January 16, 2020

TSTF-19-11
PROJ0753

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

SUBJECT: TSTF Response to NRC Questions on TSTF-554, "Revise Reactor Coolant Leakage Requirements"

On November 26, 2019, the NRC provided a Request for Additional Information (RAI) regarding TSTF-554, Revision 0, "Revise Reactor Coolant Leakage Requirements" (ADAMS Accession Number ML19318E150).

The TSTF's response to the NRC RAI is attached.

The RAI responses resulted in changes to TSTF-554. TSTF-554, Revision 1, is enclosed.

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

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Attachment
Enclosure

cc: Michelle Honcharik, Technical Specifications Branch
Victor Cusumano, Technical Specifications Branch

TSTF Response to NRC Request for Additional Information Regarding TSTF-554, "Revise Reactor Coolant Leakage Requirements"

The NRC comments are repeated below in italics, followed by the TSTF response.

By letter dated May 7, 2019, the Technical Specifications Task Force (TSTF) submitted Revision 0 of Traveler TSTF 554, "Revise Reactor Coolant Leakage Requirements" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19127A238). The U.S. Nuclear Regulatory Commission (NRC) staff provided draft request for additional information (RAI) questions (ADAMS Accession No. ML19323D534) to support a clarification call. Following the clarification call some of the RAI questions changed. The draft RAI number is noted in parenthesis for each RAI below.

The regulation at Title 10 of the Code of Federal Regulations (10 CFR) Part 50, Appendix A, General Design Criterion (GDC) 14 requires that the reactor coolant pressure boundary be designed, fabricated, erected, and tested to ensure an extremely low probability of abnormal leakage, rapidly propagating failure, and gross rupture. GDC 30 requires means for detecting and, to the extent practical, identifying the source of reactor coolant leakage. The technical specifications (TS) limit reactor coolant system (RCS) operational leakage to amounts that do not compromise safety and ensure appropriate action is taken before the integrity of the RCS is impaired. Further, 10 CFR 50.55a, "Codes and Standards," requires the performance of inservice inspection and testing of nuclear power plant components to identify defects. These requirements minimize the probability of rapidly propagating failure and gross rupture of the RCS pressure boundary attributable to material degradation. The NRC staff requires the following additional information:

1. <u>(Draft RAI – 1)</u>

Section 2.3, "Reason for the Proposed Change," states the following:

> *"There is disagreement on what is required for isolation. The industry has historically held that isolation must be within the expected capabilities of the isolation device and some normal leakage past the isolation device is acceptable. This position is consistent with other uses of the term "isolate" in Standard Technical Specifications and in Section XI of the ASME Code. The NRC position has been that isolation must be complete with no leakage past the isolation device."*

<u>Request</u>

State the basis for how Section XI of the ASME Code supports the historical industry position of some normal leakage past the isolation device being acceptable or delete "and in Section XI of the ASME Code".

<u>Response:</u>

The reference to the ASME Code is not necessary to discuss the reason for the proposed change and it has been deleted in Revision 1 of the traveler.

2. (Draft RAI – 3)

The Bases, Action A.1 of the Babcock & Wilcox, Westinghouse, Combustion Engineering, and AP1000 Standard Technical Specifications (STS) state in part that:

> *If there is no available isolation device or if the flaw cannot be isolated from the RCS due to physical or operational reasons, then Condition C applies.*

Similarly, the Bases, Action A.1 of the General Electric BWR/4 and General Electric BWR/6 STS state in part that:

> *If there is no available isolation device or if the flaw cannot be isolated from the RCS due to physical or operational reasons, then Condition D applies.*

These statements, though captured in the Bases, are not reflected in the STS changes in the Action tables. The proposed STS changes only assign a COMPLETION TIME of "Immediately" and the Required Action states, "Initiate action to isolate affected component, pipe, or vessel from the RCS by use of a closed manual valve, closed and de-activated automatic valve, blind flange, or check valve." There is no completion time for isolation of the flaw. For example, initiating action can be the installation of a blind flange, which will require a significant engineering, planning, and work execution effort without any intermediate isolation of leakage.

Request

Explain why the Required Action statement does not have a completion time for isolation of the flaw.

Response

The industry has revised TSTF-554 to require isolation of the affected component, pipe, or vessel from the RCS by use of a closed manual valve, closed and de activated automatic valve, blind flange, or check valve within 4 hours. This provides a fixed period to isolate the flaw or to enter the shutdown actions.

3. (New RAI)

Section 2.2 states (emphasis added):

> *Note that the Reactor Coolant System pressure boundary considered in the RCS Operational LEAKAGE TS and the corresponding definitions <u>are not equivalent</u> to the reactor coolant pressure boundary as defined in 10 CFR [50.2], "Definitions."*

It is the NRC staff's understanding that the definitions in 10 CFR 50.2 and the STS are meant to be consistent. They should be consistent because any RCPB leakage requires a shutdown within the time limits associated with the Reactor Coolant System LCO. The only way the licensee can avoid the shutdown is to isolate the leakage in accordance with the definition in 10 CFR 50.2 (i.e., isolating the fault from the RCS by closing two valves between the fault and the RCS). The valves must remain closed as indicated in the definition, and Action required per the TS.

<u>Request</u>

Clarify why the definitions are not the consistent or remove the sentence.

<u>Response</u>

The reference to the 10 CFR 50.2 definitions is not necessary to describe the current Technical Specifications requirements and has been deleted in Revision 1 of the traveler.

4. <u>(In lieu of draft RAI – 2, consider the following recommendation)</u>

Section 2.4 "Description of the Proposed Change," states in part that:

> *The new Condition A provides a clear action to follow if pressure boundary leakage exists. The Bases for Required Action A.1 state that normal leakage past the isolation device is acceptable and it is included in identified or unidentified LEAKAGE and subject to the TS limits. The Bases also state that if there is no available isolation device or if the flaw cannot be isolated from the RCS due to physical or operational reasons, then Condition C (an immediate plant shutdown) applies.*

Allowed leakage past the isolation device is permitted as described in the STS Actions A.1. However, aside from the clause in the definition of IDENTIFIED LEAKAGE which states that leakage cannot interfere with the operation of leakage detection systems, the change does not define limits on the allowable amount of leakage. However, even after isolation, continued propagation of the degradation at the isolated location may occur, which might impact the structural integrity of the system not only at the location of the degradation, but within the isolation boundary as well.

An example would be a flaw downstream of a closed isolation device. Though the pressure boundary function of the isolated section of the system is no longer required, structural failure at the location of the degradation (e.g., due to a licensing basis seismic event) could lead to a loss of support for the section of piping inboard of the isolation value and lead to its failure during the same licensing basis seismic event.

The NRC staff concludes that, even when isolation of the degraded portion of the system is achieved, a structural evaluation of the system should be conducted to ensure that structural integrity of the part of the system within the isolation boundary will be maintained under all licensing basis conditions, including consideration of the potential for further degradation of the isolated location.

<u>Recommendation:</u>

Based on the above discussion, the NRC staff offers the following (strike out and underlined bolded italic) revisions to the proposed STS 3.4.7 Bases for Action A1:

> If pressure boundary LEAKAGE exists, the affected component, pipe, or vessel must be isolated from the RCS by a closed manual valve, closed and de-activated automatic valve, blind flange, or check valve. Normal LEAKAGE past the isolation device is acceptable if the LEAKAGE is within the pressure boundary LEAKAGE limits, as it will limit RCS LEAKAGE ~~and prevent further deterioration~~. ***<u>While in this condition, structural integrity of the system should be considered because the structural integrity of the part of the system within the isolation boundary must be maintained under all licensing basis conditions, including consideration of the potential for further degradation of the isolated location.</u>*** LEAKAGE past the isolation device is included in identified or

> unidentified LEAKAGE. If there is no available isolation device or if the flaw cannot be isolated from the RCS due to physical or operational reasons, then Condition C applies…

<u>Response</u>

The recommended sentence has been added to the Required Action A.1 Bases. The Required Action A.1 Bases are also affected by the response to RAI 2.

Technical Specifications Task Force
Improved Standard Technical Specifications Change Traveler

Revise Reactor Coolant Leakage Requirements

NUREGs Affected: ☑ 1430 ☑ 1431 ☑ 1432 ☑ 1433 ☑ 1434 ☑ 2194

Classification: 1) Technical Change

Recommended for CLIIP?: Yes

Correction or Improvement: Improvement

NRC Fee Status: Exempt

Benefit: Provides Longer Completion Time

Changes Marked on ISTS Rev 4.0

PWROG RISD & PA (if applicable): RS-2018-001,LSC-1623

See attached justification.

Revision History

OG Revision 0 Revision Status: Closed

Revision Proposed by: TSTF

Revision Description:
Original Issue

Owners Group Review Information

Date Originated by OG: 17-Jan-19

Owners Group Comments
Originally drafted in 2016 but placed on hold. Restarted in 2018.

Owners Group Resolution: Approved Date: 22-Feb-19

TSTF Review Information

TSTF Received Date: 25-Feb-19 Date Distributed for Review 25-Feb-19

TSTF Comments:

(No Comments)

TSTF Resolution: Approved Date: 07-May-19

NRC Review Information

NRC Received Date: 07-May-19

NRC Comments:

Presubmittal teleconference held on April 16, 2019. NRC provided comments which are discussed below. Traveler revised to address comments and provided to the TSTF on April 22, 2019.

1. In the justification, Section 3.1, the statement "This more restrictive change to the definition is offset by the addition of a new Action to follow when pressure boundary leakage exists," is difficult to prove technically and isn't needed in this portion of the definition.

Sentence was revised to state, "This change to the definition is accompanied by the addition of a new Action

applicable when pressure boundary leakage exists, as discussed below."

2. The justification in Section 3.2 should discuss why a potentially depressurized downstream portion of the pipe is safer. Why normal leakage is acceptable versus the flaw leakage.

Section 3.2 is revised to state:
The proposed Bases state that since most valves are not designed for zero leakage, some leakage is expected past the isolation device. As stated in the Bases, this normal leakage is included in identified or unidentified leakage, as described in the TS definitions. The TS surveillance requirements on leakage will identify any degradation in the isolation device by changes in the identified or unidentified leakage. These surveillance requirements ensure that the device used to isolate the pressure boundary flaw can reasonably perform its isolation function to prevent further degradation of the RCS boundary until the pressure boundary leak is repaired. Leakage past the isolation device is acceptable because the isolated flaw is no longer part of the RCS pressure boundary and any further degradation would not have any significant effect on the RCS. Other considerations, such as boric acid deposition in pressurized water reactors, effects of the leakage on other plant systems, and correction of the flaw, are addressed by existing plant programs, such as the corrective action process and the operability determination process. Normal leakage may be evaluated using engineering judgement, historical performance, or other means, and does not imply that a limit on normal leakage must be established.

3. In Condition A, other similar TS have a periodic action to verify the valve is closed.

Added the following to Section 3.2, "It is unnecessary to periodically verify that the isolation device is closed because an open isolation device would be detectable by the RCS leakage SRs, such as the PWR RCS water inventory balance or the BWR verification that unidentified and total leakage and unidentified leakage increase limits are met."

4. In Condition B, the exclusion of pressure boundary leakage could lead a licensee to assume leakage past the isolation device should not be added to identified leakage. Bill Holstead made a similar comment and suggested that the identified leakage definition explicitly state that leakage past a device being used to isolate pressure boundary leakage be included in identified leakage.

NRC RAIs were received on November 26, 2019. The RAIs will result in a change to TSTF-554.

See the response to Comment 2. Added the following statement to Section 2.4, "Condition B retains the exclusion for pressure boundary leakage because Condition A does not allow pressure boundary LEAKAGE to exist. Once Required Action A.1 is completed, pressure boundary leakage no longer exists and any leakage past the isolation device and through the isolated flaw is now considered RCS operational LEAKAGE (Identified or Unidentified)."

5. A resident inspector stated that the 10 CFR 50 definition of "reactor coolant pressure boundary" and the TS term "pressure boundary" are meant to be synonymous but could be unclear on whether leakage between the first and second pressure boundary valve is pressure boundary leakage. The TSTF pointed out that the terms are not intended to be synonymous and, in fact, the BWR definition stops the "pressure boundary" at the drywell (first valve).

Added the following to Section 2.2 (current TS): Note that the Reactor Coolant System pressure boundary considered in the RCS Operational LEAKAGE TS and the corresponding definitions is not equivalent to the reactor coolant pressure boundary as defined in 10 CFR 50.12, "Definitions."

6. A reviewer asked if the Required Action A.1 valves should be specified to be ASME Class 1 valves. The TSTF pointed out that the current definition does not specify a type of device that can be used for isolation

and the intent is to not add additional requirements. However, it seems that most valves would be Class 1 valves.

No changes were made. The current definition ("nonisolable") does not specify a type of valve. The similar TS Actions on CIVs, LTOP, RCS PIV Leakage, MSIVs, MFIVs, etc., do not specify the pedigree of the isolation valve. Therefore, the type of valve is not specified in this instance.

7. "LEAKAGE past seals, packing, and gaskets is not pressure boundary LEAKAGE." I propose adding packing because packing is unique from the term seals and gaskets. Although you could view packing as a seal, it's not. It's a minor point and I don't think it would ever cause regulatory ambiguity, but why not make it correct while we have the chance.

The inserted sentence in the pressure boundary leakage definition is revised as recommended. The following is added to Section 3.1: The definition is revised to also add the following sentence, "Leakage past seals, packing, and gaskets is not pressure boundary LEAKAGE." The statement, "Leakage past seals and gaskets is not pressure boundary LEAKAGE," appears multiple times in the Bases for the RCS Operational Leakage TS. As it clarifies the scope of the definition, this statement is more appropriately included in the definition. The definition of "identified LEAKAGE," refers to leakage from valve packing. For clarity, the term "packing" is added to the relocated Bases statement being added to the pressure boundary leakage definition. This makes clear that leakage past valve packing is identified leakage, not pressure boundary leakage. The relocation of this sentence from the Bases to the definition does not change the intent or application of the requirements.

8. Recommend revising Required Action A.1 to state "Initiate action to isolate affected component, pipe, or vessel from the RCS by use of a closed manual valve, closed and de-activated automatic valve, blind flange, blank, or check valve." Similar to the above, a blank is not a blind flange. They are unique devices with different thicknesses due to the configuration of the joint. A blank is inserted between two flanges. A blank is typically thinner because it is uniformly supported across its periphery whereas a blind flange is not.

Addressing the unusual situation in which a blank could be used was considered. (From the NRC: "A blank is inserted between two flanges. A blank is typically thinner because it is uniformly supported across its periphery whereas a blind flange is not."). However, a search through the ISTS determined the term "blank" is never used in the TS or Bases, but references to closed manual valve, closed and deactivated automatic valve, blind flange, or check valve are used several times. The TSTF is concerned that specifying the term "blank" here could be interpreted as meaning that a blank can't be used anywhere else. However, we think it's likely that most licensees currently assume that a blank is a kind of blind flange in the unusual situation in which it would be needed. Therefore, to avoid the perception of more restrictive requirements elsewhere, the TSTF did not add "blank" in this usage.

9. In the template provided for submitting a TS change, the explanation for the NO response to the first question (significant increase in probability) only cites "an isolation valve to be closed" when the TS cites several other means of isolation.

Revised the sentence to state, "A new TS Action is created which requires isolation of the pressure boundary flaw from the Reactor Coolant System."

10. The proposed TS changes assign a COMPLETION TIME of "Immediately." The industry states, "When 'Immediately' is used as a Completion Time, the Required Action should be pursued without delay and in a controlled manner." I believe that for reactor coolant system pressure boundary (RCPB) leakage we need a tighter control than immediately. To meet immediately, a licensee need only cite the work order as a Priority 1 and have a team working around the clock. Potential increases in the leak rate aren't mitigated by the licensee working real hard. I have seen a bothersome trend in how some licensees treat leaks in cooling

OG Revision 0 Revision Status: Closed

water systems. Temporary repairs are delayed to the point where leakage grew much worse. I recognize that RCPB leakage will be treated in a much more controlled manner than cooling water leaks; however, there should be an upper time limit at which the licensee needs to commence shutdown actions if the leak cannot be isolated.

See response to comment 11.

11. Similar comments were "Not sure what the timeline is for an immediate completion time and when does this action start," and "In paragraph 3.2 the following is stated: due to lack of a device that can be closed, because of the inability to close an available device, or because the device cannot be accessed in the current plant conditions), then the Required Action is not met and the default (shutdown) Condition applies. At what time does the licensee implement shutdown conditions need to be applied. In my opinion, "immediately" is an open-ended time frame and is open for interpretation from one plant to another.

Revised Section 3.2 to add the following:
Section 1.3, "Completion Times," of the TS states, "When 'Immediately' is used as a Completion Time, the Required Action should be pursued without delay and in a controlled manner." The Writer's Guide {footnote with citation}, Section 4.1.6, "Chapter 3 Actions Content," paragraph j states that when it is desired to accomplish an action without delay (given the potential surrounding circumstances), but the time necessary to complete the action may vary widely based on a number of unknowns, the appropriate Completion Time is "immediately." Specifying an immediate Completion Time for the Required Action to isolate pressure boundary leakage is appropriate given the importance of isolating RCS pressure boundary leakage without delay and the variability of the time required to complete the action. Note that immediate Completion Times are used frequently in the STS for similar, safety-significant conditions, such as violation of the pressure/temperature limits, loss of residual heat removal, and loss of all emergency core cooling subsystems.

Final Resolution: NRC Requests Changes: TSTF Will Revise

TSTF Revision 1 Revision Status: Active

Revision Proposed by: NRC

Revision Description:
In response to the NRC's November 26, 2019 RAI, the following changes are made to TSTF-554.

1. Section 2.2 and 2.3 of the justification are revised to remove unnecessary information.

2. Required Action A.1 is revised from immediately initiating action to isolate the flaw to isolating the flaw within 4 hours.

3. The Bases of Required Action A.1 is revised to include the following sentence: "While in this condition, structural integrity of the system should be considered because the structural integrity of the part of the system within the isolation boundary must be maintained under all licensing basis conditions, including consideration of the potential for further degradation of the isolated location."

TSTF Revision 1 Revision Status: Active

Owners Group Review Information

Date Originated by OG: 08-Dec-19

Owners Group Comments
(No Comments)

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TSTF Review Information

TSTF Received Date: 31-Dec-19 Date Distributed for Review 31-Dec-19

TSTF Comments:
(No Comments)

TSTF Resolution: Approved Date: 16-Jan-20

NRC Review Information

NRC Received Date: 16-Jan-20

Affected Technical Specifications

1.1	Definitions Change Description: LEAKAGE definition	
LCO 3.4.13 Bases	RCS Operational LEAKAGE	NUREG(s)- 1430 1431 1432 Only
Action 3.4.13.A	RCS Operational LEAKAGE Change Description: New Action	NUREG(s)- 1430 1431 1432 Only
Action 3.4.13.A	RCS Operational LEAKAGE Change Description: Renamed B	NUREG(s)- 1430 1431 1432 Only
Action 3.4.13.A Bases	RCS Operational LEAKAGE Change Description: New Action	NUREG(s)- 1430 1431 1432 Only
Action 3.4.13.A Bases	RCS Operational LEAKAGE Change Description: Renamed B	NUREG(s)- 1430 1431 1432 Only
Action 3.4.13.B	RCS Operational LEAKAGE Change Description: Renamed C	NUREG(s)- 1430 1431 1432 Only
Action 3.4.13.B Bases	RCS Operational LEAKAGE Change Description: Renamed C	NUREG(s)- 1430 1431 1432 Only

LCO 3.4.4 Bases	RCS Operational LEAKAGE	NUREG(s)- 1433 Only
Action 3.4.4.A	RCS Operational LEAKAGE Change Description: Renamed B	NUREG(s)- 1433 Only
Action 3.4.4.A	RCS Operational LEAKAGE Change Description: New Action	NUREG(s)- 1433 Only
Action 3.4.4.A Bases	RCS Operational LEAKAGE Change Description: Renamed B	NUREG(s)- 1433 Only
Action 3.4.4.A Bases	RCS Operational LEAKAGE Change Description: New Action	NUREG(s)- 1433 Only
Action 3.4.4.B	RCS Operational LEAKAGE Change Description: Renamed C	NUREG(s)- 1433 Only
Action 3.4.4.B Bases	RCS Operational LEAKAGE Change Description: Renamed C	NUREG(s)- 1433 Only
Action 3.4.4.C	RCS Operational LEAKAGE Change Description: Renamed D	NUREG(s)- 1433 Only
Action 3.4.4.C Bases	RCS Operational LEAKAGE Change Description: Renamed D	NUREG(s)- 1433 Only
LCO 3.4.5 Bases	RCS Operational LEAKAGE	NUREG(s)- 1434 Only
Action 3.4.5.A	RCS Operational LEAKAGE Change Description: New Action	NUREG(s)- 1434 Only
Action 3.4.5.A	RCS Operational LEAKAGE Change Description: Renamed B	NUREG(s)- 1434 Only
Action 3.4.5.A Bases	RCS Operational LEAKAGE Change Description: New Action	NUREG(s)- 1434 Only
Action 3.4.5.A Bases	RCS Operational LEAKAGE Change Description: Renamed B	NUREG(s)- 1434 Only
Action 3.4.5.B	RCS Operational LEAKAGE Change Description: Renamed C	NUREG(s)- 1434 Only
Action 3.4.5.B Bases	RCS Operational LEAKAGE Change Description: Renamed C	NUREG(s)- 1434 Only
Action 3.4.5.C	RCS Operational LEAKAGE Change Description: Renamed D	NUREG(s)- 1434 Only
Action 3.4.5.C Bases	RCS Operational LEAKAGE Change Description: Renamed D	NUREG(s)- 1434 Only
LCO 3.4.7 Bases	RCS Operational LEAKAGE	NUREG(s)- 2194 Only

Action 3.4.7.A	RCS Operational LEAKAGE Change Description: Renamed B	NUREG(s)- 2194 Only
Action 3.4.7.A	RCS Operational LEAKAGE Change Description: New Action	NUREG(s)- 2194 Only
Action 3.4.7.A Bases	RCS Operational LEAKAGE Change Description: Renamed B	NUREG(s)- 2194 Only
Action 3.4.7.A Bases	RCS Operational LEAKAGE Change Description: New Action	NUREG(s)- 2194 Only
Action 3.4.7.B	RCS Operational LEAKAGE Change Description: Renamed C	NUREG(s)- 2194 Only
Action 3.4.7.B Bases	RCS Operational LEAKAGE Change Description: Renamed C	NUREG(s)- 2194 Only

1. SUMMARY DESCRIPTION

The Technical Specifications (TS) definition of "LEAKAGE" and the Reactor Coolant System (RCS) Operational Leakage TS are revised. The revision clarifies the requirements when pressure boundary leakage is detected and adds a Required Action when pressure boundary leakage is identified. The proposed change is applicable to the following Standard Technical Specifications (STS):

- NUREG-1430, "Standard Technical Specifications, Babcock & Wilcox Plants," Section 1.1, "Definitions", and TS 3.4.13, "RCS Operational LEAKAGE";
- NUREG-1431, "Standard Technical Specifications, Westinghouse Plants," Section 1.1, "Definitions", and TS 3.4.13, "RCS Operational LEAKAGE";
- NUREG-1432, "Standard Technical Specifications, Combustion Engineering Plants," Section 1.1, "Definitions", and TS 3.4.13, "RCS Operational LEAKAGE";
- NUREG-1433, "Standard Technical Specifications, General Electric BWR/4 Plants," Section 1.1, "Definitions", and TS 3.4.4, "RCS Operational LEAKAGE";
- NUREG-1434, "Standard Technical Specifications, General Electric BWR/6 Plants," Section 1.1, "Definitions", and TS 3.4.5, "RCS Operational LEAKAGE";
- NUREG-2194, "Standard Technical Specifications, Westinghouse Advanced Passive 1000 (AP1000) Plants," Section 1.1, "Definitions", and TS 3.4.7, "RCS Operational LEAKAGE".

2. DETAILED DESCRIPTION

2.1 Reactor Coolant System Design and Operation

Components that contain or transport the coolant to or from the reactor core make up the RCS. Component joints are made by welding, bolting, rolling, or pressure loading, and valves isolate connecting systems from the RCS. During plant life, the joint and valve interfaces can produce varying amounts of reactor coolant leakage by design, or through normal operational wear or mechanical deterioration.

Title 10 of the Code of Federal Regulations (10 CFR) Part 50, Appendix A, General Design Criterion (GDC) 14 requires that the reactor coolant pressure boundary be designed, fabricated, erected, and tested to ensure an extremely low probability of abnormal leakage, rapidly propagating failure, and gross rupture. GDC 30 requires means for detecting and, to the extent practical, identifying the source of reactor coolant leakage. The TS limit RCS operational leakage to amounts that do not compromise safety and ensure appropriate action is taken before the integrity of the RCS is impaired. Further, 10 CFR 50.55a, "Codes and Standards," requires the performance of inservice inspection and testing of nuclear power plant components to identify defects. These requirements minimize the probability of rapidly propagating failure attributable to material degradation and gross rupture of the RCS pressure boundary.

The safety significance of RCS leakage varies depending on its source, rate, and duration. Therefore, detecting and monitoring reactor coolant leakage into the containment area is necessary. Separating the identified leakage from the unidentified leakage is necessary to provide quantitative information to the operators, allowing them to take corrective action to

mitigate the leakage before it would become detrimental to the safety of the facility and the public.

A limited amount of leakage inside containment is expected as the RCS and other connected systems cannot be made 100% leak tight. Expected leakage from these systems is detected, located, and isolated from the containment atmosphere, if possible, to not interfere with unexpected RCS leakage detection.

2.2 Current Technical Specifications Requirements

The current definition of pressure boundary leakage for Pressurized Water Reactors (PWRs) states:

> LEAKAGE (except primary to secondary LEAKAGE) through a nonisolable fault in an RCS component body, pipe wall, or vessel wall."

The Boiling Water Reactor (BWR)/4 and BWR/6 STS definition is the same, except it does not include the parenthetical phrase "(except primary to secondary LEAKAGE)."

The AP1000 STS definition is the same, except it includes the parenthetical phrase "(except primary to secondary LEAKAGE and [passive residual heat removal heat exchanger] PRHR HX tube LEAKAGE)."

The "RCS Operational LEAKAGE" TS does not allow any amount of pressure boundary leakage. The Action for the existence of pressure boundary leakage is to be in Mode 3 in 6 hours for PWR plants and 12 hours for BWR plants.

2.3 Reason for the Proposed Change

The definition and application of pressure boundary leakage in the RCS Operational Leakage Technical Specifications are unclear and, in some cases, may be overly conservative or may force plant operators to take overly conservative, higher risk actions (e.g., commencing a plant shutdown).

- The industry and the NRC have discussed whether the term "nonisolable" means "could be isolated if desired," "attempted to be isolated and failed," or "must be isolated." Under any interpretation, the term constitutes an evaluation or action embedded in the definition.

- There is disagreement on what is required for isolation. The industry has historically held that isolation must be within the expected capabilities of the isolation device and some normal leakage past the isolation device is acceptable. This position is consistent with other uses of the term “isolate” in Standard Technical Specifications. The NRC position has been that isolation must be complete with no leakage past the isolation device.

2.4 <u>Description of the Proposed Change</u>

The proposed change addresses these issues by eliminating the term “nonisolable” from the definition and providing an additional TS Required Action to clarify when pressure boundary leakage requires plant operators to shut down the unit.

The proposed change does not alter the "RCS Leakage Detection Instrumentation" requirements in NUREG-1430, NUREG-1431, and NUREG-1432 TS 3.4.15, NUREG-1433 TS 3.4.6, NUREG-1434 TS 3.4.7, or NUREG-2194 TS 3.4.9.

<u>Definitions</u>

The pressure boundary leakage definition is revised to delete the word "nonisolable." The sentence, "LEAKAGE past seals, packing, and gaskets is not pressure boundary LEAKAGE," is moved from the TS Bases and added to the definition:

For the NUREG-1430, NUREG-1431, and NUREG-1432:

LEAKAGE shall be:

a. <u>Identified LEAKAGE</u>

1. LEAKAGE, such as that from pump seals or valve packing (except reactor coolant pump (RCP) seal water injection or leakoff), that is captured and conducted to collection systems or a sump or collecting tank;

2. LEAKAGE into the containment atmosphere from sources that are both specifically located and known ~~either~~ *to* not ~~to~~ interfere with the operation of leakage detection systems; or ~~not to be pressure boundary LEAKAGE*; or*~~

3. Reactor Coolant System (RCS) LEAKAGE through a steam generator to the Secondary System (primary to secondary LEAKAGE)*;*

b. <u>Unidentified LEAKAGE</u>

All LEAKAGE (except RCP seal water injection or leakoff) that is not identified LEAKAGE*;* and

c. <u>Pressure Boundary LEAKAGE</u>

LEAKAGE (except primary to secondary LEAKAGE) through a ~~nonisolable~~ fault in an RCS component body, pipe wall, or vessel wall. *LEAKAGE past seals, packing, and gaskets is not pressure boundary LEAKAGE.*

For NUREG-1433 and NUREG-1434:

LEAKAGE shall be:

a. <u>Identified LEAKAGE</u>

1. LEAKAGE into the drywell, such as that from pump seals or valve packing that is captured and conducted to a sump or collecting tank;

2. LEAKAGE into the drywell atmosphere from sources that are both specifically located and known ~~either~~ *to* not ~~to~~ interfere with the operation of leakage detection systems ~~or not to be pressure boundary LEAKAGE~~*;*

b. <u>Unidentified LEAKAGE</u>

All LEAKAGE that is not identified LEAKAGE*;*

c. <u>Total LEAKAGE</u>

Sum of the identified and unidentified LEAKAGE*;* and

d. <u>Pressure Boundary LEAKAGE</u>

LEAKAGE through a ~~nonisolable~~ fault in a Reactor Coolant System (RCS) component body, pipe wall, or vessel wall. *LEAKAGE past seals, packing, and gaskets is not pressure boundary LEAKAGE.*

For NUREG-2194:

LEAKAGE shall be:

a. <u>Identified LEAKAGE</u>

1. LEAKAGE, such as that from seals or valve packing, that is captured and conducted to collection systems or a sump or collecting tank;

2. LEAKAGE into the containment atmosphere from sources that are both specifically located and known ~~either~~ *to* not ~~to~~ interfere with the operation of leakage detection systems ~~or not to be pressure boundary LEAKAGE~~;

3. Reactor Coolant System (RCS) LEAKAGE through a steam generator ~~(SG)~~ to the Secondary System (primary to secondary LEAKAGE); or

4. RCS LEAKAGE through the passive residual heat removal heat exchanger (PRHR HX) to the In-containment Refueling Water Storage Tank (IRWST);

b. <u>Unidentified LEAKAGE</u>

All LEAKAGE that is not identified LEAKAGE;

c. Pressure Boundary LEAKAGE

LEAKAGE (except primary to secondary LEAKAGE and PRHR HX tube LEAKAGE) through a fault in an RCS component body, pipe wall, or vessel wall. *LEAKAGE past seals, packing, and gaskets is not pressure boundary LEAKAGE.*

Editorial corrections are made to the "leakage" definition punctuation to be consistent with TSTF-GG-05-01, "Writer's Guide for Plant-Specific Improved Technical Specifications," Revision 1 (August 2010), Section 2.1.3, "Ordered List Format," paragraph c, which states, "Punctuate the last item in each listing level with a period, colon or semicolon as appropriate (that is, use a semicolon for all the list items except the last one, in which case, use a period)."

Actions

A new Action is added to Babcock & Wilcox, Westinghouse, and Combustion Engineering STS TS 3.4.13, BWR/4 TS 3.4.4, BWR/6 TS 3.4.5, and AP1000 STS TS 3.4.7. The Action states:

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Pressure boundary LEAKAGE exists.	A.1	Isolate affected component, pipe, or vessel from the RCS by use of a closed manual valve, closed and de-activated automatic valve, blind flange, or check valve.	4 hours

The new Condition A provides a clear action to follow if pressure boundary leakage exists. The Completion Time of 4 hours is consistent with the Action for identified or unidentified LEAKAGE not within limit. The Bases for Required Action A.1 states that normal leakage past the isolation device is acceptable and it is included in identified or unidentified LEAKAGE and subject to the TS limits. If the Action cannot be completed within the Completion Time, then Condition C (an immediate plant shutdown) applies.

In the Babcock & Wilcox, Combustion Engineering, Westinghouse, and AP1000 STS, existing Conditions A and B are renumbered B and C to reflect the new Condition A. Condition B retains the exclusion for pressure boundary leakage because Condition A addresses pressure boundary leakage. Once Required Action A.1 is completed, pressure boundary leakage no longer exists and any leakage past the isolation device and through the isolated flaw is now considered RCS operational LEAKAGE (Identified or Unidentified). The existing Condition C is revised to delete applicability to pressure boundary leakage since pressure boundary leakage is addressed by the new Condition A.

In BWR/4 TS 3.4.4 and BWR/6 TS 3.4.5, existing Conditions A, B, and C are renumbered to reflect the new Condition A. The existing Condition B is revised to delete applicability to pressure boundary leakage since pressure boundary leakage is addressed by the new Condition A.

The proposed change does not affect the RCS LEAKAGE Surveillance Requirements.

Technical Specification Bases

The proposed change is supported by changes to the STS Bases. In addition to changes to reflect the changes to the TS, the LCO Bases are revised to provide a more accurate description of the purpose of the RCS operational leakage limits. The regulation at Title 10 of the Code of Federal Regulations (10 CFR), Part 50.36, states, "A summary statement of the bases or reasons for such specifications, other than those covering administrative controls, shall also be included in the application, but shall not become part of the technical specifications." A licensee may make changes to the TS Bases without prior NRC staff review and approval in accordance with the Technical Specifications Bases Control Program. The proposed TS Bases changes are consistent with the proposed TS changes and provide the purpose for each requirement in the specification consistent with the Commission's Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors, dated July 2, 1993 (58 FR 39132). Therefore, the Bases changes are provided for information and approval of the Bases is not requested.

A model application is included in the proposed change as Enclosure 1. The model may be used by licensees desiring to adopt the traveler following NRC approval.

3. TECHNICAL EVALUATION

The proposed change clarifies the TS requirements regarding pressure boundary leakage. The definition of "pressure boundary leakage" has existed in its current form since at least the mid-1970's. However, the term "nonisolable fault" is not defined in the Technical Specifications, the Standard Review Plan (NUREG-0800), Regulatory Guide 1.45, "Guidance on Monitoring and Responding to Reactor Coolant System Leakage," the 1998 version of the Boiler and Pressure Vessel Code, or NRC generic correspondence. A review of NRC internal historical documents discussing Technical Specifications did not identify any additional guidance on the meaning of "nonisolable fault" as it relates to pressure boundary leakage. Absent a definition or guidance, there have been differing interpretations of the requirements.

3.1 Revision of the Pressure Boundary Leakage and Other Leakage Definitions

The proposed change eliminates the term "nonisolable" from the pressure boundary leakage definition. Removal of the term "nonisolable" from the definition results in any fault in an RCS component body, pipe wall, or vessel wall being considered pressure boundary leakage. This change to the definition is accompanied by the addition of a new Action applicable when pressure boundary leakage exists, as discussed below.

The definition is revised to also add the following sentence, "Leakage past seals, packing, and gaskets is not pressure boundary LEAKAGE." The statement, "Leakage past seals and gaskets is not pressure boundary LEAKAGE," appears multiple times in the Bases for the RCS Operational

Leakage TS. As it clarifies the scope of the definition, this statement is more appropriately included in the definition. The definition of "identified LEAKAGE," refers to leakage from valve packing. For clarity, the term "packing" is added to the relocated Bases statement being added to the pressure boundary leakage definition. This makes clear that leakage past valve packing is identified leakage, not pressure boundary leakage. The relocation of this sentence from the Bases to the definition does not change the intent or application of the requirements.

The existing exclusion of pressure boundary leakage from identified leakage is deleted. The exclusion arbitrarily assigned pressure boundary leakage to unidentified leakage, when pressure boundary leakage is more likely to be identified leakage because the location must be known to identify the leakage as pressure boundary leakage. However, the change has no significant effect on plant operation as the Actions require isolation of pressure boundary leakage within 4 hours, which is the same Completion Time for unidentified or identified leakage exceeding the limit to be restored to compliance. If the Action is not met, a plant shutdown is required. The Bases for Required Action A.1, states that leakage past the closed isolation device is included in identified or unidentified LEAKAGE.

Editorial corrections are made to the "leakage" definition punctuation to be consistent with TSTF-GG-05-01, "Writer's Guide for Plant-Specific Improved Technical Specifications," Revision 1 (August 2010). As discussed in Section 2.1.3, "Ordered List Format," each item of a list should end with a semicolon except for the last item, and second-to-last line in each list level should end with a conjunction. Secondary level list entries should start with a lower case letter.

3.2 Addition of Condition A

Condition A applies if pressure boundary leakage exists. Required Action A.1 requires isolation of the affected component, pipe, or vessel from the RCS by use of a closed manual valve, closed and de-activated automatic valve, blind flange, or check valve, with a Completion Time of 4 hours. The flaw is isolated from the reactor coolant pressure source to prevent further degradation of the flaw, which could result in additional leakage. The Required Action A.1 Bases state that any leakage past the isolation device is identified or unidentified leakage (per the definitions) and the appropriate TS limits apply.

It is unnecessary to periodically verify that the isolation device is closed as an open device would be detectable by the RCS leakage SRs, such as the PWR RCS water inventory balance or the BWR verification that unidentified and total leakage and unidentified leakage increase limits are met.

The Completion Time of 4 hours is consistent with the Completion Time applicable when identified or unidentified leakage is not within limit and provides a reasonable period to isolate the flaw while avoiding further damage to the reactor coolant pressure boundary.

The proposed Bases state that since most valves are not designed for zero leakage, some leakage is expected past the isolation device. As stated in the Bases, this normal leakage is included in identified or unidentified leakage, as described in the TS definitions. The TS surveillance requirements on leakage will identify any degradation in the isolation device by changes in the identified or unidentified leakage. These surveillance requirements ensure that the device used

to isolate the pressure boundary flaw can reasonably perform its isolation function to prevent further degradation of the RCS boundary until the pressure boundary leak is repaired. Leakage past the isolation device is acceptable because the isolated flaw is no longer part of the RCS pressure boundary and any further degradation would not have any significant effect on the RCS. The Bases also state that while in the Condition, structural integrity of the system should be considered because the structural integrity of the part of the system within the isolation boundary must be maintained under all licensing basis conditions, including consideration of the potential for further degradation of the isolated location. This and other considerations, such as boric acid deposition in pressurized water reactors, effects of the leakage on other plant systems, and correction of the flaw, are addressed by existing plant programs, such as the corrective action process and the operability determination process. Normal leakage may be evaluated using engineering judgement, historical performance, or other means, and does not imply that a limit on normal leakage must be established.

3.3 Other Action Changes

The addition of Condition A results in renumbering the existing Actions. The default Condition (i.e., "Required Action and associated Completion Time not met") is revised, as required, to be applicable should any Action not be met and to exclude pressure boundary leakage, which is addressed in Condition A. These changes are consistent with the other proposed changes.

4. REGULATORY EVALUATION

Section IV, "The Commission Policy," of the "Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors" (58 Federal Register 39132), dated July 22, 1993, states in part:

> The purpose of Technical Specifications is to impose those conditions or limitations upon reactor operation necessary to obviate the possibility of an abnormal situation or event giving rise to an immediate threat to the public health and safety by identifying those features that are of controlling importance to safety and establishing on them certain conditions of operation which cannot be changed without prior Commission approval.
>
> …[T]he Commission will also entertain requests to adopt portions of the improved STS, even if the licensee does not adopt all STS improvements.
>
> …The Commission encourages all licensees who submit Technical Specification related submittals based on this Policy Statement to emphasize human factors principles.
>
> …In accordance with this Policy Statement, improved STS have been developed and will be maintained for [BWR designs]. The Commission encourages licensees to use the improved STS as the basis for plant-specific Technical Specifications.
>
> …[I]t is the Commission intent that the wording and Bases of the improved STS be used … to the extent practicable.

As described in the Commission's "Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors," recommendations were made by NRC and industry

task groups for new STS that include greater emphasis on human factors principles in order to add clarity and understanding to the text of the STS, and provide improvements to the Bases of STS, which provides the purpose for each requirement in the specification.

Additionally, 10 CFR 50.36(b) requires:

> Each license authorizing operation of a … utilization facility … will include technical specifications. The technical specifications will be derived from the analyses and evaluation included in the safety analysis report, and amendments thereto, submitted pursuant to [10 CFR] 50.34 ["Contents of applications; technical information"]. The Commission may include such additional technical specifications as the Commission finds appropriate.

The categories of items required to be in the TSs are provided in 10 CFR 50.36(c). As required by 10 CFR 50.36(c)(2)(i), the TSs will include LCOs, which are the lowest functional capability or performance levels of equipment required for safe operation of the facility. Per 10 CFR 50.36(c)(2)(i), when an LCO of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the TSs until the condition can be met.

Per 10 CFR 50.90, whenever a holder of a license desires to amend the license, application for an amendment must be filed with the Commission, fully describing the changes desired, and following as far as applicable, the form prescribed for original applications.

Per 10 CFR 50.92(a), in determining whether an amendment to a license will be issued to the applicant, the Commission will be guided by the considerations which govern the issuance of initial licenses to the extent applicable and appropriate.

The NRC staff's guidance for the review of TS is in Chapter 16, "Technical Specifications," of NUREG-0800, Revision 3, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants" (SRP), dated March 2010 (ADAMS Accession No. ML100351425). As described therein, as part of the regulatory standardization effort, the NRC staff has prepared STS for each of the light-water reactor nuclear designs.

In conclusion, based on the considerations discussed above, the proposed revision does not alter the current manner of operation and (1) there is reasonable assurance that the health and safety of the public will not be endangered by continued 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.

5. REFERENCES

None.

Enclosure 1

Model Application

[DATE] 10 CFR 50.90

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

DOCKET NO.
PLANT NAME
50-[xxx]
SUBJECT: Application to Revise Technical Specifications to Adopt TSTF-554, "Revise Reactor Coolant Leakage Requirements"

Pursuant to 10 CFR 50.90, [LICENSEE] is submitting a request for an amendment to the Technical Specifications (TS) for [PLANT NAME, UNIT NOS.].

[LICENSEE] requests adoption of TSTF-554, "Revise Reactor Coolant Leakage Requirements," which is an approved change to the Standard Technical Specifications (STS), into the [PLANT NAME, UNIT NOS] Technical Specifications (TS). The proposed amendment revises the Technical Specification (TS) definition of "Leakage," clarifies the requirements when pressure boundary leakage is detected, and adds a Required Action when pressure boundary leakage is identified. The change is requested as part of the Consolidated Line Item Improvement Process (CLIIP).

The enclosure provides a description and assessment of the proposed changes. Attachment 1 provides the existing TS pages marked to show the proposed changes. Attachment 2 provides revised (clean) TS pages. Attachment 3 provides existing TS Bases pages marked to show the proposed changes for information only.

Approval of the proposed amendment is requested by [date]. Once approved, the amendment shall be implemented within [ ] days.

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

[In accordance with 10 CFR 50.30(b), a license amendment request must be executed in a signed original under oath or affirmation. This can be accomplished by attaching a notarized affidavit confirming the signature authority of the signatory, or by including the following statement in the cover letter: "I declare under penalty of perjury that the foregoing is true and correct. Executed on (date)." The alternative statement is pursuant to 28 USC 1746. It does not require notarization.]

If you should have any questions regarding this submittal, please contact [NAME, TELEPHONE NUMBER].

Sincerely,

[Name, Title]

Attachments:
1. Proposed Technical Specification Changes (Mark-Up)
2. Revised Technical Specification Pages
3. Proposed Technical Specification Bases Changes (Mark-Up) for Information Only

{Attachments 1 - 3 are not included in the model application and are to be provided by the licensee.}

cc: NRC Project Manager
NRC Regional Office
NRC Resident Inspector
State Contact

ENCLOSURE - DESCRIPTION AND ASSESSMENT

1.0 DESCRIPTION

[LICENSEE] requests adoption of TSTF-554, "Revise Reactor Coolant Leakage Requirements," which is an approved change to the Standard Technical Specifications (STS), into the [PLANT NAME, UNIT NOS] Technical Specifications (TS). The proposed amendment revises the Technical Specification (TS) definition of "Leakage" and the Reactor Coolant System (RCS) Operational Leakage TS to clarify the requirements.

2.0 ASSESSMENT

2.1 Applicability of Safety Evaluation

[LICENSEE] has reviewed the safety evaluation for TSTF-554 provided to the Technical Specifications Task Force in a letter dated [DATE]. This review included a review of the NRC staff's evaluation, as well as the information provided in TSTF-554. [As described herein,] [LICENSEE] has concluded that the justifications presented in TSTF-554 and the safety evaluation prepared by the NRC staff are applicable to [PLANT, UNIT NOS.] and justify this amendment for the incorporation of the changes into the [PLANT] TS.

2.2 Variations

[LICENSEE is not proposing any variations from the TS changes described in TSTF-554 or the applicable parts of the NRC staff's safety evaluation dated [DATE].] [LICENSEE is proposing the following variations from the TS changes described in TSTF-554 or the applicable parts of the NRC staff's safety evaluation: describe the variations.]

[The [PLANT] TS utilize different [numbering][and][titles] than the Standard Technical Specifications on which TSTF-554 was based. Specifically, [describe differences between the plant-specific TS numbering and/or titles and the TSTF-554 numbering and titles.] These differences are administrative and do not affect the applicability of TSTF-554 to the [PLANT] TS.]

[The [PLANT] TS contain requirements that differ from the Standard Technical Specifications on which TSTF-554 was based but are encompassed in the TSTF-554 justification. [Describe differences and why TSTF-554 is still applicable.]

3.0 REGULATORY ANALYSIS

3.1 No Significant Hazards Consideration Analysis

[LICENSEE] requests adoption of TSTF-554, "Revise Reactor Coolant Leakage Requirements," that is an approved change to the Standard Technical Specifications (STS), into the [PLANT NAME, UNIT NOS] Technical Specifications (TS). The proposed amendment revises the Technical Specification (TS) definition of "Leakage," clarifies the requirements when pressure boundary leakage is detected, and adds a Required Action when pressure boundary leakage is identified.

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

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

   Response: No

   The proposed amendment revises the TS definition of "Leakage," clarifies the requirements when pressure boundary leakage is detected, and adds a Required Action when pressure boundary leakage is identified.

   The proposed change revises the definition of pressure boundary leakage. Pressure boundary leakage is a precursor to some accidents previously evaluated. The proposed change expands the definition of pressure boundary leakage by eliminating the qualification that pressure boundary leakage must be from a "nonisolable" flaw. A new TS Action is created which requires isolation of the pressure boundary flaw from the Reactor Coolant System. This new action provides assurance that the flaw will not result in any accident previously evaluated.

   Pressure boundary leakage, and the actions taken when pressure boundary leakage is detected, is not assumed in the mitigation of any accident previously evaluated. As a result, the consequences of any accident previously evaluated are unaffected.

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

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

   Response: No

   The proposed amendment revises the TS definition of "Leakage," clarifies the requirements when pressure boundary leakage is detected, and adds a Required Action when pressure boundary leakage is identified. The proposed change does not alter the design function or operation of the RCS. The proposed change does not alter the ability of the RCS to perform its design function. Since pressure boundary leakage is an evaluated accident, the proposed change does not create any new failure mechanisms, malfunctions, or accident initiators not considered in the design and licensing bases.

   Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

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

   Response: No

The proposed amendment revises the TS definition of "Leakage," clarifies the requirements when pressure boundary leakage is detected, and adds a Required Action when pressure boundary leakage is identified. The proposed change does not affect the initial assumptions, margins, or controlling values used in any accident analysis. The amount of leakage allowed from the RCS is not increased. The proposed change does not affect any design basis or safety limit or any Limiting Condition for Operation.

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

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

3.2 Conclusion

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission’s regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

4.0 ENVIRONMENTAL EVALUATION

The proposed change would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed change does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed change meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed change.

Technical Specifications Proposed Changes

1.1 Definitions

EMERGENCY FEEDWATER INITIATION AND CONTROL (EFIC) RESPONSE TIME	The EFIC RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its EFIC actuation setpoint at the channel sensor until the emergency feedwater equipment is capable of performing its function (i.e., valves travel to their required positions, pumps discharge pressures reach their required values, etc.). Times shall include diesel generator starting and sequence loading delays, where applicable. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured.
ENGINEERED SAFETY FEATURE (ESF) RESPONSE TIME	The ESF RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its ESF actuation setpoint at the channel sensor until the ESF equipment is capable of performing its safety function (i.e., the valves travel to their required positions, pump discharge pressures reach their required values, etc.). Times shall include diesel generator starting and sequence loading delays, where applicable. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured.
LEAKAGE	LEAKAGE shall be:

a. Identified LEAKAGE

1. LEAKAGE, such as that from pump seals or valve packing (except RCP seal water injection or leakoff), that is captured and conducted to collection systems or a sump or collecting tank;

2. LEAKAGE into the containment atmosphere from sources that are both specifically located and known ~~either~~ to not ~~to~~ interfere with the operation of leakage detection systems; or ~~not to be pressure boundary LEAKAGE, or~~

3. Reactor Coolant System (RCS) LEAKAGE through a steam generator to the Secondary System (primary to secondary LEAKAGE);~~.~~

b. Unidentified LEAKAGE

All LEAKAGE (except RCP seal water injection or leakoff) that is not identified LEAKAGE;~~,~~ and

1.1 Definitions

LEAKAGE (continued)

c. Pressure Boundary LEAKAGE

LEAKAGE (except primary to secondary LEAKAGE) through a ~~nonisolable~~ fault in an RCS component body, pipe wall, or vessel wall. LEAKAGE past seals, packing, and gaskets is not pressure boundary LEAKAGE.

MODE — A MODE shall correspond to any one inclusive combination of core reactivity condition, power level, average reactor coolant temperature, and reactor vessel head closure bolt tensioning specified in Table 1.1-1 with fuel in the reactor vessel.

NUCLEAR HEAT FLUX HOT CHANNEL FACTOR $F_Q(Z)$ — $F_Q(Z)$ shall be the maximum local linear power density in the core divided by the core average fuel rod linear power density, assuming nominal fuel pellet and fuel rod dimensions.

NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR $F^N_{\Delta H}$ — $F^N_{\Delta H}$ shall be the ratio of the integral of linear power along the fuel rod on which minimum departure from nucleate boiling ratio occurs, to the average fuel rod power.

OPERABLE – OPERABILITY — A system, subsystem, train, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication, and other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s).

PHYSICS TESTS — PHYSICS TESTS shall be those tests performed to measure the fundamental nuclear characteristics of the reactor core and related instrumentation.

These tests are:

a. Described in Chapter [14, Initial Test Program] of the FSAR,

b. Authorized under the provisions of 10 CFR 50.59, or

c. Otherwise approved by the Nuclear Regulatory Commission.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.13 RCS Operational LEAKAGE

LCO 3.4.13 RCS operational LEAKAGE shall be limited to:

a. No pressure boundary LEAKAGE,

b. 1 gpm unidentified LEAKAGE,

c. 10 gpm identified LEAKAGE, and

d. 150 gallons per day primary to secondary LEAKAGE through any one steam generator (SG).

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Pressure boundary LEAKAGE exists.	A.1 Isolate affected component, pipe, or vessel from the RCS by use of a closed manual valve, closed and de-activated automatic valve, blind flange, or check valve.	4 hours
BA. RCS operational LEAKAGE not within limits for reasons other than pressure boundary LEAKAGE or primary to secondary LEAKAGE.	BA.1 Reduce LEAKAGE to within limits.	4 hours
CB. Required Action and associated Completion Time of Condition A not met. OR Pressure boundary LEAKAGE exists.	CB.1 Be in MODE 3. AND CB.2 Be in MODE 5.	6 hours 36 hours

CONDITION	REQUIRED ACTION	COMPLETION TIME
<u>OR</u> Primary to secondary LEAKAGE not within limit.		

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.13 RCS Operational LEAKAGE

BASES

BACKGROUND

Components that contain or transport the coolant to or from the reactor core make up the RCS. Component joints are made by welding, bolting, rolling, or pressure loading, and valves isolate connecting systems from the RCS.

During plant life, the joint and valve interfaces can produce varying amounts of reactor coolant LEAKAGE, through either normal operational wear or mechanical deterioration. The purpose of the RCS Operational LEAKAGE LCO is to limit system operation in the presence of LEAKAGE from these sources to amounts that do not compromise safety. This LCO specifies the types and amounts of LEAKAGE.

10 CFR 50, Appendix A, GDC 30 (Ref. 1), requires means for detecting and, to the extent practical, identifying the source of reactor coolant LEAKAGE. Regulatory Guide 1.45 (Ref. 2) describes acceptable methods for selecting Leakage Detection Systems.

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 is necessary. Quickly separating the identified LEAKAGE from the unidentified LEAKAGE is necessary to provide quantitative information to the operators, allowing them to take corrective action should a leak occur detrimental to the safety of the facility and the public.

A limited amount of leakage inside containment is expected from auxiliary systems that cannot be made 100% leaktight. Leakage from these systems should be detected, located, and isolated from the containment atmosphere, if possible, to not interfere with RCS leakage detection.

This LCO deals with protection of the reactor coolant pressure boundary (RCPB) from degradation and the core from inadequate cooling, in addition to preventing the accident analysis radiation release assumptions from being exceeded. The consequences of violating this LCO include the possibility of a loss of coolant accident (LOCA). However, the ability to monitor leakage provides advance warning to permit plant shutdown before a LOCA occurs. This advantage has been shown by "leak before break" studies.

BASES

APPLICABLE SAFETY ANALYSES

Except for primary to secondary LEAKAGE, the safety analyses do not address operational LEAKAGE. However, other operational LEAKAGE is related to the safety analyses for LOCA; the amount of leakage can affect the probability of such an event. The safety analysis for an event resulting in steam discharge to the atmosphere assumes that primary to secondary LEAKAGE from all steam generators (SGs) is [1 gallon per minute] or increases to [1 gallon per minute] as a result of accident induced conditions. The LCO requirement to limit primary to secondary LEAKAGE through any one SG to less than or equal to 150 gallons per day is significantly less than the conditions assumed in the safety analysis.

Primary to secondary LEAKAGE is a factor in the dose releases outside containment resulting from a steam line break (SLB) accident. To a lesser extent, other accidents or transients involve secondary steam release to the atmosphere, such as a steam generator tube rupture (SGTR). The leakage contaminates the secondary fluid.

The FSAR (Ref. 3) analysis for SGTR assumes the contaminated secondary fluid is only briefly released via safety valves and the majority is steamed to the condenser. The [1 gpm] primary to secondary LEAKAGE safety analysis assumption is relatively inconsequential.

The SLB is more limiting for site radiation releases. The safety analysis for the SLB accident assumes the entire [1 gpm] primary to secondary LEAKAGE is through the affected generator as an initial condition. The dose consequences resulting from the SLB accident are well within the limits defined in 10 CFR 100.

RCS operational LEAKAGE satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

RCS operational LEAKAGE shall be limited to:

a. Pressure Boundary LEAKAGE

~~No p~~Pressure boundary LEAKAGE is prohibited ~~allowed, being indicative of material deterioration. LEAKAGE of this type is unacceptable~~ as the leak itself could cause further RCPB deterioration, resulting in higher LEAKAGE. ~~Violation of this LCO could result in continued degradation of the RCPB. LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE.~~

BASES

LCO (continued)

b. Unidentified LEAKAGE

One gallon per minute (gpm) of unidentified LEAKAGE is allowed as a reasonable minimum detectable amount that the containment air monitoring and containment sump level monitoring equipment can detect within a reasonable time period. Separating the sources of leakage (i.e., leakage from an identified source versus leakage from an unidentified source) is necessary for prompt identification of potentially adverse conditions, assessment of the safety significance, and corrective action. ~~Violation of this LCO could result in continued degradation of the RCPB, if the LEAKAGE is from the pressure boundary.~~

c. Identified LEAKAGE

Up to 10 gpm of identified LEAKAGE is considered allowable because LEAKAGE is from known sources that do not interfere with detection of unidentified LEAKAGE and is well within the capability of the RCS makeup system. Identified LEAKAGE includes LEAKAGE to the containment from specifically known and located sources, but does not include ~~pressure boundary LEAKAGE or~~ controlled reactor coolant pump (RCP) seal leakoff (a normal function not considered LEAKAGE). ~~Violation of this LCO could result in continued degradation of a component or system.~~

d. Primary to Secondary LEAKAGE Through Any One SG

The limit of 150 gallons per day per SG is based on the operational LEAKAGE performance criterion in NEI 97-06, Steam Generator Program Guidelines (Ref. 4). The Steam Generator Program operational LEAKAGE performance criterion in NEI 97-06 states, "The RCS operational primary to secondary leakage through any one SG shall be limited to 150 gallons per day." The limit is based on operating experience with SG tube degradation mechanisms that result in tube leakage. The operational leakage rate criterion in conjunction with the implementation of the Steam Generator Program is an effective measure for minimizing the frequency of steam generator tube ruptures.

APPLICABILITY

In MODES 1, 2, 3, and 4, the potential for RCPB LEAKAGE is greatest when the RCS is pressurized.

In MODES 5 and 6, LEAKAGE limits are not required because the reactor coolant pressure is far lower, resulting in lower stresses and reduced potentials for LEAKAGE.

BASES

APPLICABILITY (continued)

LCO 3.4.14, "RCS Pressure Isolation Valve (PIV) Leakage," measures leakage through each individual PIV and can impact this LCO. Of the two PIVs in series in each isolated line, leakage measured through one PIV does not result in RCS LEAKAGE when the other is leaktight. If both valves leak and result in a loss of mass from the RCS, the loss must be included in the allowable identified LEAKAGE.

ACTIONS

A.1

If pressure boundary LEAKAGE exists, the affected component, pipe, or vessel must be isolated from the RCS by a closed manual valve, closed and de-activated automatic valve, blind flange, or check valve within 4 hours. While in this condition, structural integrity of the system should be considered because the structural integrity of the part of the system within the isolation boundary must be maintained under all licensing basis conditions, including consideration of the potential for further degradation of the isolated location. Normal LEAKAGE past the isolation device is acceptable as it will limit RCS LEAKAGE and is included in identified or unidentified LEAKAGE. This action is necessary to prevent further deterioration of the RCPB.

B.1

If unidentified LEAKAGE or identified LEAKAGE are in excess of the LCO limits, the LEAKAGE must be reduced to within limits within 4 hours. This Completion Time allows time to verify leakage rates and either identify unidentified LEAKAGE or reduce LEAKAGE to within limits before the reactor must be shut down. This action is necessary to prevent further deterioration of the RCPB.

~~B~~C.1 and ~~B~~C.2

If ~~any pressure boundary LEAKAGE exists or~~ primary to secondary LEAKAGE is not within limit, or any of the Required Actions and associated Completion Times cannot be met, ~~if unidentified or identified LEAKAGE cannot be reduced to within limits within 4 hours,~~ the reactor must be brought to lower pressure conditions to reduce the severity of the LEAKAGE and its potential consequences. The reactor must be brought to MODE 3 within 6 hours and MODE 5 within 36 hours. This action reduces the LEAKAGE and also reduces the factors that tend to degrade the pressure boundary.

The Completion Times allowed are reasonable, based on operating experience, to reach the required conditions from full power conditions in an orderly manner and without challenging plant systems. In MODE 5, the pressure stresses acting on the RCPB are much lower and further deterioration is much less likely.

SURVEILLANCE REQUIREMENTS

SR 3.4.13.1

Verifying RCS LEAKAGE within the LCO limits ensures that the integrity of the RCPB is maintained. Pressure boundary LEAKAGE would at first appear as unidentified LEAKAGE and can only be positively identified by inspection. Unidentified LEAKAGE and identified LEAKAGE are determined by performance of an RCS water inventory balance.

The RCS water inventory balance must be performed with the reactor at steady state operating conditions (stable temperature, power level, pressurizer and makeup tank levels, makeup and letdown, [and RCP seal

1.1 Definitions

ENGINEERED SAFETY FEATURE (ESF) RESPONSE TIME	The ESF RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its actuation setpoint at the channel sensor until the ESF equipment is capable of performing its safety function (i.e., the valves travel to their required positions, pump discharge pressures reach their required values, etc.). Times shall include diesel generator starting and sequence loading delays, where applicable. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. In lieu of measurement, response time may be verified for selected components provided that the components and methodology for verification have been previously reviewed and approved by the NRC.
LEAKAGE	LEAKAGE shall be:

a. Identified LEAKAGE

1. LEAKAGE, such as that from pump seals or valve packing (except reactor coolant pump (RCP) seal water injection or leakoff), that is captured and conducted to collection systems or a sump or collecting tank;

2. LEAKAGE into the containment atmosphere from sources that are both specifically located and known ~~either~~ to not ~~to~~ interfere with the operation of leakage detection systems ~~or not to be pressure boundary LEAKAGE~~; or

3. Reactor Coolant System (RCS) LEAKAGE through a steam generator to the Secondary System (primary to secondary LEAKAGE); ~~.~~

b. Unidentified LEAKAGE

All LEAKAGE (except RCP seal water injection or leakoff) that is not identified LEAKAGE; and

c. Pressure Boundary LEAKAGE

LEAKAGE (except primary to secondary LEAKAGE) through a ~~nonisolable~~ fault in an RCS component body, pipe wall, or vessel wall. LEAKAGE past seals, packing, and gaskets is not pressure boundary LEAKAGE.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.13 RCS LEAKAGE

LCO 3.4.13 RCS operational LEAKAGE shall be limited to:

a. No pressure boundary LEAKAGE;

b. 1 gpm unidentified LEAKAGE;

c. 10 gpm identified LEAKAGE; and

d. 150 gallons per day primary to secondary LEAKAGE through any one steam generator (SG).

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Pressure boundary LEAKAGE exists.	A.1 Isolate affected component, pipe, or vessel from the RCS by use of a closed manual valve, closed and de-activated automatic valve, blind flange, or check valve.	4 hours
BA. RCS operational LEAKAGE not within limits for reasons other than pressure boundary LEAKAGE or primary to secondary LEAKAGE.	BA.1 Reduce LEAKAGE to within limits.	4 hours
CB. Required Action and associated Completion Time of Condition A not met. OR	CB.1 Be in MODE 3. AND CB.2 Be in MODE 5.	6 hours 36 hours

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~Pressure boundary LEAKAGE exists.~~ OR Primary to secondary LEAKAGE not within limit.		

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.13 RCS Operational LEAKAGE

BASES

BACKGROUND

Components that contain or transport the coolant to or from the reactor core make up the RCS. Component joints are made by welding, bolting, rolling, or pressure loading, and valves isolate connecting systems from the RCS.

During plant life, the joint and valve interfaces can produce varying amounts of reactor coolant LEAKAGE, through either normal operational wear or mechanical deterioration. The purpose of the RCS Operational LEAKAGE LCO is to limit system operation in the presence of LEAKAGE from these sources to amounts that do not compromise safety. This LCO specifies the types and amounts of LEAKAGE.

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

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 is necessary. Quickly separating the identified LEAKAGE from the unidentified LEAKAGE is necessary to provide quantitative information to the operators, allowing them to take corrective action should a leak occur that is detrimental to the safety of the facility and the public.

A limited amount of leakage inside containment is expected from auxiliary systems that cannot be made 100% leaktight. Leakage from these systems should be detected, located, and isolated from the containment atmosphere, if possible, to not interfere with RCS leakage detection.

This LCO deals with protection of the reactor coolant pressure boundary (RCPB) from degradation and the core from inadequate cooling, in addition to preventing the accident analyses radiation release assumptions from being exceeded. The consequences of violating this LCO include the possibility of a loss of coolant accident (LOCA).

BASES

APPLICABLE SAFETY ANALYSES

Except for primary to secondary LEAKAGE, the safety analyses do not address operational LEAKAGE. However, other operational LEAKAGE is related to the safety analyses for LOCA; the amount of leakage can affect the probability of such an event. The safety analysis for an event resulting in steam discharge to the atmosphere assumes that primary to secondary LEAKAGE from all steam generators (SGs) is [1 gallon per minute] or increases to [1 gallon per minute] as a result of accident induced conditions. The LCO requirement to limit primary to secondary LEAKAGE through any one SG to less than or equal to 150 gallons per day is significantly less than the conditions assumed in the safety analysis.

Primary to secondary LEAKAGE is a factor in the dose releases outside containment resulting from a steam line break (SLB) accident. To a lesser extent, other accidents or transients involve secondary steam release to the atmosphere, such as a steam generator tube rupture (SGTR). The leakage contaminates the secondary fluid.

The FSAR (Ref. 3) analysis for SGTR assumes the contaminated secondary fluid is only briefly released via safety valves and the majority is steamed to the condenser. The [1 gpm] primary to secondary LEAKAGE safety analysis assumption is relatively inconsequential.

The SLB is more limiting for site radiation releases. The safety analysis for the SLB accident assumes the entire [1 gpm] primary to secondary LEAKAGE is through the affected generator as an initial condition. The dose consequences resulting from the SLB accident are well within the limits defined in 10 CFR 100 or the staff approved licensing basis (i.e., a small fraction of these limits).

The RCS operational LEAKAGE satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

RCS operational LEAKAGE shall be limited to:

a. Pressure Boundary LEAKAGE

No pPressure boundary LEAKAGE is prohibited allowed, being indicative of material deterioration. LEAKAGE of this type is unacceptable as the leak itself could cause further RCPB deterioration, resulting in higher LEAKAGE. Violation of this LCO could result in continued degradation of the RCPB. LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE.

BASES

LCO (continued)

b. Unidentified LEAKAGE

One gallon per minute (gpm) of unidentified LEAKAGE is allowed as a reasonable minimum detectable amount that the containment air monitoring and containment sump level monitoring equipment can detect within a reasonable time period. Separating the sources of leakage (i.e., leakage from an identified source versus leakage from an unidentified source) is necessary for prompt identification of potentially adverse conditions, assessment of the safety significance, and corrective action. ~~Violation of this LCO could result in continued degradation of the RCPB, if the LEAKAGE is from the pressure boundary.~~

c. Identified LEAKAGE

Up to 10 gpm of identified LEAKAGE is considered allowable because LEAKAGE is from known sources that do not interfere with detection of unidentified LEAKAGE and is well within the capability of the RCS Makeup System. Identified LEAKAGE includes LEAKAGE to the containment from specifically known and located sources, but does not include ~~pressure boundary LEAKAGE or~~ controlled reactor coolant pump (RCP) seal leakoff (a normal function not considered LEAKAGE). ~~Violation of this LCO could result in continued degradation of a component or system.~~

d. Primary to Secondary LEAKAGE Through Any One SG

The limit of 150 gallons per day per SG is based on the operational LEAKAGE performance criterion in NEI 97-06, Steam Generator Program Guidelines (Ref. 4). The Steam Generator Program operational LEAKAGE performance criterion in NEI 97-06 states, "The RCS operational primary to secondary leakage through any one SG shall be limited to 150 gallons per day." The limit is based on operating experience with SG tube degradation mechanisms that result in tube leakage. The operational leakage rate criterion in conjunction with the implementation of the Steam Generator Program is an effective measure for minimizing the frequency of steam generator tube ruptures.

APPLICABILITY

In MODES 1, 2, 3, and 4, the potential for RCPB LEAKAGE is greatest when the RCS is pressurized.

In MODES 5 and 6, LEAKAGE limits are not required because the reactor coolant pressure is far lower, resulting in lower stresses and reduced potentials for LEAKAGE.

BASES

APPLICABILITY (continued)

LCO 3.4.14, "RCS Pressure Isolation Valve (PIV) Leakage," measures leakage through each individual PIV and can impact this LCO. Of the two PIVs in series in each isolated line, leakage measured through one PIV does not result in RCS LEAKAGE when the other is leak tight. If both valves leak and result in a loss of mass from the RCS, the loss must be included in the allowable identified LEAKAGE.

ACTIONS

A.1

If pressure boundary LEAKAGE exists, the affected component, pipe, or vessel must be isolated from the RCS by a closed manual valve, closed and de-activated automatic valve, blind flange, or check valve within 4 hours. While in this condition, structural integrity of the system should be considered because the structural integrity of the part of the system within the isolation boundary must be maintained under all licensing basis conditions, including consideration of the potential for further degradation of the isolated location. Normal LEAKAGE past the isolation device is acceptable as it will limit RCS LEAKAGE and is included in identified or unidentified LEAKAGE. This action is necessary to prevent further deterioration of the RCPB.

B.1

Unidentified LEAKAGE or identified LEAKAGE in excess of the LCO limits must be reduced to within limits within 4 hours. This Completion Time allows time to verify leakage rates and either identify unidentified LEAKAGE or reduce LEAKAGE to within limits before the reactor must be shut down. This action is necessary to prevent further deterioration of the RCPB.

CB.1 and CB.2

If any pressure boundary LEAKAGE exists, or primary to secondary LEAKAGE is not within limit, or if any of the Required Actions and associated Completion Times cannot be met, unidentified or identified LEAKAGE cannot be reduced to within limits within 4 hours, the reactor must be brought to lower pressure conditions to reduce the severity of the LEAKAGE and its potential consequences. It should be noted that LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE. The reactor must be brought to MODE 3 within 6 hours and MODE 5 within 36 hours. This action reduces the LEAKAGE and also reduces the factors that tend to degrade the pressure boundary.

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. In MODE 5, the pressure stresses acting on the RCPB are much lower, and further deterioration is much less likely.

SURVEILLANCE REQUIREMENTS

SR 3.4.13.1

Verifying RCS LEAKAGE to be within the LCO limits ensures the integrity of the RCPB is maintained. Pressure boundary LEAKAGE would at first appear as unidentified LEAKAGE and can only be positively identified by inspection. ~~It should be noted that LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE.~~ Unidentified LEAKAGE and identified LEAKAGE are determined by performance of an RCS water inventory balance.

SURVEILLANCE REQUIREMENTS (continued)

The RCS water inventory balance must be met with the reactor at steady state operating conditions (stable temperature, power level, pressurizer and makeup tank levels, makeup and letdown, [and RCP seal injection and return flows]). The Surveillance is modified by two Notes. Note 1 states that this SR is not required to be performed until 12 hours after establishing steady state operation. The 12 hour allowance provides sufficient time to collect and process all necessary data after stable plant conditions are established.

Steady state operation is required to perform a proper inventory balance since calculations during maneuvering are not useful. For RCS operational LEAKAGE determination by water inventory balance, steady state is defined as stable RCS pressure, temperature, power level, pressurizer and makeup tank levels, makeup and letdown, and RCP seal injection and return flows.

An early warning of pressure boundary LEAKAGE or unidentified LEAKAGE is provided by the automatic systems that monitor the containment atmosphere radioactivity and the containment sump level. ~~It should be noted that LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE.~~ These leakage detection systems are specified in LCO 3.4.15, "RCS Leakage Detection Instrumentation."

Note 2 states that this SR is not applicable to primary to secondary LEAKAGE because LEAKAGE of 150 gallons per day cannot be measured accurately by an RCS water inventory balance.

[The 72 hour Frequency is a reasonable interval to trend LEAKAGE and recognizes the importance of early leakage detection in the prevention of accidents.

1.1 Definitions

Ē - AVERAGE DISINTEGRATION ENERGY	Ē shall be the average (weighted in proportion to the concentration of each radionuclide in the reactor coolant at the time of sampling) of the sum of the average beta and gamma energies per disintegration (in MeV) for isotopes, other than iodines, with half lives > [15] minutes, making up at least 95% of the total noniodine activity in the coolant.
ENGINEERED SAFETY FEATURE (ESF) RESPONSE TIME	The ESF RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its ESF actuation setpoint at the channel sensor until the ESF equipment is capable of performing its safety function (i.e., the valves travel to their required positions, pump discharge pressures reach their required values, etc.). Times shall include diesel generator starting and sequence loading delays, where applicable. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. In lieu of measurement, response time may be verified for selected components provided that the components and methodology for verification have been previously reviewed and approved by the NRC.
LEAKAGE	LEAKAGE shall be:

a. Identified LEAKAGE

1. LEAKAGE, such as that from pump seals or valve packing (except reactor coolant pump (RCP) seal water injection or leakoff), that is captured and conducted to collection systems or a sump or collecting tank;

2. LEAKAGE into the containment atmosphere from sources that are both specifically located and known ~~either~~ to not ~~to~~ interfere with the operation of leakage detection systems ~~or not to be pressure boundary LEAKAGE~~; or

3. Reactor Coolant System (RCS) LEAKAGE through a steam generator to the Secondary System (primary to secondary LEAKAGE),

b. Unidentified LEAKAGE

All LEAKAGE (except RCP seal water injection or leakoff) that is not identified LEAKAGE~~,~~ and

1.1 Definitions

LEAKAGE (continued)

c. Pressure Boundary LEAKAGE

LEAKAGE (except primary to secondary LEAKAGE) through a ~~nonisolable~~ fault in an RCS component body, pipe wall, or vessel wall. LEAKAGE past seals, packing, and gaskets is not pressure boundary LEAKAGE.

MODE

A MODE shall correspond to any one inclusive combination of core reactivity condition, power level, average reactor coolant temperature, and reactor vessel head closure bolt tensioning specified in Table 1.1-1 with fuel in the reactor vessel.

OPERABLE – OPERABILITY

A system, subsystem, train, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication, and other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s).

PHYSICS TESTS

PHYSICS TESTS shall be those tests performed to measure the fundamental nuclear characteristics of the reactor core and related instrumentation.

These tests are:

a. Described in Chapter [14, Initial Test Program] of the FSAR,

b. Authorized under the provisions of 10 CFR 50.59, or

c. Otherwise approved by the Nuclear Regulatory Commission.

PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR)

The PTLR is the unit specific document that provides the reactor vessel pressure and temperature limits, including heatup and cooldown rates, for the current reactor vessel fluence period. These pressure and temperature limits shall be determined for each fluence period in accordance with Specification 5.6.4.

RATED THERMAL POWER (RTP)

RTP shall be a total reactor core heat transfer rate to the reactor coolant of [3410] MWt.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.13 RCS Operational LEAKAGE

LCO 3.4.13 RCS operational LEAKAGE shall be limited to:

a. No pressure boundary LEAKAGE,

b. 1 gpm unidentified LEAKAGE,

c. 10 gpm identified LEAKAGE, and

d. 150 gallons per day primary to secondary LEAKAGE through any one steam generator (SG).

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Pressure boundary LEAKAGE exists.	A.1 Isolate affected component, pipe, or vessel from the RCS by use of a closed manual valve, closed and de-activated automatic valve, blind flange, or check valve.	4 hours
BA. RCS operational LEAKAGE not within limits for reasons other than pressure boundary LEAKAGE or primary to secondary LEAKAGE.	BA.1 Reduce LEAKAGE to within limits.	4 hours
CB. Required Action and associated Completion Time of Condition A not met. OR	CB.1 Be in MODE 3. AND CB.2 Be in MODE 5.	6 hours 36 hours

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~Pressure boundary LEAKAGE exists.~~ OR Primary to secondary LEAKAGE not within limit.		

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.13 RCS Operational LEAKAGE

BASES

BACKGROUND

Components that contain or transport the coolant to or from the reactor core make up the RCS. Component joints are made by welding, bolting, rolling, or pressure loading, and valves isolate connecting systems from the RCS.

During plant life, the joint and valve interfaces can produce varying amounts of reactor coolant LEAKAGE, through either normal operational wear or mechanical deterioration. The purpose of the RCS Operational LEAKAGE LCO is to limit system operation in the presence of LEAKAGE from these sources to amounts that do not compromise safety. This LCO specifies the types and amounts of LEAKAGE.

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

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 is necessary. Quickly separating the identified LEAKAGE from the unidentified LEAKAGE is necessary to provide quantitative information to the operators, allowing them to take corrective action should a leak occur detrimental to the safety of the facility and the public.

A limited amount of leakage inside containment is expected from auxiliary systems that cannot be made 100% leaktight. Leakage from these systems should be detected, located, and isolated from the containment atmosphere, if possible, to not interfere with RCS LEAKAGE detection.

This LCO deals with protection of the reactor coolant pressure boundary (RCPB) from degradation and the core from inadequate cooling, in addition to preventing the accident analysis radiation release assumptions from being exceeded. The consequences of violating this LCO include the possibility of a loss of coolant accident (LOCA).

BASES

APPLICABLE SAFETY ANALYSES

Except for primary to secondary LEAKAGE, the safety analyses do not address operational LEAKAGE. However, other operational LEAKAGE is related to the safety analyses for LOCA; the amount of leakage can affect the probability of such an event. The safety analysis for an event resulting in steam discharge to the atmosphere assumes that primary to secondary LEAKAGE from all steam generators (SGs) is [1 gallon per minute] or increases to [1 gallon per minute] as a result of accident induced conditions. The LCO requirement to limit primary to secondary LEAKAGE through any one SG to less than or equal to 150 gallons per day is significantly less than the conditions assumed in the safety analysis.

Primary to secondary LEAKAGE is a factor in the dose releases outside containment resulting from a steam line break (SLB) accident. To a lesser extent, other accidents or transients involve secondary steam release to the atmosphere, such as a steam generator tube rupture (SGTR). The leakage contaminates the secondary fluid.

The FSAR (Ref. 3) analysis for SGTR assumes the contaminated secondary fluid is only briefly released via safety valves and the majority is steamed to the condenser. The [1 gpm] primary to secondary LEAKAGE safety analysis assumption is relatively inconsequential.

The SLB is more limiting for site radiation releases. The safety analysis for the SLB accident assumes the entire [1 gpm] primary to secondary LEAKAGE is through the affected generator as an initial condition. The dose consequences resulting from the SLB accident are well within the limits defined in 10 CFR 50 or the staff approved licensing basis (i.e., a small fraction of these limits).

RCS operational LEAKAGE satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

RCS operational LEAKAGE shall be limited to:

a. Pressure Boundary LEAKAGE

~~No p~~Pressure boundary LEAKAGE is prohibited ~~allowed, being indicative of material deterioration. LEAKAGE of this type is unacceptable~~ as the leak itself could cause further RCPB deterioration, resulting in higher LEAKAGE. ~~Violation of this LCO could result in continued degradation of the RCPB. LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE.~~

BASES

LCO (continued)

b. Unidentified LEAKAGE

One gallon per minute (gpm) of unidentified LEAKAGE is allowed as a reasonable minimum detectable amount that the containment air monitoring and containment sump level monitoring equipment can detect within a reasonable time period. Separating the sources of leakage (i.e., leakage from an identified source versus leakage from an unidentified source) is necessary for prompt identification of potentially adverse conditions, assessment of the safety significance, and corrective action. ~~Violation of this LCO could result in continued degradation of the RCPB, if the LEAKAGE is from the pressure boundary.~~

c. Identified LEAKAGE

Up to 10 gpm of identified LEAKAGE is considered allowable because LEAKAGE is from known sources that do not interfere with detection of unidentified LEAKAGE and is well within the capability of the RCS makeup system. Identified LEAKAGE includes LEAKAGE to the containment from specifically known and located sources, but does not include ~~pressure boundary LEAKAGE or~~ controlled reactor coolant pump (RCP) seal leakoff (a normal function not considered LEAKAGE). ~~Violation of this LCO could result in continued degradation of a component or system.~~

LCO 3.4.14, "RCS Pressure Isolation Valve (PIV) Leakage," measures leakage through each individual PIV and can impact this LCO. Of the two PIVs in series in each isolated line, leakage measured through one PIV does not result in RCS LEAKAGE when the other is leaktight. If both valves leak and result in a loss of mass from the RCS, the loss must be included in the allowable identified LEAKAGE.

d. Primary to Secondary LEAKAGE Through Any One SG

The limit of 150 gallons per day per SG is based on the operational LEAKAGE performance criterion in NEI 97-06, Steam Generator Program Guidelines (Ref. 4). The Steam Generator Program operational LEAKAGE performance criterion in NEI 97-06 states, "The RCS operational primary to secondary leakage through any one SG shall be limited to 150 gallons per day." The limit is based on operating experience with SG tube degradation mechanisms that result in tube leakage. The operational leakage rate criterion in conjunction with the implementation of the Steam Generator Program is an effective measure for minimizing the frequency of steam generator tube ruptures.

BASES

APPLICABILITY

In MODES 1, 2, 3, and 4, the potential for RCPB LEAKAGE is greatest when the RCS is pressurized.

In MODES 5 and 6, LEAKAGE limits are not required because the reactor coolant pressure is far lower, resulting in lower stresses and reduced potentials for LEAKAGE.

ACTIONS

A.1

If pressure boundary LEAKAGE exists, the affected component, pipe, or vessel must be isolated from the RCS by a closed manual valve, closed and de-activated automatic valve, blind flange, or check valve within 4 hours. While in this condition, structural integrity of the system should be considered because the structural integrity of the part of the system within the isolation boundary must be maintained under all licensing basis conditions, including consideration of the potential for further degradation of the isolated location. Normal LEAKAGE past the isolation device is acceptable as it will limit RCS LEAKAGE and is included in identified or unidentified LEAKAGE. This action is necessary to prevent further deterioration of the RCPB.

B.1

Unidentified LEAKAGE or identified LEAKAGE in excess of the LCO limits must be reduced to within limits within 4 hours. This Completion Time allows time to verify leakage rates and either identify unidentified LEAKAGE or reduce LEAKAGE to within limits before the reactor must be shut down. This action is necessary to prevent further deterioration of the RCPB.

CB.1 and CB.2

If any pressure boundary LEAKAGE exists or primary to secondary LEAKAGE is not within limit, or if any of the Required Actions and associated Completion Times cannot be met, unidentified or identified LEAKAGE cannot be reduced to within limits within 4 hours, the reactor must be brought to lower pressure conditions to reduce the severity of the LEAKAGE and its potential consequences. The reactor must be brought to MODE 3 within 6 hours and to MODE 5 within 36 hours. This action reduces the LEAKAGE and also reduces the factors that tend to degrade the pressure boundary.

The allowed Completion Times are reasonable, based on operating experience, to reach the required conditions from full power conditions in an orderly manner and without challenging plant systems. In MODE 5,

the pressure stresses acting on the RCPB are much lower, and further deterioration is much less likely.

SURVEILLANCE REQUIREMENTS

SR 3.4.13.1

Verifying RCS LEAKAGE to be within the LCO limits ensures the integrity of the RCPB is maintained. Pressure boundary LEAKAGE would at first appear as unidentified LEAKAGE and can only be positively identified by inspection. Unidentified LEAKAGE and identified LEAKAGE are determined by performance of an RCS water inventory balance.

1.1 Definitions

END OF CYCLE RECIRCULATION PUMP TRIP (EOC RPT) SYSTEM RESPONSE TIME

The EOC RPT SYSTEM RESPONSE TIME shall be that time interval from initial signal generation by [the associated turbine stop valve limit switch or from when the turbine control valve hydraulic oil control oil pressure drops below the pressure switch setpoint] to complete suppression of the electric arc between the fully open contacts of the recirculation pump circuit breaker. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured, [except for the breaker arc suppression time, which is not measured but is validated to conform to the manufacturer's design value].

ISOLATION SYSTEM RESPONSE TIME

The ISOLATION SYSTEM RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its isolation initiation setpoint at the channel sensor until the isolation valves travel to their required positions. Times shall include diesel generator starting and sequence loading delays, where applicable. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. In lieu of measurement, response time may be verified for selected components provided that the components and methodology for verification have been previously reviewed and approved by the NRC.

LEAKAGE

LEAKAGE shall be:

a. Identified LEAKAGE

1. LEAKAGE into the drywell, such as that from pump seals or valve packing that is captured and conducted to a sump or collecting tank;~~,~~ or

2. LEAKAGE into the drywell atmosphere from sources that are both specifically located and known ~~either~~ to not ~~to~~ interfere with the operation of leakage detection systems ~~or not to be pressure boundary LEAKAGE~~;~~,~~

b. Unidentified LEAKAGE

All LEAKAGE into the drywell that is not identified LEAKAGE~~,~~

c. Total LEAKAGE

Sum of the identified and unidentified LEAKAGE;~~,~~ and

1.1 Definitions

LEAKAGE (continued)

d. Pressure Boundary LEAKAGE

LEAKAGE through a ~~nonisolable~~ fault in a Reactor Coolant System (RCS) component body, pipe wall, or vessel wall. LEAKAGE past seals, packing, and gaskets is not pressure boundary LEAKAGE.

[LINEAR HEAT GENERATION RATE (LHGR)	The LHGR shall be the heat generation rate per unit length of fuel rod. It is the integral of the heat flux over the heat transfer area associated with the unit length.]
LOGIC SYSTEM FUNCTIONAL TEST	A LOGIC SYSTEM FUNCTIONAL TEST shall be a test of all logic components required for OPERABILITY of a logic circuit, from as close to the sensor as practicable up to, but not including, the actuated device, to verify OPERABILITY. The LOGIC SYSTEM FUNCTIONAL TEST may be performed by means of any series of sequential, overlapping, or total system steps so that the entire logic system is tested.
[MAXIMUM FRACTION OF LIMITING POWER DENSITY (MFLPD)	The MFLPD shall be the largest value of the fraction of limiting power density in the core. The fraction of limiting power density shall be the LHGR existing at a given location divided by the specified LHGR limit for that bundle type.]
MINIMUM CRITICAL POWER RATIO (MCPR)	The MCPR shall be the smallest critical power ratio (CPR) that exists in the core [for each class of fuel]. The CPR is that power in the assembly that is calculated by application of the appropriate correlation(s) to cause some point in the assembly to experience boiling transition, divided by the actual assembly operating power.
MODE	A MODE shall correspond to any one inclusive combination of mode switch position, average reactor coolant temperature, and reactor vessel head closure bolt tensioning specified in Table 1.1-1 with fuel in the reactor vessel.
OPERABLE – OPERABILITY	A system, subsystem, division, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication, and other auxiliary equipment that are required for the system, subsystem, division, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s).

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.4 RCS Operational LEAKAGE

LCO 3.4.4 RCS operational LEAKAGE shall be limited to:

a. No pressure boundary LEAKAGE,

b. ≤ 5 gpm unidentified LEAKAGE, [and]

c. ≤ [30] gpm total LEAKAGE averaged over the previous 24 hour period, and

[d. ≤ 2 gpm increase in unidentified LEAKAGE within the previous [4] hour period in MODE 1.]

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Pressure boundary LEAKAGE exists.	A.1 Isolate affected component, pipe, or vessel from the RCS by use of a closed manual valve, closed and de-activated automatic valve, blind flange, or check valve.	4 hours
BA. Unidentified LEAKAGE not within limit. OR Total LEAKAGE not within limit.	BA.1 Reduce LEAKAGE to within limits.	4 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
CB. Unidentified LEAKAGE increase not within limit.	CB.1 Reduce LEAKAGE to within limits. OR CB.2 Verify source of unidentified LEAKAGE increase is not service sensitive type 304 or type 316 austenitic stainless steel.	4 hours 4 hours
DC. Required Action and associated Completion Time of Condition A or B not met. OR Pressure boundary LEAKAGE exists.	DC.1 Be in MODE 3. AND DC.2 Be in MODE 4.	12 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.4.1	Verify RCS unidentified and total LEAKAGE and unidentified LEAKAGE increase are within limits.	[8 hours OR In accordance with the Surveillance Frequency Control Program]

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.4 RCS Operational LEAKAGE

BASES

BACKGROUND

The RCS includes systems and components that contain or transport the coolant to or from the reactor core. The pressure containing components of the RCS and the portions of connecting systems out to and including the isolation valves define the reactor coolant pressure boundary (RCPB). The joints of the RCPB components are welded or bolted.

During plant life, the joint and valve interfaces can produce varying amounts of reactor coolant LEAKAGE, through either normal operational wear or mechanical deterioration. Limits on RCS operational LEAKAGE are required to ensure appropriate action is taken before the integrity of the RCPB is impaired. This LCO specifies the types and limits of LEAKAGE. This protects the RCS pressure boundary described in 10 CFR 50.2, 10 CFR 50.55a(c), and GDC 55 of 10 CFR 50, Appendix A (Refs 1, 2, and 3).

The safety significance of RCS LEAKAGE from the RCPB varies widely depending on the source, rate, and duration. Therefore, detection of LEAKAGE in the primary containment is necessary. Methods for quickly separating the identified LEAKAGE from the unidentified LEAKAGE are necessary to provide the operators quantitative information to permit them to take corrective action should a leak occur that is detrimental to the safety of the facility or the public.

A limited amount of leakage inside primary containment is expected from auxiliary systems that cannot be made 100% leaktight. Leakage from these systems should be detected and isolated from the primary containment atmosphere, if possible, so as not to mask RCS operational LEAKAGE detection.

This LCO deals with protection of the RCPB from degradation and the core from inadequate cooling, in addition to preventing the accident analyses radiation release assumptions from being exceeded. The consequences of violating this LCO include the possibility of a loss of coolant accident.

BASES

APPLICABLE SAFETY ANALYSES

The allowable RCS operational LEAKAGE limits are based on the predicted and experimentally observed behavior of pipe cracks. The normally expected background LEAKAGE due to equipment design and the detection capability of the instrumentation for determining system LEAKAGE were also considered. The evidence from experiments suggests that, for LEAKAGE even greater than the specified unidentified LEAKAGE limits, the probability is small that the imperfection or crack associated with such LEAKAGE would grow rapidly.

The unidentified LEAKAGE flow limit allows time for corrective action before the RCPB could be significantly compromised. The 5 gpm limit is a small fraction of the calculated flow from a critical crack in the primary system piping. Crack behavior from experimental programs (Refs. 2 and 3) shows that leakage rates of hundreds of gallons per minute will precede crack instability (Ref. 4).

The low limit on increase in unidentified LEAKAGE assumes a failure mechanism of intergranular stress corrosion cracking (IGSCC) that produces tight cracks. This flow increase limit is capable of providing an early warning of such deterioration.

No applicable safety analysis assumes the total LEAKAGE limit. The total LEAKAGE limit considers RCS inventory makeup capability and drywell floor sump capacity.

RCS operational LEAKAGE satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

RCS operational LEAKAGE shall be limited to:

a. Pressure Boundary LEAKAGE

~~No p~~Pressure boundary LEAKAGE is prohibited ~~allowed, being indicative of material degradation. LEAKAGE of this type is unacceptable~~ as the leak itself could cause further RCPB deterioration, resulting in higher LEAKAGE.~~ Violation of this LCO could result in continued degradation of the RCPB. LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE.~~

b. Unidentified LEAKAGE

The 5 gpm of unidentified LEAKAGE is allowed as a reasonable minimum detectable amount that the containment air monitoring, drywell sump level monitoring, and containment air cooler condensate flow rate monitoring equipment can detect within a reasonable time period. Separating the sources of leakage (i.e., leakage from an identified source versus leakage from an unidentified source) is necessary for prompt identification of potentially adverse conditions, assessment of the safety significance,

and corrective action. ~~Violation of this LCO could result in continued degradation of the RCPB.~~

BASES

LCO (continued)

c. Total LEAKAGE

The total LEAKAGE limit is based on a reasonable minimum detectable amount. The limit also accounts for LEAKAGE from known sources (identified LEAKAGE). Violation of this LCO indicates an unexpected amount of LEAKAGE and, therefore, could indicate new or additional degradation in an RCPB component or system.

d. Unidentified LEAKAGE Increase

An unidentified LEAKAGE increase of > 2 gpm within the previous [4] hour period indicates a potential flaw in the RCPB and must be quickly evaluated to determine the source and extent of the LEAKAGE. The increase is measured relative to the steady state value; temporary changes in LEAKAGE rate as a result of transient conditions (e.g., startup) are not considered. As such, the 2 gpm increase limit is only applicable in MODE 1 when operating pressures and temperatures are established. ~~Violation of this LCO could result in continued degradation of the RCPB.~~

APPLICABILITY

In MODES 1, 2, and 3, the RCS operational LEAKAGE LCO applies, because the potential for RCPB LEAKAGE is greatest when the reactor is pressurized.

In MODES 4 and 5, RCS operational LEAKAGE limits are not required since the reactor is not pressurized and stresses in the RCPB materials and potential for LEAKAGE are reduced.

ACTIONS

A.1

If pressure boundary LEAKAGE exists, the affected component, pipe, or vessel must be isolated from the RCS by a closed manual valve, closed and de-activated automatic valve, blind flange, or check valve within 4 hours. While in this condition, structural integrity of the system should be considered because the structural integrity of the part of the system within the isolation boundary must be maintained under all licensing basis conditions, including consideration of the potential for further degradation of the isolated location. Normal LEAKAGE past the isolation device is acceptable as it will limit RCS LEAKAGE and is included in identified or unidentified LEAKAGE. This action is necessary to prevent further deterioration of the RCPB.

B.1

With RCS unidentified or total LEAKAGE greater than the limits, actions must be taken to reduce the leak. Because the LEAKAGE limits are conservatively below the LEAKAGE that would constitute a critical crack size, 4 hours is allowed to reduce the LEAKAGE rates before the reactor must be shut down. If an unidentified LEAKAGE has been identified and quantified, it may be reclassified and considered as identified LEAKAGE; however, the total LEAKAGE limit would remain unchanged.

CB.1 and CB.2

An unidentified LEAKAGE increase of > 2 gpm within a 4 hour period is an indication of a potential flaw in the RCPB and must be quickly evaluated. Although the increase does not necessarily violate the absolute unidentified LEAKAGE limit, certain susceptible components must be determined not to be the source of the LEAKAGE increase within the required Completion Time. For an unidentified LEAKAGE increase greater than required limits, an alternative to reducing LEAKAGE increase to within limits (i.e., reducing the LEAKAGE rate such that the current rate is less than the "2 gpm increase in the previous [4] hours" limit; either by isolating the source or other possible methods) is to evaluate service sensitive type 304 and type 316 austenitic stainless steel piping that is subject to high stress or that contains relatively stagnant or intermittent flow fluids and determine it is not the source of the increased LEAKAGE. This type piping is very susceptible to IGSCC.

The 4 hour Completion Time is reasonable to properly reduce the LEAKAGE increase or verify the source before the reactor must be shut down without unduly jeopardizing plant safety.

DC.1 and DC.2

If any Required Action and associated Completion Time ~~of Condition A or B~~ is not met ~~or if pressure boundary LEAKAGE exists~~, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to MODE 3 within 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 from full power conditions in an orderly manner and without challenging plant safety systems.

SURVEILLANCE REQUIREMENTS

SR 3.4.4.1

1.1 Definitions

ISOLATION SYSTEM RESPONSE TIME

The ISOLATION SYSTEM RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its isolation initiation setpoint at the channel sensor until the isolation valves travel to their required positions. Times shall include diesel generator starting and sequence loading delays, where applicable. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. In lieu of measurement, response time may be verified for selected components provided that the components and methodology for verification have been previously reviewed and approved by the NRC.

LEAKAGE

LEAKAGE shall be:

a. Identified LEAKAGE

1. LEAKAGE into the drywell such as that from pump seals or valve packing that is captured and conducted to a sump or collecting tank;, or

2. LEAKAGE into the drywell atmosphere from sources that are both specifically located and known either to not to interfere with the operation of leakage detection systems or not to be pressure boundary LEAKAGE;,

b. Unidentified LEAKAGE

All LEAKAGE into the drywell that is not identified LEAKAGE,

c. Total LEAKAGE

Sum of the identified and unidentified LEAKAGE;, and

1.1 Definitions

LEAKAGE (continued)

d. Pressure Boundary LEAKAGE

LEAKAGE through a ~~nonisolable~~ fault in a Reactor Coolant System (RCS) component body, pipe wall, or vessel wall. LEAKAGE past seals, packing, and gaskets is not pressure boundary LEAKAGE.

[LINEAR HEAT GENERATION RATE (LHGR)	The LHGR shall be the heat generation rate per unit length of fuel rod. It is the integral of the heat flux over the heat transfer area associated with the unit length.]
LOGIC SYSTEM FUNCTIONAL TEST	A LOGIC SYSTEM FUNCTIONAL TEST shall be a test of all logic components required for OPERABILITY of a logic circuit, from as close to the sensor as practicable up to, but not including, the actuated device, to verify OPERABILITY. The LOGIC SYSTEM FUNCTIONAL TEST may be performed by means of any series of sequential, overlapping, or total system steps so that the entire logic system is tested.
[MAXIMUM FRACTION OF LIMITING POWER DENSITY (MFLPD)	The MFLPD shall be the largest value of the fraction of limiting power density in the core. The fraction of limiting power density shall be the LHGR existing at a given location divided by the specified LHGR limit for that bundle type.]
MINIMUM CRITICAL POWER RATIO (MCPR)	The MCPR shall be the smallest critical power ratio (CPR) that exists in the core [for each class of fuel]. The CPR is that power in the assembly that is calculated by application of the appropriate correlation(s) to cause some point in the assembly to experience boiling transition, divided by the actual assembly operating power.
MODE	A MODE shall correspond to any one inclusive combination of mode switch position, average reactor coolant temperature, and reactor vessel head closure bolt tensioning specified in Table 1.1-1 with fuel in the reactor vessel.
OPERABLE – OPERABILITY	A system, subsystem, division, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication, and other auxiliary equipment that are required for the system, subsystem, division, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s).

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.5 RCS Operational LEAKAGE

LCO 3.4.5 RCS operational LEAKAGE shall be limited to:

a. No pressure boundary LEAKAGE,

b. ≤ 5 gpm unidentified LEAKAGE, [and]

c. ≤ [30] gpm total LEAKAGE averaged over the previous 24 hour period, and

[[d. ≤ 2 gpm increase in unidentified LEAKAGE within the previous [4] hour period in MODE 1.]

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Pressure boundary LEAKAGE exists.	A.1 Isolate affected component, pipe, or vessel from the RCS by use of a closed manual valve, closed and de-activated automatic valve, blind flange, or check valve.	4 hours
BA. Unidentified LEAKAGE not within limit. OR Total LEAKAGE not within limit.	BA.1 Reduce LEAKAGE to within limits.	4 hours
CB. Unidentified LEAKAGE increase not within limit.	CB.1 Reduced LEAKAGE to within limit. OR	4 hours 4 hours

CONDITION	REQUIRED ACTION	COMPLETION TIME
	CB.2 Verify source of unidentified LEAKAGE increase is not service sensitive type 304 or type 316 austenitic stainless steel.	

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
DC. Required Action and associated Completion Time of Condition A or B not met. OR Pressure boundary LEAKAGE exists.	DC.1 Be in MODE 3. AND DC.2 Be in MODE 4.	12 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.5.1	Verify RCS unidentified and total LEAKAGE and unidentified LEAKAGE increase are within limits.	[8 hours OR In accordance with the Surveillance Frequency Control Program]

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.5 RCS Operational LEAKAGE

BASES

BACKGROUND

The RCS includes systems and components that contain or transport the coolant to or from the reactor core. The pressure containing components of the RCS and the portions of connecting systems out to and including the isolation valves define the reactor coolant pressure boundary (RCPB). The joints of the RCPB components are welded or bolted.

During plant life, the joint and valve interfaces can produce varying amounts of reactor coolant LEAKAGE, through either normal operational wear or mechanical deterioration. Limits on RCS operational LEAKAGE are required to ensure appropriate action is taken before the integrity of the RCPB is impaired. This LCO specifies the types and limits of LEAKAGE.

This protects the RCS pressure boundary described in 10 CFR 50.2, 10 CFR 50.55a(c), and GDC 55 of 10 CFR 50, Appendix A (Refs. 1, 2, and 3).

The safety significance of leaks from the RCPB varies widely depending on the source, rate, and duration. Therefore, detection of LEAKAGE in the drywell is necessary. Methods for quickly separating the identified LEAKAGE from the unidentified LEAKAGE are necessary to provide the operators quantitative information to permit them to take corrective action should a leak occur detrimental to the safety of the facility or the public.

A limited amount of leakage inside the drywell is expected from auxiliary systems that cannot be made 100% leaktight. Leakage from these systems should be detected and isolated from the drywell atmosphere, if possible, so as not to mask RCS operational LEAKAGE detection.

This LCO deals with protection of the RCPB from degradation and the core from inadequate cooling, in addition to preventing the accident analyses radiation release assumptions from being exceeded. The consequences of violating this LCO include the possibility of a loss of coolant accident.

APPLICABLE SAFETY ANALYSES

The allowable RCS operational LEAKAGE limits are based on the predicted and experimentally observed behavior of pipe cracks. The normally expected background LEAKAGE due to equipment design and the detection capability of the instrumentation for determining system LEAKAGE were also considered. The evidence from experiments suggests, for LEAKAGE even greater than the specified unidentified LEAKAGE limits, the probability is small that the imperfection or crack associated with such LEAKAGE would grow rapidly.

BASES

APPLIICABLE SAFETY ANALYSES (continued)

The unidentified LEAKAGE flow limit allows time for corrective action before the RCPB could be significantly compromised. The 5 gpm limit is a small fraction of the calculated flow from a critical crack in the primary system piping. Crack behavior from experimental programs (Refs. 4 and 5) shows leak rates of hundreds of gallons per minute will precede crack instability (Ref. 6).

The low limit on increase in unidentified LEAKAGE assumes a failure mechanism of intergranular stress corrosion cracking (IGSCC) that produces tight cracks. This flow increase limit is capable of providing an early warning of such deterioration.

No applicable safety analysis assumes the total LEAKAGE limit. The total LEAKAGE limit considers RCS inventory makeup capability and drywell floor sump capacity.

RCS operational LEAKAGE satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

RCS operational LEAKAGE shall be limited to:

a. Pressure Boundary LEAKAGE

~~No p~~Pressure boundary LEAKAGE is prohibited ~~allowed, being indicative of material degradation. LEAKAGE of this type is unacceptable~~ as the leak itself could cause further RCPB deterioration, resulting in higher LEAKAGE. ~~Violation of this LCO could result in continued degradation of the RCPB. LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE.~~

b. Unidentified LEAKAGE

Five gpm of unidentified LEAKAGE is allowed as a reasonable minimum detectable amount that the drywell air monitoring, drywell sump level monitoring, and drywell air cooler condensate flow rate monitoring equipment can detect within a reasonable time period. Separating the sources of leakage (i.e., leakage from an identified source versus leakage from an unidentified source) is necessary for prompt identification of potentially adverse conditions, assessment of the safety significance, and corrective action. ~~Violation of this LCO could result in continued degradation of the RCPB.~~

c. Total LEAKAGE

The total LEAKAGE limit is based on a reasonable minimum detectable amount. The limit also accounts for LEAKAGE from known sources (identified LEAKAGE). Violation of this LCO indicates

an unexpected amount of LEAKAGE and, therefore, could indicate new or additional degradation in an RCPB component or system.

BASES

LCO (continued)

d. Unidentified LEAKAGE Increase

An unidentified LEAKAGE increase of > 2 gpm within the previous 4 hour period indicates a potential flaw in the RCPB and must be quickly evaluated to determine the source and extent of the LEAKAGE. The increase is measured relative to the steady state value; temporary changes in LEAKAGE rate as a result of transient conditions (e.g., startup) are not considered. As such, the 2 gpm increase limit is only applicable in MODE 1 when operating pressures and temperatures are established. ~~Violation of this LCO could result in continued degradation of the RCPB.~~

APPLICABILITY

In MODES 1, 2, and 3, the RCS operational LEAKAGE LCO applies because the potential for RCPB LEAKAGE is greatest when the reactor is pressurized.

In MODES 4 and 5, RCS operational LEAKAGE limits are not required since the reactor is not pressurized and stresses in the RCPB materials and potential for LEAKAGE are reduced.

ACTIONS

A.1

If pressure boundary LEAKAGE exists, the affected component, pipe, or vessel must be isolated from the RCS by a closed manual valve, closed and de-activated automatic valve, blind flange, or check valve within 4 hours. While in this condition, structural integrity of the system should be considered because the structural integrity of the part of the system within the isolation boundary must be maintained under all licensing basis conditions, including consideration of the potential for further degradation of the isolated location. Normal LEAKAGE past the isolation device is acceptable as it will limit RCS LEAKAGE and is included in identified or unidentified LEAKAGE. This action is necessary to prevent further deterioration of the RCPB.

B.1

With RCS unidentified or total LEAKAGE greater than the limits, actions must be taken to reduce the leak. Because the LEAKAGE limits are conservatively below the LEAKAGE that would constitute a critical crack size, 4 hours is allowed to reduce the LEAKAGE rates before the reactor must be shut down. If an unidentified LEAKAGE has been identified and

quantified, it may be reclassified and considered as identified LEAKAGE. However, the total LEAKAGE limit would remain unchanged.

CB.1 and CB.2

An unidentified LEAKAGE increase of > 2 gpm within a 4 hour period is an indication of a potential flaw in the RCPB and must be quickly evaluated. Although the increase does not necessarily violate the absolute unidentified LEAKAGE limit, certain susceptible components must be determined not to be the source of the LEAKAGE increase within the required Completion Time. For an unidentified LEAKAGE increase greater than required limits, an alternative to reducing LEAKAGE increase to within limits (i.e., reducing the leakage rate such that the current rate is less than the "2 gpm increase in the previous [4] hours" limit; either by isolating the source or other possible methods) is to evaluate RCS

ACTIONS (continued)

type 304 and type 316 austenitic stainless steel piping that is subject to high stress or that contains relatively stagnant or intermittent flow fluids and determine it is not the source of the increased LEAKAGE. This type of piping is very susceptible to IGSCC.

The 4 hour Completion Time is needed to properly reduce the LEAKAGE increase or verify the source before the reactor must be shut down.

DC.1 and DC.2

If any Required Action and associated Completion Time ~~of Condition A or B~~ is not met ~~or if pressure boundary LEAKAGE exists~~, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to MODE 3 within 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 from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.4.5.1

The RCS LEAKAGE is monitored by a variety of instruments designed to provide alarms when LEAKAGE is indicated and to quantify the various types of LEAKAGE. Leakage detection instrumentation is discussed in more detail in the Bases for LCO 3.4.7, "RCS Leakage Detection Instrumentation." Sump level and flow rate are typically monitored to determine actual LEAKAGE rates. However, any method may be used to quantify LEAKAGE within the guidelines of Reference 7. [In conjunction with alarms and other administrative controls, an 8 hour Frequency for

1.1 Definitions

ENGINEERED SAFETY FEATURE (ESF) RESPONSE TIME

The ESF RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its actuation setpoint at the channel sensor until the ESF equipment is capable of performing its safety function (i.e., the valves travel to their required positions). The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. In lieu of measurement, response time may be verified for selected components provided that the components and methodology for verification have been previously reviewed and approved by the NRC.

LEAKAGE

LEAKAGE shall be:

a. Identified LEAKAGE

1. LEAKAGE, such as that from seals or valve packing, that is captured and conducted to collection systems or a sump or collecting tank;

2. LEAKAGE into the containment atmosphere from sources that are both specifically located and known ~~either~~ to not ~~to~~ interfere with the operation of leakage detection systems ~~or not to be pressure boundary LEAKAGE~~;

3. Reactor Coolant System (RCS) LEAKAGE through a steam generator (SG) to the Secondary System (primary to secondary LEAKAGE); or

4. RCS LEAKAGE through the passive residual heat removal heat exchanger (PRHR HX) to the In containment Refueling Water Storage Tank (IRWST);

b. Unidentified LEAKAGE

All LEAKAGE that is not identified LEAKAGE;~~.~~

1.1 Definitions

LEAKAGE (continued)

c. Pressure Boundary LEAKAGE

LEAKAGE (except primary to secondary LEAKAGE and PRHR HX tube LEAKAGE) through a ~~nonisolatable~~ fault in an RCS component body, pipe wall, or vessel wall. LEAKAGE past seals, packing, and gaskets is not pressure boundary LEAKAGE.

MODE

A MODE shall correspond to any one inclusive combination of core reactivity condition, power level, average reactor coolant temperature, and reactor vessel head closure bolt tensioning specified in Table 1.1-1 with fuel in the reactor vessel.

OPERABLE-OPERABILITY

A system, subsystem, train, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication, and other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s).

PHYSICS TESTS

PHYSICS TESTS shall be those tests performed to measure the fundamental nuclear characteristics of the reactor core and related instrumentation. These tests are:

a. Described in Chapter 14, Initial Test Program, of the FSAR;

b. Authorized under the provisions of 10 CFR 50.59; or

c. Otherwise approved by the Nuclear Regulatory Commission.

PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR)

The PTLR is the unit specific document that provides the reactor vessel pressure and temperature limits, including heatup and cooldown rates, for the current reactor vessel fluence period. These pressure and temperature limits shall be determined for each fluence period in accordance with Specification 5.6.4.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.7 RCS Operational LEAKAGE

LCO 3.4.7 RCS operational LEAKAGE shall be limited to:

a. No pressure boundary LEAKAGE,

b. 0.5 gpm unidentified LEAKAGE,

c. 10 gpm identified LEAKAGE from the RCS,

d. 150 gallons per day primary to secondary LEAKAGE through any one Steam Generator (SG), and

e. 500 gallons per day primary to In-Containment Refueling Water Storage Tank (IRWST) LEAKAGE through the passive residual heat removal heat exchanger (PRHR HX).

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

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Pressure boundary LEAKAGE exists.	A.1 Isolate affected component, pipe, or vessel from the RCS by use of a closed manual valve, closed and de-activated automatic valve, blind flange, or check valve.	4 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B~~A~~. RCS operational LEAKAGE not within limits for reasons other than pressure boundary LEAKAGE or primary to secondary LEAKAGE.	B~~A~~.1 Reduce LEAKAGE to within limits.	4 hours
C~~B~~. Required Action and associated Completion Time not met. ~~OR~~ ~~Pressure boundary LEAKAGE exists.~~ OR Primary to secondary LEAKAGE not within limit.	C~~B~~.1 Be in MODE 3. AND C~~B~~.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.7.1	-------------------------------NOTES------------------------------- 1. Not required to be performed until 12 hours after establishment of steady state operation. 2. Not applicable to primary to secondary LEAKAGE. -- Verify RCS operational LEAKAGE is within limits by performance of RCS water inventory balance.	72 hours

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.7 RCS Operational LEAKAGE

BASES

BACKGROUND

Components that contain or transport the coolant to or from the reactor core comprise the RCS. Component joints are made by welding, bolting, rolling, or pressure loading, and valves isolate connecting systems from the RCS.

During plant life, the joint and valve interfaces can produce varying amounts of reactor coolant LEAKAGE, through either normal operational wear or mechanical deterioration. The purpose of the RCS Operational LEAKAGE LCO is to limit system operation in the presence of LEAKAGE from these sources to amounts that do not compromise safety. This LCO specifies the types and amounts of LEAKAGE.

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

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 is necessary to provide quantitative information to the operators, allowing them to take corrective action should a leak occur that is detrimental to the safety of the facility and the public.

A limited amount of LEAKAGE inside containment is expected from auxiliary systems that cannot be made 100% leaktight. LEAKAGE from these systems should be detected, located, and isolated from the containment atmosphere, if possible, to not interfere with RCS LEAKAGE detection.

This LCO deals with protection of the reactor coolant pressure boundary (RCPB) from degradation and the core from inadequate cooling, in addition to preventing the accident analyses radiation release assumptions from being exceeded. The consequences of violating this LCO include the possibility of a loss of coolant accident (LOCA).

BASES

BACKGROUND (continued)

LCO 3.4.15, "RCS Pressure Isolation Valve (PIV) Integrity," measures leakage through each individual PIV and can impact this LCO. Of the two PIVs in series in each isolated line, leakage measured through one PIV does not result in RCS LEAKAGE when the other is leak tight. If both valves leak and result in a loss of mass from the RCS, the loss must be included in the allowable identified LEAKAGE.

APPLICABLE SAFETY ANALYSES

Except for primary to secondary LEAKAGE, the safety analyses do not address operational LEAKAGE. However, other operational LEAKAGE is related to the safety analyses for LOCA. The amount of LEAKAGE can affect the probability of such an event. The safety analysis for an event resulting in steam discharge to the atmosphere assumes a 300 gpd primary to secondary LEAKAGE as the initial condition.

Primary to secondary LEAKAGE is a factor in the dose releases outside containment resulting from a steam line break (SLB) accident. To a lesser extent, other accidents or transients involve secondary steam release to the atmosphere, such as a steam generator tube rupture (SGTR). The leak contaminates the secondary fluid.

The FSAR Chapter 15 (Ref. 3) analyses for the accidents involving secondary side releases assume 150 gpd primary to secondary LEAKAGE in each generator as an initial condition. The design basis radiological consequences resulting from a postulated SLB accident and SGTR are provided in Sections 15.1.5 and 15.6.3 of FSAR Chapter 15, respectively.

The RCS operational LEAKAGE satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

RCS operational LEAKAGE shall be limited to:

a. Pressure Boundary LEAKAGE

~~No p~~Pressure boundary LEAKAGE is prohibited ~~allowed, being indicative of material deterioration. LEAKAGE of this type is unacceptable~~ as the leak itself could cause further RCPB deterioration, resulting in higher LEAKAGE. ~~Violation of this LCO could result in continued degradation of the RCPB. LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE.~~

BASES

LCO (continued)

b. Unidentified LEAKAGE

0.5 gpm of unidentified LEAKAGE is allowed as a reasonable minimum detectable amount that the containment air F18 particulate radioactivity monitoring and containment sump level monitoring equipment, can detect within a reasonable time period. This leak rate supports leak before break (LBB) criteria. Separating the sources of leakage (i.e., leakage from an identified source versus leakage from an unidentified source) is necessary for prompt identification of potentially adverse conditions, assessment of the safety significance, and corrective action. ~~Violation of this LCO could result in continued degradation of the RCPB, if the LEAKAGE is from the pressure boundary.~~

c. Identified LEAKAGE

Up to 10 gpm of identified LEAKAGE is considered allowable because LEAKAGE is from known sources that do not interfere with detection of unidentified LEAKAGE and is well within the capability of the RCS Makeup System. Identified LEAKAGE includes LEAKAGE to the containment from specifically known and located sources~~, but does not include pressure boundary LEAKAGE~~. ~~Violation of this LCO could result in continued degradation of a component or system.~~

d. Primary to Secondary LEAKAGE through One SG

The limit of 150 gallons per day per SG is based on the operational LEAKAGE performance criterion in NEI 97-06, Steam Generator Program Guidelines (Ref. 4). The Steam Generator Program operational LEAKAGE performance criterion in NEI 97-06 states, "The RCS operational primary to secondary leakage through any one SG shall be limited to 150 gallons per day." The limit is based on operating experience with SG tube degradation mechanisms that result in tube leakage. The operational leakage rate criterion in conjunction with the implementation of the Steam Generator Program is an effective measure for minimizing the frequency of steam generator tube ruptures.

e. Primary to In-Containment Refueling Water Storage Tank (IRWST) LEAKAGE through the Passive Residual Heat Removal Heat Exchanger (PRHR HX)

The 500 gpd limit from the PRHR HX is based on the assumption that a single crack leaking this amount would not lead to a PRHR HX tube rupture under the stress condition of an RCS pressure increase event. If the leakage is through many cracks, and the cracks are

LCO (continued)

very small, then the above assumption is conservative. This is conservative because the thickness of the PRHR HX tubes is approximately 60% greater than the thickness of the SG tubes. Furthermore, a PRHR HX tube rupture would result in an isolable leak and would not lead to a direct release of radioactivity to the atmosphere.

APPLICABILITY

In MODES 1, 2, 3, and 4, the potential for RCPB LEAKAGE is greatest when the RCS is pressurized.

In MODES 5 and 6, LEAKAGE limits are not required because the reactor coolant pressure is far lower, resulting in lower stresses and reduced potentials for LEAKAGE.

ACTIONS

A.1

If pressure boundary LEAKAGE exists, the affected component, pipe, or vessel must be isolated from the RCS by a closed manual valve, closed and de-activated automatic valve, blind flange, or check valve within 4 hours. While in this condition, structural integrity of the system should be considered because the structural integrity of the part of the system within the isolation boundary must be maintained under all licensing basis conditions, including consideration of the potential for further degradation of the isolated location. Normal LEAKAGE past the isolation device is acceptable as it will limit RCS LEAKAGE and is included in identified or unidentified LEAKAGE. This action is necessary to prevent further deterioration of the RCPB.

B.1

Unidentified LEAKAGE or identified LEAKAGE in excess of the LCO limits must be reduced to within limits within 4 hours. This Completion Time allows time to verify leakage rates and either identify unidentified LEAKAGE or reduce LEAKAGE to within limits before the reactor must be shut down. This action is necessary to prevent further deterioration of the RCPB.

CB.1 and CB.2

If any pressure boundary LEAKAGE exists, or primary to secondary LEAKAGE is not within limits, or if any of the Required Actions and associated Completion Times cannot be met, unidentified or identified LEAKAGE cannot be reduced to within limits within 4 hours, the reactor must be brought to lower pressure conditions to reduce the severity of the LEAKAGE and its potential consequences. It should be noted that LEAKAGE past seals and gaskets is not pressure boundary LEAKAGE. The reactor must be brought to MODE 3 within 6 hours and to MODE 5 within 36 hours. This action reduces the LEAKAGE and also reduces the factors which tend to degrade the pressure boundary.

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 ACTIONS challenging plant systems. In MODE 5, the pressure stresses acting on the RCPB are much lower, and further deterioration is much less likely.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.7.1

Verifying RCS LEAKAGE within the LCO limits ensures the integrity of the RCPB is maintained. Pressure boundary LEAKAGE would at first appear as unidentified LEAKAGE and can only be positively identified by inspection.

Unidentified LEAKAGE and identified LEAKAGE are determined by performance of an RCS water inventory balance.

The RCS water inventory balance must be met with the reactor at steady state operating conditions. The Surveillance is modified by two Notes. Note 1 states that this SR is not required to be performed until 12 hours after establishing steady state operation. The 12 hour allowance provides sufficient time to collect and process all necessary data after stable plant conditions are established.

Steady state operation is required to perform a proper inventory balance since calculations during maneuvering are not useful. For RCS operational LEAKAGE determination by inventory balance, steady state is defined as stable RCS pressure, temperature, power level, pressurizer level, and reactor coolant drain tank and in-containment refueling water storage tank (IRWST) levels.