requested in the RAI. TSTF-514, Revision 1, is attached.

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

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Enclosure

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BWR OWNERS' GROUP

Response to June 11, 2009 Request for Additional Information Regarding TSTF-514, Revision 0, "Revise BWR Operability Requirements and Actions for RCS Leakage Instrumentation"

The NRC provided the following Request for Additional Information:

The proposed change to the boiling water reactor (BWR) Improved Standard Technical Specification (ISTS) for reactor coolant system (RCS) leakage detection instrumentation revises the Bases to more 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 and the necessary actions under certain conditions:

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 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 for 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-514, Revision 0, 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. Surveillance Requirement (SR) 3.4.4.1 and SR 3.4.5.1 of NUREG-1433 and NUREG-1434, respectively, require that operators verify RCS unidentified leakage and total leakage [and unidentified leakage increase] are within limits on a frequency of 8 hours. The associated bases indicate that sump level and flow rate would typically be used to determine actual leakage rates. However, the bases also state that any method within the guidelines of Regulatory Guide 1.45, Rev. 0, may be used to quantify leakage. Alternative Staff Position 3 of Supplement 1 to NRC Generic Letter (GL) 88-01, "NRC Position on IGSCC [Intergranular Stress Corrosion Cracking] in BWR Austenitic Stainless Steel Piping," describes that manual pumping of the containment sump or measurement of the differences in sump level over time may be used to quantify RCS leakage rate when the sump monitoring instrumentation is inoperable.

   Proposed Condition F would require obtaining and analyzing a grab sample of the primary containment (BWR/4) or drywell (BWR/6) atmosphere, monitoring RCS leakage using administrative means every 6 hours, and restoring at least one RCS leakage detection monitor to operable status within 72 hours; otherwise, a plant shutdown would be required. From the proposed bases, it is not clear that the proposed required actions would reasonably quantify RCS leakage. The precedent amendment (ADAMS Accession No. ML082261529) cited in Section 4.0 of TSTF-514 required performance of a specific surveillance at an increased frequency to quantify RCS leakage when all leakage monitoring systems were inoperable. This surveillance used instruments that were independent of the inoperable leakage monitoring systems. Accordingly, please revise the required actions for proposed Condition F to specify performance of a method to quantify RCS leakage at an increased frequency that would demonstrate RCS unidentified leakage and total leakage [and unidentified leakage increase] are within limits during the period that all automatic RCS leakage monitoring systems are inoperable.

Response

The BWR design does not provide alternative methods to quantify RCS leakage other than the RCS leakage monitoring instrumentation. However, there are methods which can detect a significant change in RCS leakage. These methods include primary containment and drywell pressure, temperature, and humidity, Component Cooling Water System outlet temperatures and makeup, Reactor Recirculation System pump seal pressure and temperature and motor cooler temperature indications, Drywell cooling fan outlet temperatures, Reactor

Building Chiller amperage, Control Rod Drive System flange temperatures, and Safety Relief Valves tailpipe temperature, flow, or pressure. Verification that these indications have not increased since the RCS leakage monitoring instrumentation became inoperable, coupled with the atmospheric grab samples, is sufficient to alert the operating staff to an unexpected increase in RCS leakage. Periodic verification using these indications is sufficient to ensure that no increase in RCS leakage has occurred.

Required Action F.2 is revised to state, "Verify no increase in RCS LEAKAGE over pre-established values." The Bases state, "available indications must be used to verify that there is no increase in RCS LEAKAGE over the values established when the monitors became inoperable." If there is an indicated increase in RCS leakage, Required Action F.2 is not met and Condition G, which requires a plant shutdown, is entered.

The revised Required Action F.2 is not similar to the precedent amendment and reference to it has been eliminated.

3. In part, the LCO section of the proposed bases states:

   "The drywell floor drain sump monitoring system is required to quantify the unidentified LEAKAGE from the RCS. Thus, for the system to be considered OPERABLE, either the flow monitoring or the sump level monitoring portion of the system must be OPERABLE."

   This statement does not clearly indicate the required capabilities for the drywell floor drain sump monitoring system to quantify the leakage rate. Clarify the statement to indicate that both a means of quantifying the volume of leakage and a means of determining the time for the volume to accumulate in the sump must be available for the monitoring system to be operable.

Response

The TSTF agrees to provide the requested clarification. The LCO Bases are revised to state, "The drywell floor drain sump monitoring system is required to quantify the unidentified LEAKAGE rate from the RCS. Thus, for the system to be considered OPERABLE, either the flow monitoring or the sump level monitoring portion of the system must be OPERABLE and capable of determining the leakage rate." The added text is underlined.

Technical Specification Task Force
Improved Standard Technical Specifications Change Traveler

Revise BWR 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: John Messina, (330) 384-5878, jmessina@firstenergycorp.com

See attached.

Revision History

OG Revision 0 Revision Status: Closed

Revision Proposed by: BWROG

Revision Description:
Original Issue

Owners Group Review Information

Date Originated by OG: 14-Jan-09

Owners Group Comments
(No Comments)

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

NRC Review Information

NRC Received Date: 18-Feb-09

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

TSTF Revision 1 Revision Status: Active

TSTF Revision 1 Revision Status: Active

Revision Proposed by: NRC

Revision Description:
TSTF-514 is revised to reflect the industry's response to the NRC's 6/11/2009 Request for Additional Information.

Specific changes are:

1. The Background section of the Bases is revised to include the optional statement, "[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.]"

2. Proposed Required Action F.2 is revised from, "Monitor RCS leakage by administrative means" to "Verify no increase in RCS LEAKAGE over pre-established values."

3. The LCO Bases are revised to clarify that the drywell floor drain sump monitoring system is required to quanitify the leakage rate, not leakage.

The justification is revised to reflect these changes.

Owners Group Review Information

Date Originated by OG: 14-Aug-09

Owners Group Comments
(No Comments)

Owners Group Resolution: Date:

TSTF Review Information

TSTF Received Date: 14-Aug-09 Date Distributed for Review 14-Aug-09

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

TSTF Comments:
(No Comments)

TSTF Resolution: Approved Date: 08-Sep-09

NRC Review Information

NRC Received Date: 08-Sep-09

Affected Technical Specifications

Bkgnd 3.4.6 Bases	RCS Leakage Detection Instrumentation	NUREG(s)- 1433 Only
S/A 3.4.6 Bases	RCS Leakage Detection Instrumentation	NUREG(s)- 1433 Only

LCO 3.4.6 Bases	RCS Leakage Detection Instrumentation	NUREG(s)- 1433 Only
Ref. 3.4.6 Bases	RCS Leakage Detection Instrumentation	NUREG(s)- 1433 Only
Action 3.4.6.C Bases	RCS Leakage Detection Instrumentation Change Description: Corrected SR Reference	NUREG(s)- 1433 Only
Action 3.4.6.D	RCS Leakage Detection Instrumentation Change Description: New Action	NUREG(s)- 1433 Only
Action 3.4.6.D	RCS Leakage Detection Instrumentation Change Description: Relabeled E	NUREG(s)- 1433 Only
Action 3.4.6.D Bases	RCS Leakage Detection Instrumentation Change Description: Relabeled E	NUREG(s)- 1433 Only
Action 3.4.6.D Bases	RCS Leakage Detection Instrumentation Change Description: New Action	NUREG(s)- 1433 Only
Action 3.4.6.E	RCS Leakage Detection Instrumentation Change Description: Relabeled G	NUREG(s)- 1433 Only
Action 3.4.6.E Bases	RCS Leakage Detection Instrumentation Change Description: Relabeled G	NUREG(s)- 1433 Only
Action 3.4.6.F	RCS Leakage Detection Instrumentation	NUREG(s)- 1433 Only
Action 3.4.6.F Bases	RCS Leakage Detection Instrumentation	NUREG(s)- 1433 Only
Bkgnd 3.4.7 Bases	RCS Leakage Detection Instrumentation	NUREG(s)- 1434 Only
S/A 3.4.7 Bases	RCS Leakage Detection Instrumentation	NUREG(s)- 1434 Only
LCO 3.4.7 Bases	RCS Leakage Detection Instrumentation	NUREG(s)- 1434 Only
Ref. 3.4.7 Bases	RCS Leakage Detection Instrumentation	NUREG(s)- 1434 Only
Action 3.4.7.D	RCS Leakage Detection Instrumentation Change Description: Relabeled E	NUREG(s)- 1434 Only
Action 3.4.7.D	RCS Leakage Detection Instrumentation Change Description: New Action	NUREG(s)- 1434 Only
Action 3.4.7.D Bases	RCS Leakage Detection Instrumentation Change Description: Relabeled E	NUREG(s)- 1434 Only
Action 3.4.7.D Bases	RCS Leakage Detection Instrumentation Change Description: New Action	NUREG(s)- 1434 Only
Action 3.4.7.E	RCS Leakage Detection Instrumentation Change Description: Relabeled G	NUREG(s)- 1434 Only
Action 3.4.7.E Bases	RCS Leakage Detection Instrumentation Change Description: Relabeled G	NUREG(s)- 1434 Only

Action 3.4.7.F	RCS Leakage Detection Instrumentation	NUREG(s)- 1434 Only
Action 3.4.7.F Bases	RCS Leakage Detection Instrumentation	NUREG(s)- 1434 Only

1.0 Description

NUREG-1433 Specification 3.4.6, "RCS Leakage Detection Instrumentation," and NUREG-1434 Specification 3.4.7 of the same title require 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) for BWR/4 plants (NUREG-1433) requires one drywell floor drain sump monitoring system, one channel of either primary containment atmospheric particulate or atmospheric gaseous monitoring system, and (optionally) a primary containment air cooler condensate flow rate monitoring system. The BWR/6 ISTS (NUREG-1434) requires one drywell floor drain sump monitoring system, one channel of either drywell atmospheric particulate or atmospheric gaseous monitoring system, and (optionally) a drywell air cooler condensate flow rate monitoring system.

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 atmospheric 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 atmospheric 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

The "RCS Leakage Detection Instrumentation," specification (BWR/4 LCO 3.4.6 and BWR/6 LCO 3.4.7) is revised to add a new Condition. New Condition D is applicable when the atmospheric gaseous radioactivity monitor is the only Operable monitor (i.e., all other monitors are inoperable). The Required Actions require analyzing grab samples of the primary containment (BWR/4) or drywell (BWR/6) atmosphere and monitoring RCS leakage using administrative means every 12 hours and restoring another monitor to Operable status within 7 days.

Existing Condition F 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 grab sample of the primary containment (BWR/4) or drywell (BWR/6) atmosphere every 6 hours and every 6 hours monitoring the available indications to verify that RCS leakage has not increased since the required monitors became inoperable. At least one RCS leakage detection monitor must be restored to Operable status within 72 hours or a plant shutdown is required.

Existing Condition E 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.

Also, the primary containment and drywell 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 "RCS Leakage Detection Instrumentation" Bases do not clearly define the basis for Operability for the RCS leakage detection 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 atmospheric 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 atmospheric gaseous radiation monitor is often the first monitor to indicate an increase in RCS leak rate. Therefore, the preferred solution is to retain the atmospheric gaseous radiation monitor in the LCO 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 atmospheric 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. All references 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 atmospheric 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 atmospheric gaseous radiation monitor is the only Operable monitor, the current Technical Specifications require grab samples of the primary containment or drywell atmosphere once per 12 hours and restoration of the inoperable monitors within 30 days. The proposed change requires analyzing grab samples from the primary containment or drywell atmosphere and monitoring RCS leakage by administrative means once per 12 hours and restoration of at least one additional monitor within 7 days.

Administrative means of monitoring RCS leakage include monitoring and trending parameters that may indicate an increase in RCS leakage. There are diverse alternative mechanisms from which appropriate indicators may be selected based on plant conditions. It is not necessary to utilize all of these methods, but a method or methods should be selected considering the current plant conditions and historical or expected sources of unidentified leakage. The administrative methods include, but are not limited to, primary containment and drywell pressure, temperature, and humidity, Component Cooling Water System outlet temperatures and makeup, Reactor Recirculation System pump seal pressure and temperature and motor cooler temperature indications, Drywell cooling fan outlet temperatures, Reactor Building Chiller amperage, Control Rod Drive System flange temperatures, and Safety Relief Valves tailpipe temperature, flow, or pressure. These indications, coupled with the atmospheric grab samples, are sufficient to alert the operating staff to an unexpected increase in unidentified LEAKAGE.

A primary containment or drywell grab sample is comparable to the atmospheric 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, the frequent performance of the grab samples ensures there is no significant loss of monitoring capability during the limited time period allowed by the proposed change. The 12 hour (once per shift) performance of primary containment or drywell grab samples and monitoring by administrative means is reasonable given the availability of the atmospheric gaseous radiation monitor. The 7 day Completion Time to restore another monitor to Operable status is reasonable given the diverse methods employed in the Required Actions 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 primary containment or drywell grab samples and monitoring available indications to verify that there is no increase in RCS leakage over the values established when the monitors became inoperable.

There are diverse alternative mechanisms for determining that RCS leakage has not increased, from which appropriate indicators may be selected based on plant conditions. It is not necessary to utilize all of these methods, but a method or methods should be selected considering the current plant conditions and historical or expected sources of

leakage. These methods include, but are not limited to, primary containment and drywell pressure, temperature, and humidity, Component Cooling Water System outlet temperatures and makeup, Reactor Recirculation System pump seal pressure and temperature and motor cooler temperature indications, Drywell cooling fan outlet temperatures, Reactor Building Chiller amperage, Control Rod Drive System flange temperatures, and Safety Relief Valves tailpipe temperature, flow, or pressure. Verification that these indications have not increased since the required monitors became inoperable, coupled with the atmospheric grab samples, is sufficient to alert the operating staff to an unexpected increase in RCS leakage.

The combination of these frequent actions 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.

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.

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 detection instrumentation monitor is the atmospheric gaseous radiation monitor. The proposed change also extends the allowed operating time when all RCS leakage detection 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 detection instrumentation monitor is the atmospheric gaseous radiation monitor. The proposed change also extends the allowed operating time when all RCS leakage detection 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 detection instrumentation monitor is the atmospheric gaseous radiation monitor. The proposed change also extends the allowed operating time when all RCS leakage detection instrumentation is inoperable. Reducing the amount of time the plant is allowed to operate with only the atmospheric 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 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 50.36, "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 the "RCS Leakage Detection Instrumentation" Specification. The modification of the Actions in the Specification 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)

3.4.6 RCS Leakage Detection Instrumentation

LCO 3.4.6 The following RCS leakage detection instrumentation shall be OPERABLE:

a. Drywell floor drain sump monitoring system, [and]

b. One channel of either primary containment atmospheric particulate or atmospheric gaseous monitoring system, and

[c. Primary containment air cooler condensate flow rate monitoring system.]

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Drywell floor drain sump monitoring system inoperable.	A.1 Restore drywell floor drain sump monitoring system to OPERABLE status.	30 days
B. Required primary containment atmospheric monitoring system inoperable.	B.1 Analyze grab samples of primary containment atmosphere. AND B.2 [Restore required primary containment atmospheric monitoring system to OPERABLE status.	Once per 12 hours 30 days]

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. [Primary containment air cooler condensate flow rate monitoring system inoperable.	C.1 ----------NOTE---------- Not applicable when required primary containment atmospheric monitoring system is inoperable. ---------- Perform SR 3.4.6.1.	Once per 8 hours]
---------- NOTE ---------- Only applicable when the primary containment atmospheric gaseous radiation monitor is the only OPERABLE monitor. ---------- D. Drywell floor drain sump monitoring system inoperable. AND [Primary containment air cooler condensate flow rate monitoring system inoperable.]	D.1 Analyze grab samples of the primary containment atmosphere. AND D.2 Monitor RCS LEAKAGE by administrative means. AND D.3.1 Restore drywell floor drain sump monitoring system to OPERABLE status. OR [D.3.2 Restore primary containment air cooler condensate flow rate monitoring system to OPERABLE status.]	Once per 12 hours Once per 12 hours 7 days 7 days
ED.[Required primary containment atmospheric monitoring system inoperable. AND [Primary containment air cooler condensate flow rate monitoring	ED.1 Restore required primary containment atmospheric monitoring system to OPERABLE status. OR ED.2 [Restore primary containment air cooler condensate flow rate	30 days 30 days]

system inoperable.]	monitoring system to OPERABLE status.]	
~~E. Required Action and associated Completion Time of Condition A, B, [C, or D] not met.~~	~~E.1 Be in MODE 3.~~ ~~AND~~ ~~E.2 Be in MODE 4.~~	~~12 hours~~ ~~36 hours~~
F. All required leakage detection systems inoperable.	F.1 Analyze grab samples of the primary containment atmosphere. AND F.2 Verify no increase in RCS LEAKAGE over pre-established values. AND F.3 Restore at least one RCS leakage detection monitor to OPERABLE status. ~~Enter LCO 3.0.3.~~	Once per 6 hours Once per 6 hours 72 hours ~~Immediately~~
G. Required Action and associated Completion Time not met.	G.1 Be in MODE 3. AND G.2 Be in MODE 4.	12 hours 36 hours

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.6 RCS Leakage Detection Instrumentation

BASES

BACKGROUND

GDC 30 of 10 CFR 50, Appendix A (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.

Limits on LEAKAGE from the reactor coolant pressure boundary (RCPB) are required so that appropriate action can be taken before the integrity of the RCPB is impaired (Ref. 2). Leakage detection systems for the RCS are provided to alert the operators when leakage rates above normal background levels are detected and also to supply quantitative measurement of leakage rates. [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 Bases for LCO 3.4.4, "RCS Operational LEAKAGE," discuss the limits on RCS LEAKAGE rates.

Systems for separating the LEAKAGE of an identified source from an unidentified source are necessary to provide prompt and quantitative information to the operators to permit them to take immediate corrective action.

LEAKAGE from the RCPB inside the drywell is detected by at least one of two or three independently monitored variables, such as sump level changes and drywell gaseous and particulate radioactivity levels. The primary means of quantifying LEAKAGE in the drywell is the drywell floor drain sump monitoring system.

The drywell floor drain sump monitoring system monitors the LEAKAGE collected in the floor drain sump. This unidentified LEAKAGE consists of LEAKAGE from control rod drives, valve flanges or packings, floor drains, the Closed Cooling Water System, and drywell air cooling unit condensate drains, and any LEAKAGE not collected in the drywell equipment drain sump. The primary containment floor drain sump has transmitters that supply level indications in the main control room.

The floor drain sump level indicators have switches that start and stop the sump pumps when required. A timer starts each time the sump is pumped down to the low level setpoint. If the sump fills to the high level setpoint before the timer ends, an alarm sounds in the control room, indicating a LEAKAGE rate into the sump in excess of a preset limit.

A flow indicator in the discharge line of the drywell floor drain sump pumps provides flow indication in the control room. The pumps can also be started from the control room.

BASES

BACKGROUND (continued)

The primary containment air monitoring systems continuously monitor the primary containment atmosphere for airborne particulate and gaseous radioactivity. A sudden increase of radioactivity, which may be attributed to RCPB steam or reactor water LEAKAGE, is annunciated in the control room. ~~The primary containment atmosphere particulate and gaseous radioactivity monitoring systems are not capable of quantifying LEAKAGE rates, but are sensitive enough to indicate increased LEAKAGE rates of 1 gpm within 1 hour. Larger changes in LEAKAGE rates are detected in proportionally shorter times (Ref. 3).~~

[Condensate from four of the six primary containment coolers is routed to the primary containment floor drain sump and is monitored by a flow transmitter that provides indication and alarms in the control room. This primary containment air cooler condensate flow rate monitoring system serves as an added indicator, but not quantifier, of RCS unidentified LEAKAGE.]

APPLICABLE SAFETY ANALYSES

A threat of significant compromise to the RCPB exists if the barrier contains a crack that is large enough to propagate rapidly. LEAKAGE rate limits are set low enough to detect the LEAKAGE emitted from a single crack in the RCPB (Refs. ~~4~~ 3 and ~~54~~). ~~Each of the leakage detection systems inside the drywell is designed with the capability of detecting LEAKAGE less than the established LEAKAGE rate limits and providing appropriate alarm of excess LEAKAGE in the control room.~~

A control room alarm allows the operators to evaluate the significance of the indicated LEAKAGE and, if necessary, shut down the reactor for further investigation and corrective action. The allowed LEAKAGE rates are well below the rates predicted for critical crack sizes (Ref. ~~65~~). Therefore, these actions provide adequate response before a significant break in the RCPB can occur.

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

LCO

This LCO requires instruments of diverse monitoring principles to be OPERABLE to provide confidence that small amounts of unidentified LEAKAGE 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 drywell floor drain sump monitoring system is required to quantify the unidentified LEAKAGE rate from the RCS. Thus, for the system to be considered OPERABLE, either the flow monitoring or the sump level

monitoring portion of the system must be OPERABLE and capable of determining the leakage rate. The identification of an increase in unidentified LEAKAGE will be delayed by the time required for the unidentified LEAKAGE to travel to the drywell floor drain 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 primary containment, can be detected by the gaseous or particulate primary containment atmospheric 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 primary containment atmospheric radioactivity monitors to detect a 1 gpm increase within 1 hour during normal operation. However, the gaseous or particulate containment primary atmospheric 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 6).

[An increase in humidity of the containment atmospheric could indicate the release of water vapor to the containment. Primary containment air cooler condensate flow rate 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 drywell floor drain sump monitoring system, in combination with a gaseous or particulate primary containment atmospheric radioactivity monitor [and a primary containment air cooler condensate flow rate monitoring system], provides an acceptable minimum.

~~The drywell floor drain sump monitoring system is required to quantify the unidentified LEAKAGE from the RCS. Thus, for the system to be considered OPERABLE, either the flow monitoring or the sump level monitoring portion of the system must be OPERABLE. The other monitoring systems provide early alarms to the operators so closer examination of other detection systems will be made to determine the extent of any corrective action that may be required. With the leakage~~

~~detection systems inoperable, monitoring for LEAKAGE in the RCPB is degraded.~~

BASES

APPLICABILITY

In MODES 1, 2, and 3, leakage detection systems are required to be OPERABLE to support LCO 3.4.4. This Applicability is consistent with that for LCO 3.4.4.

ACTIONS

A.1

With the drywell floor drain sump monitoring system inoperable, no other form of sampling can provide the equivalent information to quantify leakage. However, the primary containment atmospheric activity monitor [and the primary containment air cooler condensate flow rate monitor] will provide indication of changes in leakage.

With the drywell floor drain sump monitoring system inoperable, but with RCS unidentified and total LEAKAGE being determined every 8 hours (SR 3.4.4.1), operation may continue for 30 days. The 30 day Completion Time of Required Action A.1 is acceptable, based on operating experience, considering the multiple forms of leakage detection that are still available.

B.1 and B.2

With both gaseous and particulate primary containment atmospheric monitoring channels inoperable, grab samples of the primary containment atmosphere must be taken and analyzed to provide periodic leakage information. [Provided a sample is obtained and analyzed once every 12 hours, the plant may be operated for up to 30 days to allow restoration of at least one of the required monitors.] [Provided a sample is obtained and analyzed every 12 hours, the plant may continue operation since at least one other form of drywell leakage detection (i.e., air cooler condensate flow rate monitor) is available.]

The 12 hour interval provides periodic information that is adequate to detect LEAKAGE. The 30 day Completion Time for restoration recognizes that at least one other form of leakage detection is available.

BASES

ACTIONS (continued)

[C.1

With the required primary containment air cooler condensate flow rate monitoring system inoperable, SR 3.4.6.1 must be performed every 8 hours to provide periodic information of activity in the primary containment at a more frequent interval than the routine Frequency of SR 3.4.~~7~~6.1. The 8 hour interval provides periodic information that is adequate to detect LEAKAGE and recognizes that other forms of leakage detection are available. However, this Required Action is modified by a Note that allows this action to be not applicable if the required primary containment atmospheric monitoring system is inoperable. Consistent with SR 3.0.1, Surveillances are not required to be performed on inoperable equipment.]

D.1, D.2, D.3.1, and D.3.2

With the drywell floor drain sump monitoring system [and the primary containment air cooler condensate flow rate monitoring system] inoperable, the only means of detecting LEAKAGE is the primary containment atmospheric gaseous radiation monitor. A Note clarifies this applicability of the Condition. The primary containment atmospheric gaseous radiation 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 primary containment atmosphere must be taken and analyzed and monitoring of RCS leakage by administrative means must be performed every 12 hours to provide alternate periodic information.

Administrative means of monitoring RCS leakage include monitoring and trending parameters that may indicate an increase in RCS leakage. There are diverse alternative mechanisms from which appropriate indicators may be selected based on plant conditions. It is not necessary to utilize all of these methods, but a method or methods should be selected considering the current plant conditions and historical or expected sources of unidentified leakage. The administrative methods include, but are not limited to, primary containment and drywell pressure, temperature, and humidity, Component Cooling Water System outlet temperatures and makeup, Reactor Recirculation System pump seal pressure and temperature and motor cooler temperature indications, Drywell cooling fan outlet temperatures, Reactor Building Chiller amperage, Control Rod Drive System flange temperatures, and Safety Relief Valves tailpipe temperature, flow, or pressure. These indications, coupled with the atmospheric grab samples, are sufficient to alert the operating staff to an unexpected increase in unidentified LEAKAGE.

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

With both the primary containment gaseous and particulate atmospheric monitor channels]and the primary containment air cooler condensate flow rate monitor] inoperable, the only means of detecting LEAKAGE is the drywell floor drain 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 Time ensures that the plant will not be operated in a degraded 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 associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to perform the actions in an orderly manner and without challenging plant systems.~~

F.1, F.2, and F.3

With all required monitors inoperable, no required automatic means of monitoring LEAKAGE are available~~, and immediate plant shutdown in accordance with LCO 3.0.3 is required~~. Frequent use of indirect methods of monitoring RCS LEAKAGE must be implemented. Every 6 hours grab samples of the primary containment atmosphere must be taken and analyzed and available indications must be used to verify that there is no increase in RCS LEAKAGE over the last quantified RCS LEAKAGE value determined prior to the monitors becoming inoperable.

There are diverse alternative mechanisms for determining that RCS LEAKAGE has not increased, from which appropriate indicators may be selected based on plant conditions. It is not necessary to utilize all of these methods, but a method or methods should be selected considering the current plant conditions and historical or expected sources of RCS LEAKAGE. These methods include, but are not limited to, primary containment and drywell pressure, temperature, and humidity,

Component Cooling Water System outlet temperatures and makeup, Reactor Recirculation System pump seal pressure and temperature and motor cooler temperature indications, Drywell cooling fan outlet temperatures, Reactor Building Chiller amperage, Control Rod Drive System flange temperatures, and Safety Relief Valves tailpipe temperature, flow, or pressure. Verification that these indications have not increased since the required monitors became inoperable, coupled with the atmospheric grab samples, is sufficient to alert the operating staff to an unexpected increase in RCS LEAKAGE.

With the available indications used to verify that there is no increase in RCS LEAKAGE over the values established when the monitors became inoperable, 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.

G.1 and G.2

If any Required Action cannot be met within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to perform the actions in an orderly manner and without challenging plant systems.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.6.1

This SR is for the performance of a CHANNEL CHECK of the required primary containment atmospheric monitoring system. 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.

SR 3.4.6.2

This SR is for the performance of a CHANNEL FUNCTIONAL TEST of the required RCS leakage detection instrumentation. The test ensures that the monitors can perform their function in the desired manner. The test also 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 31 days considers instrument reliability, and operating experience has shown it proper for detecting degradation.

SR 3.4.6.3

This SR is for the performance of a CHANNEL CALIBRATION of required 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 proven this Frequency is acceptable.

REFERENCES

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

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

~~3. FSAR, Section [5.2.7.2.1].~~

~~4~~3. GEAP-5620, April 1968.

~~5~~.4 NUREG-75/067, October 1975.

~~6~~5. FSAR, Section [5.2.7.5.2].

6. FSAR, Section [5.2.7.2.1].

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.7 RCS Leakage Detection Instrumentation

LCO 3.4.7 The following RCS leakage detection instrumentation shall be OPERABLE:

a. Drywell floor drain sump monitoring system, [and]

b. One channel of either drywell atmospheric particulate or atmospheric gaseous monitoring system, [and

[c. Drywell air cooler condensate flow rate monitoring system.]

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Drywell floor drain sump monitoring system inoperable.	A.1 Restore drywell floor drain sump monitoring system to OPERABLE status.	30 days
B. Required drywell atmospheric monitoring system inoperable.	B.1 Analyze grab samples of drywell atmosphere. AND B.2 [Restore required drywell atmospheric monitoring system to OPERABLE status.	Once per 12 hours 30 days]

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. [Drywell air cooler condensate flow rate monitoring system inoperable.	----------NOTE---------- Not applicable when the required drywell atmospheric monitoring system is inoperable. ---------- C.1 Perform SR 3.4.7.1.	Once per 8 hours]
---------- NOTE ---------- Only applicable when the drywell atmospheric gaseous monitoring system is the only OPERABLE monitor. ---------- D. Drywell floor drain sump monitoring system inoperable. AND [Drywell air cooler condensate flow rate monitoring system inoperable.]	D.1 Analyze grab samples of the drywell atmosphere. AND D.2 Monitor RCS LEAKAGE by administrative means. AND D.3.1 Restore drywell floor drain sump monitoring system to OPERABLE status. OR [D.3.2 Restore drywell air cooler condensate flow rate monitoring system to OPERABLE status.]	Once per 12 hours Once per 12 hours 7 days 7 days
~~E~~D. [Required drywell atmospheric monitoring system inoperable. AND [Drywell air cooler condensate flow rate monitoring system inoperable.]	~~E~~D.1 Restore required drywell atmospheric monitoring system to OPERABLE status. OR ~~E~~D.2 [Restore drywell air cooler condensate flow rate monitoring system to OPERABLE status.]	30 days 30 days]
~~E. Required Action and~~	~~E.1 Be in MODE 3.~~	~~12 hours~~

~~associated Completion Time of Condition A, B, [C, or D] not met.~~	~~AND~~ ~~E.2 Be in MODE 4.~~	 ~~36 hours~~
F. All required leakage detection systems inoperable.	F.1 Analyze grab samples of the drywell atmosphere. AND F.2 Verify no increase in RCS LEAKAGE over pre-established values. AND F.3 Restore at least one RCS leakage detection monitor to OPERABLE status. ~~Enter LCO 3.0.3.~~	Once per 6 hours Once per 6 hours 72 hours ~~Immediately~~
G. Required Action and associated Completion Time not met.	G.1 Be in MODE 3. AND G.2 Be in MODE 4.	12 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.7.1	Perform CHANNEL CHECK of required drywell atmospheric monitoring system.	12 hours

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.7 RCS Leakage Detection Instrumentation

BASES

BACKGROUND

GDC 30 of 10 CFR 50, Appendix A (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.

Limits on LEAKAGE from the reactor coolant pressure boundary (RCPB) are required so that appropriate action can be taken before the integrity of the RCPB is impaired (Ref. 2). Leakage detection systems for the RCS are provided to alert the operators when leakage rates above normal background levels are detected and also to supply quantitative measurement of rates. [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 Bases for LCO 3.4.5, "RCS Operational LEAKAGE," discuss the limits on RCS LEAKAGE rates.

Systems for separating the LEAKAGE of an identified source from an unidentified source are necessary to provide prompt and quantitative information to the operators to permit them to take immediate corrective action.

LEAKAGE from the RCPB inside the drywell is detected by at least one of two or three independently monitored variables, such as sump level changes and drywell gaseous and particulate radioactivity levels. The primary means of quantifying LEAKAGE in the drywell is the drywell floor drain sump monitoring system.

The drywell floor drain sump monitoring system monitors the LEAKAGE collected in the floor drain sump. This unidentified LEAKAGE consists of LEAKAGE from control rod drives, valve flanges or packings, floor drains, the Closed Cooling Water System, and drywell air cooling unit condensate drains, and any LEAKAGE not collected in the drywell equipment drain sump. The drywell floor drain sump has transmitters that supply level indications in the main control room.

The floor drain sump level indicators have switches that start and stop the sump pumps when required. A timer starts each time the sump is pumped down to the low level setpoint. If the sump fills to the high level setpoint before the timer ends, an alarm sounds in the control room, indicating a LEAKAGE rate into the sump in excess of a preset limit. A second timer starts when the sump pumps start on high level. Should this timer run out before the sump level reaches the low level setpoint, an alarm is sounded in the control room indicating a LEAKAGE rate into the

sump in excess of a preset limit. A flow indicator in the discharge line of the drywell floor drain sump pumps provides flow indication in the control room.

BASES

BACKGROUND (continued)

The drywell air monitoring systems continuously monitor the drywell atmosphere for airborne particulate and gaseous radioactivity. A sudden increase of radioactivity, which may be attributed to RCPB steam or reactor water LEAKAGE, is annunciated in the control room. ~~The drywell atmosphere particulate and gaseous radioactivity monitoring systems are not capable of quantifying leakage rates, but are sensitive enough to indicate increased LEAKAGE rates of 1 gpm within 1 hour. Larger changes in LEAKAGE rates are detected in proportionally shorter times (Ref. 3).~~

[Condensate from four of the six drywell coolers is routed to the drywell floor drain sump and is monitored by a flow transmitter that provides indication and alarms in the control room. This drywell air cooler condensate flow rate monitoring system serves as an added indicator, but not quantifier, of RCS unidentified LEAKAGE.]

APPLICABLE SAFETY ANALYSES

A threat of significant compromise to the RCPB exists if the barrier contains a crack that is large enough to propagate rapidly. LEAKAGE rate limits are set low enough to detect the LEAKAGE emitted from a single crack in the RCPB (Refs. 34 and ~~45~~). ~~Each of the leakage detection systems inside the drywell is designed with the capability of detecting LEAKAGE less than the established LEAKAGE rate limits and providing appropriate alarm of excess LEAKAGE in the control room.~~

A control room alarm allows the operators to evaluate the significance of the indicated LEAKAGE and, if necessary, shut down the reactor for further investigation and corrective action. The allowed LEAKAGE rates are well below the rates predicted for critical crack sizes (Ref. ~~56~~). Therefore, these actions provide adequate response before a significant break in the RCPB can occur.

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

LCO

This LCO requires instruments of diverse monitoring principles to be OPERABLE to provide confidence that small amounts of unidentified LEAKAGE 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 drywell floor drain sump monitoring system is required to quantify the unidentified LEAKAGE rate from the RCS. Thus, for the system to be considered OPERABLE, either the flow monitoring or the sump level monitoring portion of the system must be OPERABLE and capable of

determining the leakage rate. The identification of an increase in unidentified LEAKAGE will be delayed by the time required for the unidentified LEAKAGE to travel to the drywell floor drain 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 drywell, can be detected by the gaseous or particulate drywell atmospheric 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 drywell atmospheric radioactivity monitors to detect a 1 gpm increase within 1 hour during normal operation. However, the gaseous or particulate drywell atmospheric 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 6).

[An increase in humidity of the drywell atmosphere could indicate the release of water vapor to the drywell. Drywell air cooler condensate flow rate 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 drywell floor drain sump monitoring system, in combination with a gaseous or particulate drywell atmospheric radioactivity monitor [and a drywell air cooler condensate flow rate monitoring system], provides an acceptable minimum.
~~The drywell floor drain sump monitoring system is required to quantify the unidentified LEAKAGE from the RCS. Thus, for the system to be considered OPERABLE, either the flow monitoring or the sump level monitoring portion of the system must be OPERABLE. The other monitoring systems provide early alarms to the operators so closer examination of other detection systems will be made to determine the extent of any corrective action that may be required. With the leakage detection systems inoperable, monitoring for LEAKAGE in the RCPB is degraded.~~

BASES

APPLICABILITY

In MODES 1, 2, and 3, leakage detection systems are required to be OPERABLE to support LCO 3.4.5. This Applicability is consistent with that for LCO 3.4.5.

ACTIONS

A.1

With the drywell floor drain sump monitoring system inoperable, no other form of sampling can provide the equivalent information to quantify leakage. However, the drywell atmospheric activity monitor [and the drywell air cooler condensate flow rate monitor] will provide indications of changes in leakage.

With the drywell floor drain sump monitoring system inoperable, but with RCS unidentified and total LEAKAGE being determined every 8 hours (SR 3.4.5.1), operation may continue for 30 days. The 30 day Completion Time of Required Action A.1 is acceptable, based on operating experience, considering the multiple forms of leakage detection that are still available.

B.1 and B.2

With both gaseous and particulate drywell atmospheric monitoring channels inoperable, grab samples of the drywell atmosphere shall be taken and analyzed to provide periodic leakage information. [Provided a sample is obtained and analyzed every 12 hours, the plant may be operated for up to 30 days to allow restoration of at least one of the required monitors.] [Provided a sample is obtained and analyzed every 12 hours, the plant may continue operation since at least one other form of drywell leakage detection (i.e., air cooler condensate flow rate monitor) is available.]

The 12 hour interval provides periodic information that is adequate to detect LEAKAGE. The 30 day Completion Time for restoration recognizes that at least one other form of leakage detection is available.

BASES

ACTIONS (continued)

[C.1

With the required drywell air cooler condensate flow rate monitoring system inoperable, SR 3.4.7.1 is performed every 8 hours to provide periodic information of activity in the drywell at a more frequent interval than the routine Frequency of SR 3.4.7.1. The 8 hour interval provides periodic information that is adequate to detect LEAKAGE and recognizes that other forms of leakage detection are available. However, this Required Action is modified by a Note that allows this action to be not applicable if the required drywell atmospheric monitoring system is inoperable. Consistent with SR 3.0.1, Surveillances are not required to be performed on inoperable equipment.]

D.1, D.2, D.3.1, and D.3.2

With the drywell floor drain sump monitoring system [and the drywell air cooler condensate flow rate monitoring system] inoperable, the only means of detecting LEAKAGE is the drywell atmospheric gaseous radiation monitor. A Note clarifies this applicability of the Condition. The drywell atmospheric gaseous radiation 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 drywell atmosphere must be taken and analyzed and monitoring of RCS leakage by administrative means must be performed every 12 hours to provide alternate periodic information.

Administrative means of monitoring RCS leakage include monitoring and trending parameters that may indicate an increase in RCS leakage. There are diverse alternative mechanisms from which appropriate indicators may be selected based on plant conditions. It is not necessary to utilize all of these methods, but a method or methods should be selected considering the current plant conditions and historical or expected sources of unidentified leakage. The administrative methods include, but are not limited to, primary containment and drywell pressure, temperature, and humidity, Component Cooling Water System outlet temperatures and makeup, Reactor Recirculation System pump seal pressure and temperature and motor cooler temperature indications, Drywell cooling fan outlet temperatures, Reactor Building Chiller amperage, Control Rod Drive System flange temperatures, and Safety Relief Valves tailpipe temperature, flow, or pressure. These indications, coupled with the atmospheric grab samples, are sufficient to alert the operating staff to an unexpected increase in unidentified LEAKAGE.

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

With both the gaseous and particulate drywell atmospheric monitor channels [and the drywell air cooler condensate flow rate monitor] inoperable, the only means of detecting LEAKAGE is the drywell floor drain 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 Time ensures that the plant will not be operated in a degraded 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 associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions in an orderly manner and without challenging plant systems.~~

F.1, F.2, and F.3

With all required monitors inoperable, no required automatic means of monitoring LEAKAGE are available. Frequent use of indirect methods of monitoring RCS LEAKAGE must be implemented. Every 6 hours grab samples of the primary containment atmosphere must be taken and analyzed and available indications must be used to verify that there is no increase in RCS LEAKAGE over the last quantified RCS LEAKAGE value determined prior to the monitors becoming inoperable.

There are diverse alternative mechanisms for determining that RCS LEAKAGE has not increased, from which appropriate indicators may be selected based on plant conditions. It is not necessary to utilize all of these methods, but a method or methods should be selected considering the current plant conditions and historical or expected sources of RCS LEAKAGE. These methods include, but are not limited to, primary containment and drywell pressure, temperature, and humidity, Component Cooling Water System outlet temperatures and makeup, Reactor Recirculation System pump seal pressure and temperature and

motor cooler temperature indications, Drywell cooling fan outlet temperatures, Reactor Building Chiller amperage, Control Rod Drive System flange temperatures, and Safety Relief Valves tailpipe temperature, flow, or pressure. Verification that these indications have not increased since the required monitors became inoperable, coupled with the atmospheric grab samples, is sufficient to alert the operating staff to an unexpected increase in RCS LEAKAGE.

With the available indications used to verify that there is no increase in RCS LEAKAGE over the values established when the monitors became inoperable, 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 any Required Action cannot be met within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions in an orderly manner and without challenging plant systems.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.7.1

This SR requires the performance of a CHANNEL CHECK of the required drywell atmospheric monitoring system. 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.

SR 3.4.7.2

This SR requires the performance of a CHANNEL FUNCTIONAL TEST of the required RCS leakage detection instrumentation. The test ensures that the monitors can perform their function in the desired manner. The test also 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 31 days considers instrument reliability, and operating experience has shown it proper for detecting degradation.

SR 3.4.7.3

This SR requires the performance of a CHANNEL CALIBRATION of the required RCS leakage detection instrumentation channels. The calibration verifies the accuracy of the instrument string, including the instruments located inside the drywell. The Frequency of [18] months is a typical refueling cycle and considers channel reliability. Operating experience has proven this Frequency is acceptable.

REFERENCES

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

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

~~3. FSAR, Section [5.2.5.2].~~

~~3~~4. GEAP-5620, April 1968.

~~4~~5. NUREG-75/067, October 1975.

~~5~~6. FSAR, Section [5.2.5.5.3].

6. FSAR, Section [5.2.5.2].