March 14, 2016

TSTF-16-02
PROJ0753

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

SUBJECT: Response to NRC Request for Additional Information Regarding TSTF-542, Revision 1, "Reactor Pressure Vessel Water Inventory Control" and Submittal of Revision 2

REFERENCE: Letter from Michelle Honcharik (NRC) to the TSTF, "Request for Additional Information Regarding Traveler TSTF-542, Revision 1, 'Reactor Pressure Vessel Water Inventory Control'," dated December 8, 2015 (ADAMS Accession No. ML15293A161).

On September 15, 2015, the TSTF submitted responses to an NRC request for additional information (RAI) and Revision 1 of traveler TSTF-542, "Reactor Pressure Vessel Water Inventory Control," to the Nuclear Regulatory Commission (NRC) for review (ADAMS Accession No. ML15258A850).

In the referenced letter, the NRC provided a second RAI on the traveler. The attachments to this letter respond to the request.

The RAI responses discuss changes to TSTF-542. Revision 2 of the traveler is enclosed.

Should you have any questions, please contact us.

James R. Morris (PWROG/W)

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Attachments
Enclosure: TSTF-542, Revision 2

cc: Michelle Honcharik, Licensing Processes Branch, NRC
Robert Elliott, Technical Specifications Branch, NRC

Attachment 1

Response to NRC Request for Additional Information Regarding TSTF-542, Revision 1, "Reactor Pressure Vessel Water Inventory Control"

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

By letter dated December 31, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15258A850), you submitted to the U.S. Nuclear Regulatory Commission (NRC) Traveler TSTF-542, Revision 0, "Reactor Pressure Vessel Water Inventory Control." By letter dated September 15, 2015 (ADAMS Accession No. ML15258A850), you submitted responses to NRC staff requests for additional information and Revision 1 of Traveler TSTF-542, "Reactor Pressure Vessel Water Inventory Control." Based on its review of Revision 1 of TSTF-542, the NRC staff has determined that additional information is needed. Question #1 below is from the Instrumentation and Controls branch; Questions #2 through #6 are from the Reactor Systems branch; Questions #7 through #13 are from the Technical Specifications branch.

RAI-1

Ten Second Delay

Enclosure 6, Page 210, Boiling Water Reactor (BWR)/4, Bases, states:

> *The LPCI [low pressure coolant injection] minimum flow valves are time delayed such that the valves will not open for 10 seconds after the switches detect low flow. The time delay is provided to limit reactor vessel inventory loss during the startup of the Residual Heat Removal (RHR) shutdown cooling mode.*

Please provide further details as to why the ten second delay is needed. If the Core Spray or LPCI is going to be adding water, how is it that there would be a reactor vessel inventory loss during startup of RHR shutdown cooling mode?

TSTF Response

The NRC informed the TSTF that a response to RAI-1 is no longer required.

RAI-2

Table/graph on Drain Time Calculation

The response for Question #20 of the RAI regarding TSTF-542, Revision 0, states that licensees may choose to use a simple table or graph that provides a conservatively calculated (i.e., bounding) Drain Time for ranges of penetration flow path cross-sectional areas and water heights. The NRC staff requests that the simple table or graph recommended in the RAI response be provided. Additionally, the NRC staff requests a clarification regarding how the simple table or graph will be used in comparison to the Drain Time definition.

TSTF Response

An example of a bounding Drain Time table and supporting calculation is provided in Attachment 2.

A bounding Drain Time table would be used by the plant operating staff to quickly determine a conservative estimate of Drain Time in order to respond to changing plant conditions. This conservatively estimated Drain Time would be used to enter the appropriate Condition of the proposed TS 3.5.2, "Reactor Pressure Vessel Water Inventory Control."

Alternatively, the licensee may choose to perform a more detailed calculation using the specific values for a penetration flow path. For example, the calculation could be performed using a discharge coefficient based on the physical flow path configuration, and the actual drain point elevation. The approach would most likely be used for planned maintenance.

During development of the response, the industry recognized the need to clarify the Bases regarding Drain Time. The definition states that realistic drain rates are used, but this is not explained. The Bases of SR 3.5.2.1, which requires verifying the Drain Time to be ≥ 36 hours, are revised to include the following statement, "A realistic drain rate may be determined using a single, step-wise, or integrated calculation considering the changing RPV water level during a draining event." This information is also added to Section 3.2.1.3, "Proposed Drain Time Defined Term," in the traveler justification.

RAI-3

<u>*Decay Heat Requirement*</u>

The Drain Time is monitored by the operators per surveillance requirements in technical specification (TS) 3.5.2, "RPV [reactor pressure vessel] Water Inventory Control." The NRC staff noted that other parameters are not being monitored in conjunction with the Drain Time. With a draining event in Modes 4 or 5 with fuel still in the core, the change in water inventory can thus change the heat up rate for the coolant. The proposed TS is performance based using the drain time parameter defined in the TS Section 1.1, "Definitions." Decay heat for this performance based TS is important in relation to injection source water when a drain event occurs. The NRC staff requests that an explanation be provided for why decay heat was not included as a requirement for this performance based TS.

<u>TSTF Response</u>

Decay heat removal in Modes 4 and 5 is addressed by existing TS which are not affected by the proposed change. In the BWR/4 Standard Technical Specifications (STS), the requirements are in TS 3.4.9, "Residual Heat Removal (RHR) Shutdown Cooling System - Cold Shutdown," TS 3.9.8, "Residual Heat Removal (RHR) - High Water Level," and TS 3.9.10, "Residual Heat Removal (RHR) - Low Water Level." In the BWR/6 STS, the requirements are in TS 3.4.10, "Residual Heat Removal (RHR) Shutdown Cooling System - Cold Shutdown," TS 3.9.8, "Residual Heat Removal (RHR) - High Water Level," and TS 3.9.10, "Residual Heat Removal (RHR) - Low Water Level." These specifications provide requirements on the number of RHR shutdown cooling subsystems that must be operable and in operation to ensure adequate decay heat removal from the core. These requirements apply in addition to the requirements on RPV water inventory control in the proposed change. Therefore, the proposed TS 3.5.2 does not include additional requirements on decay heat removal.

Response to NRC Request for Additional Information Regarding TSTF-542, Revision 1, "Reactor Pressure Vessel Water Inventory Control"

RAI-4

Suspension of Operations to Prevent a Drain Down Event

TS 3.5.2, "RPV Water Inventory Control," states in its limiting condition for operation (LCO) that one low pressure emergency core cooling system (ECCS) injection/spray subsystem shall be OPERABLE for Modes 4 and 5 for BWR/4, and states that one ECCS injection/spray subsystem shall be OPERABLE for Modes 4 and 5 for BWR/6. The Standard Technical Specification (STS) for BWR/4 states that two low pressure ECCS injection/spray subsystems shall be OPERABLE for the applicable Modes. The STS for BWR/6 states that two ECCS injection/subsystem shall be OPERABLE for the applicable Modes. In review of the revision to the Traveler, it is stated that the redundancy of two ECCS injection/spray subsystems are not required for a defense-in-depth measure when, consistent with other events considered during shutdown, no additional single failure is assumed. The Drain Time controls, in addition to the required ECCS injection/subsystem, provide reasonable assurance that an unexpected draining event can be prevented or mitigated before the RPV water level would be lowered to the top of active fuel (TAF).

Additionally, the proposed revisions to TS 3.5.2, "RPV Water Inventory Control," do not include any action to suspend all actions with the potential for draining the reactor vessel when there are no pumps available. The Required Actions for Condition B do not include either an alternate source capable of injecting water or to suspend operations that may cause a drain down event. The NRC staff requests an explanation for if the Required Actions are not met to restore an injection source that it is not considered to suspend operations to prevent a drain down event.

TSTF Response

The enclosed Revision 2 of TSTF-542 alters Condition B of the proposed TS 3.5.2. The requirement to restore the Drain Time to greater than 36 hours when a required ECCS injection/spray subsystem is not restored within 4 hours is replaced with a requirement to immediately initiate action to establish a method of water injection capable of operating without offsite electrical power. This is a more appropriate response to the inoperability of the required ECCS injection/spray subsystem, and with an alternate water injection method available, suspending all actions with the potential to drain the reactor vessel is not needed. The Bases of Required Action B.1 describe an adequate water injection method, which includes the necessary instrumentation and controls, water sources, and pumps and valves needed to add water to the RPV or refueling cavity should an unexpected draining event occur. It may be manually initiated and may consist of one or more systems or subsystems, and must be able to access water inventory capable of maintaining the RPV water level above the TAF for ≥ 36 hours given the current Drain Time calculation conditions.

Attachment 1

Response to NRC Request for Additional Information Regarding TSTF-542, Revision 1, "Reactor Pressure Vessel Water Inventory Control"

RAI-5

Clarification Regarding Calculation of Drain Time

The definition of Drain Time is proposed in the markups for TS Section 1.1, "Definitions." The NRC staff reviewed the provided definition for its assumptions and exceptions for determining Drain Time. The NRC staff requests that a clarification regarding how the Drain Time is calculated be provided in regards to (1) what flow paths penetrations below TAF that will be part of the Drain Time calculation, and (2) would penetrations just above TAF be excluded from this specification.

TSTF Response

As discussed in Section 3.1.2 of the justification of TSTF-542, the purpose of the proposed TS change is to protect Safety Limit 2.1.1.3, which states, "Reactor vessel water level shall be greater than the top of active irradiated fuel." Therefore, all RPV penetrations below the TAF are included in the determination of Drain Time. RPV penetrations above the TAF are not included in the determination of Drain Time as those penetrations cannot result in draining the water inventory below the TAF.

The lowest RPV penetrations above the TAF are the core spray, feedwater, and steam lines. Depending on the plant design, these lines are approximately eight to eleven feet above the TAF. Even in the smallest BWR RPVs, these levels represent over 10,000 gallons of water above the TAF. During plant maintenance it may be necessary to drain the RPV water level below those lines while fuel is in the RPV and plant procedures exist to control those evolutions. The proposed TS 3.5.2 requirements would also apply in this condition.

An unexpected draining event in the penetrations above the TAF, including any dose consequences, would be addressed under the existing Abnormal Operating Procedures. Under TS 3.5.2, an ECCS injection/spray subsystem is required to be operable during Mode 4 and 5 and would be capable of mitigating such an event. However, even without ECCS mitigation, thousands of gallons of water would still remain above the TAF.

RAI-6

Clarification of Closed System Definition

The Drain Time definition provided in the Traveler states the following:

> *b) The limiting drain rate is the larger of the drain rate through a single penetration flow path with the highest flow rate, or the sum of the drain rates through multiple penetration flow paths susceptible to a common mode failure (e.g., seismic event, loss of normal power, single human error), for all penetration flow paths below the TAF except:*
>
> *1. Penetration flow paths connected to an intact closed system…*

The TS Bases for Surveillance Requirement (SR) 3.5.2.1 states that the definition of Drain Time excludes from the calculation those penetration flow paths connected to an intact closed system, or isolated by manual or automatic valves that are locked, sealed, or otherwise secured in the closed position, blank flanges, or other devices that prevent flow of reactor coolant through the penetration flow paths. Determination that a system is intact and closed or isolated must consider the status of branch lines and ongoing plant maintenance and testing activities. The NRC staff requests that an explanation be provided regarding if the definition of a closed system considers the inclusion of a large tank.

<u>TSTF Response</u>

The BWR design does not feature closed systems connected to the RPV that include large tanks. The closed system exception would typically apply to the Reactor Water Cleanup System and, after establishment of appropriate system alignment, the Residual Heat Removal shutdown cooling system. Neither of these systems include a large tank.

RAI-7

<u>Definition of Drain Time</u>

The proposed definition of Drain Time contains criteria for excluding penetration flow paths from the calculation of drain time. One of the criteria for exclusion is a penetration flow path that contains an isolation device that can be closed prior to the RPV water level being equal to TAF by a dedicated operator who is trained, in continuous communication with the control room, is stationed at the controls, and is capable of closing the penetration flow path isolation device without offsite power.

The qualifications of the dedicated operator were the subject of Question #3 in the RAIs regarding TSTF-542, Revision 0. In that RAI, the NRC staff requested that a revision to the definition be provided that incorporates a dedicated qualified non-licensed operator or licensed operator into this exception. In response, the TSTF proposed the insertion of the phrase "[a dedicated operator] who is trained…"

The NRC staff believes a further description of the term "trained' is needed. The additional detail should ensure that the individual dedicated to this task has the necessary knowledge, skills and ability to properly close the isolation device and verify that it is fully closed.

<u>TSTF Response</u>

The enclosed Revision 2 of TSTF-542 alters the definition of Drain Time to specify that the dedicated operator must be "trained in the task." This will ensure that the dedicated operator has the necessary knowledge, skills, and ability to properly close the isolation device and verify that it is fully closed. The definition now states:

> 3. Penetration flow paths with isolation devices that can be closed prior to the RPV water level being equal to the TAF by a dedicated operator trained in the task, who is in continuous communication with the control room, is stationed at the controls,

and is capable of closing the penetration flow path isolation device without offsite power.

RAI-8

Mitigating Actions

Proposed new TS 3.5.2 requires that the Drain Time of the RPV water inventory to the TAF be ≥ 36 hours.

Condition C applies when the Drain Time is <36 hours, and ≥ 8 hours. The Required Actions are to verify containment boundary is capable of being established, that each [secondary] containment penetration flow path is capable of being isolated, and that one standby gas treatment subsystem is capable of being placed in operation in less than the Drain Time. The Completion Time for these actions is 4 hours.

Condition D applies when the Drain Time is < 8 hours. The Required Action D.1 is to initiate action to establish an additional method of water injection with water sources capable of maintaining RPV water level > TAF for ≥ 36 hours. Required Actions D.2, D.3 and D.4 require immediately initiating action to establish [secondary] containment boundary, to isolate each [secondary] containment penetration flow path or verify it can be manually isolated from the control room, and to verify one standby gas treatment subsystem is capable of being placed in operation.

When the term "immediately" is used as a Completion Time, it means the Action should be pursued without delay and in a controlled manner. This is shortest Completion Time available in the TS.

The NRC staff requested additional information on the technical basis for the proposed Required Actions for Conditions C and D in Question #7 of the NRC staff's RAI regarding TSTF 542, Revision 0. The NRC staff has reviewed the information provided and finds that additional clarification is needed.

Condition C is applicable when the Drain Time is < 36 hours and ≥ 8 hours. The action to restore compliance with the LCO is always implied within the TS. However, there is no explicit requirement to restore the Drain Time. Please provide additional discussion of safety margin and defense-in-depth considerations for operation in this condition for an unlimited time period.

Condition D is applicable when the Drain Time is < 8 hours. Required Action D.3 requires initiate action to isolate each [secondary] containment penetration flow path or verify it can be manually isolated from the control room immediately. The NRC staff requests the technical basis for not requiring that [secondary] containment flow path be isolated. At what point would complete isolation of [secondary] containment flow paths be necessary?

TSTF Response

Condition C, applicable when the Drain Time is < 36 hours and ≥ 8 hours, is an acceptable condition for continued plant operation and, therefore, there is no Required Action and Completion Time to restore the Drain Time to ≥ 36 hours. The available plant systems and the required ECCS subsystem are capable of mitigating an unexpected draining event of this magnitude. In addition, water injection could prevent the water level from reaching the TAF or, at a minimum, increase the time for the water level to reach the TAF because the calculated Drain Time does not credit any mitigating actions. Defense-in-depth is provided by the Condition C requirement to have the ability to isolate the [secondary] containment and close the [secondary] containment isolation valves in less than the Drain Time. Additional Defense-in-depth is provided by the availability of the Standby Gas Treatment System that can filter any radioactive release into the [secondary] containment. The proposed changes to LCO 3.5.2 provide safety margin by imposing a new requirement on the minimum allowed Drain Time. The current TS have no restrictions on the magnitude of a potential draining event and only provide requirements for containing any radioactive release from the resultant fuel damage. The proposed change provides a significant safety margin by requiring knowledge and control of the conservatively calculated Drain Time associated with the worst-case unexpected draining event, and prohibiting plant operation when the Drain Time is less than one hour.

Condition D, which is applicable when the Drain Time is < 8 hours, does not require all [secondary] containment isolation valves to be closed because a draining event has not occurred and there is no need for [secondary] containment isolation. However, while in Condition D, the Drain Time could be as short as one hour. Therefore, to ensure that the [secondary] containment isolation valves can be closed within the Drain Time, any open valves must be capable of being remotely closed from the control room. This ensures the [secondary] containment can be isolated within the Drain Time should an unexpected draining event occur.

The Condition D Required Actions do not require all [secondary] containment isolation valves to be closed because some valves must be open in Mode 4 or 5 to support plant operation, such as Reactor Water Cleanup. Isolating these valves when there is no draining event in progress would be detrimental to plant safety. If a draining event were to occur, the Abnormal Operating Procedures would dictate when any open [secondary] containment isolation valves are closed.

RAI-9

Justification for Required Actions A.1, B.1, and C.1

The existing LCO 3.5.2 requires two ECCS subsystems to be operable in Mode 4 and Mode 5, except with spent fuel storage gates removed and water level ≥ [23 ft] above the reactor pressure vessel flange. With one required subsystem inoperable, Action A.1 requires restoration within 4 hours. In this Condition, there would still be one operable ECCS subsystem.

If the Completion Time for Action A.1 is not met, Action B.1 requires suspension of operations with the potential to drain the reactor vessel (OPDRVs) immediately.

If both required ECCS subsystems are inoperable, Action C.1 requires suspension of OPDRVs immediately, and Action C.2 requires restoration of one ECCS subsystem to operable status within 4 hours.

If the Completion Time for Action C.2 is not met, then Required Actions D.1, D.2, and D.3 require immediate restoration of secondary containment and one SGT subsystem to operable status.

The proposed LCO 3.5.2 requires one ECCS subsystem to be operable in Modes 4 and 5. With the required ECCS subsystem inoperable (i.e., no operable ECCS subsystems), Required Action A.1 requires restoration within 4 hours. This Condition is comparable to Condition C in the existing LCO 3.5.2.

However, the existing LCO 3.5.2 requires termination of OPDRVs in this condition. There is no corresponding requirement to verify or restore the Drain Time to ≥ 36 hours.

The NRC staff requested additional detail on the basis for the proposed Completion Times in Question #4 of the RAI regarding TSTF-542, Revision 0. The NRC staff has reviewed the technical justification provided and finds that additional technical justification is needed.

TSTF Response

As discussed in the response to RAI 4, Condition B of the proposed TS 3.5.2 is revised. The previous requirement to restore the Drain Time to greater than 36 hours when the required ECCS injection/spray subsystem is not restored within 4 hours is replaced with a requirement to immediately initiate action to establish a method of water injection capable of operating without offsite electrical power. This is a more appropriate response to the inoperability of the required ECCS injection/spray subsystem.

The basis for the 4 hour Completion Time of Required Action A.1 is discussed in Section 3.2.3 of the justification. It is recognized that the existing Required Action applies when one of two required ECCS subsystems are inoperable and the proposed Required Action applies when one required ECCS subsystem is inoperable. However, the existing requirement for two operable ECCS subsystems provides the only requirement to prevent or mitigate a draining event. In the proposed TS 3.5.2, the primary protection is provided by the Drain Time limitations and an ECCS subsystem is provided for defense-in-depth. Therefore, retaining the 4 hour Completion Time is appropriate.

It is acknowledged that certain plant lineups and activities may result in having Drain Times < 36 hours. This is acceptable due to the increased defense-in-depth provided by the applicable Required Actions.

Attachment 1

Response to NRC Request for Additional Information Regarding TSTF-542, Revision 1, "Reactor Pressure Vessel Water Inventory Control"

RAI-10

Accommodations for Pre-Planned Maintenance Activities

Proposed new TS 3.5.2 does not have any accommodations for pre-planned evolutions that necessitate a Drain Time of < 8 hours. It seems appropriate to permit pre-planned evolutions provided the mitigating measures (e.g., secondary containment integrity, ECCS subsystem operable, etc.) are put in place prior to the evolution. The LCO could be conditioned by a note to state this.

The NRC staff requested changes to the proposed TS 3.5.2 to accommodate preplanned activities in Question #8 of the RAI regarding TSTF-542, Revision 0. The RAI response states that an additional separate Action for planned maintenance is not necessary. The NRC staff has reviewed the response and does not agree with this conclusion.

Please modify TS 3.5.2 to require the establishment of mitigative measures prior to initiating a planned evolution with a Drain Time < 8 hours.

TSTF Response

The industry does not agree that the Technical Specifications should require completing the Required Actions of Condition D before the Condition is entered. The industry agrees that doing so is a good practice and licensees would likely ensure that the Required Actions can be completed prior to preplanned entry into Condition D, but this good practice does not rise to the level of a Technical Specifications requirement. Such a requirement is not needed for plant safety; the proposed Required Actions are appropriate if Condition D entry isn't preplanned and, therefore, are also appropriate for the more controlled circumstance of planned activities. The Standard Technical Specifications do not include any instances in which Required Actions must be taken prior to entering a Condition. The industry believes that adding such a requirement would be unnecessary and confusing.

RAI-11

Completion Time for Condition E

The proposed Condition E applies when the Drain Time is < 1 hour or the Completion Times of Condition C or D Actions are not met. Action E.1 requires restoring the Drain Time to ≥ 36 hours immediately.

In Question #9 of the of the RAI regarding TSTF-542, Revision 0, the NRC staff requested additional discussion regarding the time required for recognition and mitigation of a draining event. In the response, the technical justification describes the response of a dedicated operator being credited for isolating a penetration flow path. However, this flow path would be omitted from the calculation of Drain Time.

Please provide a detailed evaluation of the time necessary to diagnose an unexpected drain event when the Control Room is required to dispatch an operator to manually isolate a flow path.

<u>TSTF Response</u>

The one-hour Drain Time was chosen as a conservative limit to prohibit plant operation in a configuration that could lead to a rapid drop in RPV water level to the TAF. This is a new Technical Specifications requirement proposed by the industry to promote safe operation. The Condition E limit was not based on an evaluation of all possible unexpected draining events and the time required for an operator to take action to mitigate those events. In Modes 4 and 5, when the reactor is subcritical, licensed operators closely monitor RPV water level. Should an unexpected draining event occur, the control room personnel will be aware of abnormal water level conditions and actions will be taken to mitigate the event prior to the RPV water level reaching the TAF. As discussed in the response to RAI-5, the lowest penetrations above the TAF represent over 10,000 gallons of water above the fuel. An unexpected draining event in the penetrations above the TAF, including any dose consequences, would be addressed under the existing Abnormal Operating Procedures. Under TS 3.5.2, an ECCS injection/spray subsystem is required to be operable during Mode 4 and 5 and would be capable of mitigating such an event. However, even without ECCS mitigation, thousands of gallons of water would still remain above the TAF.

It is important to note that the calculated Drain Time takes no credit for mitigating actions, such as water injection. There are many water injection methods available to the operator from the control room in Modes 4 and 5, including the required ECCS subsystem. The first action operators would take if a drop in the RPV water level were detected would be to increase water injection to offset the loss of water inventory. These water injection methods can offset any water inventory loss until the draining event can be terminated. In parallel, actions to isolate the draining event would be taken, but the time required and method employed will depend on the nature of the leak. For these reasons, it is not possible to provide a detailed evaluation of the time necessary to diagnose an unexpected draining event and to dispatch an operator to manually isolate a flow path.

RAI-12

<u>Lack of SR for Required ECCS Pump</u>

Proposed new TS 3.5.2 does not contain any SRs to verify the required ECCS pump is capable of establishing the required flow. The existing SR 3.5.2.5, which verifies that the required ECCS pump develops the specified flow rate corresponding to a specified reactor pressure, is proposed to be deleted.

The technical justification in TSTF-542, Revision 1, states, in part, "it is not necessary to perform similar flow rate tests during the relatively small fraction of an operating cycle when the plant is in Modes 4 and 5…" There are no restrictions on the amount of time a unit may be in Modes 4 and 5. TS are intended to cover reasonably foreseen plant configurations. Therefore, this is not a valid technical basis for deletion of an SR unless a restriction on the amount of time spent in Modes 4 and 5 is also proposed.

The existing SR 3.5.2.5 requires verification of flow rate as a function of system head corresponding to a specified reactor pressure. The Traveler contains a technical discussion that most penetration flow paths would only permit a drain rate of tens or hundreds of gallons per minute. This discussion provides a technical basis for concluding that the acceptance criteria of SR 3.5.2.5 are conservative. As discussed in Question #11 of the RAI regarding TSTF 542, Revision 0, the NRC staff position is that a SR is needed to verify the performance requirements for the low head ECCS pump relied upon for protection of SL 2.1.1.3.

Please modify proposed TS 3.5.2 to specify an appropriate SR to verify the operability of the required ECCS injection/spray subsystem pump.

<u>TSTF Response</u>

The enclosed Revision 2 of TSTF-542 retains SR 3.5.2.5, renumbers it to SR 3.5.2.6, and alters it to require operating the ECCS injection/spray subsystem through the recirculation line for ≥ 10 minutes at the current Frequency of every 92 days. As discussed in the referenced previous RAI responses, there are no specific flow rate assumptions for the required ECCS injection/spray subsystem to mitigate an unexpected draining event. Therefore, the existing requirement to confirm a specific flow rate at a specified reactor pressure is not needed to demonstrate operability. The proposed test will ensure that the required ECCS injection/spray subsystem is capable of being manually started and operated. Testing the ECCS injection/spray subsystem through the recirculation line is necessary to avoid overfilling the refueling cavity. The minimum operating time of 10 minutes was based on engineering judgement as being sufficiently long to identify any operational issues with the ECCS subsystem. The performance frequency of 92 days or in accordance with the Surveillance Frequency Control Program was retained from the existing STS and is consistent with the at-power testing requirement of SR 3.5.1.7.

RAI-13

<u>Changes Since Revision 4 of NUREG Was Approved</u>

Please review the Travelers that have been approved since Revision 4 to NUREG-1433 and NUREG-1434 and identify any changes to the TS that are included within the scope of proposed TSTF-542. Please provide a set of marked-up TS pages that reflect the currently-approved version of the STS.

<u>TSTF Response</u>

There has been only one traveler approved since the issuance of Revision 4 of NUREG-1433 and NUREG-1434 which affects the TS revised by TSTF-542. That traveler is TSTF-523, "Generic Letter 2008-01, Managing Gas Accumulation," which was approved by the NRC on January 15, 2014. TSTF-523 affects SR 3.5.2.3, which verifies that the ECCS piping is full of water, and SR 3.5.2.4, which verifies that valves are in the correct position. These SRs are renumbered SR 3.5.2.4 and SR 3.5.2.5 in the proposed change. The effect of TSTF-523 is discussed in Section 3.2.4.3 of the TSTF-542 justification, which states:

It is recognized that this SR is affected by TSTF Traveler TSTF-523, "Generic Letter 2008-01, Managing Gas Accumulation," which was approved by the NRC on January 15, 2014. The changes in TSTF-523 to the existing SR 3.5.2.3 and SR 3.5.2.4 is also applicable to the proposed SR 3.5.2.4 and SR 3.5.2.5. However, to avoid the complications of linking the staff review of a licensee amendment request to adopting TSTF-523 and TSTF-542, the changes in TSTF-523 are not incorporated into TSTF-542.

TSTF-523 SR changes to STS Revision 4 (additions are in italics; deletions are struck through):

SR 3.5.2.3	Verify, for each required ECCS injection/spray subsystem, *locations susceptible to gas accumulation are sufficiently filled with water* ~~the piping is filled with water from the pump discharge valve to the injection valve.~~	[31 days <u>OR</u> In accordance with the Surveillance Frequency Control Program]

SR 3.5.2.4	------------------------------*NOTE*--------------------------- *Not required to be met for system vent flow paths opened under administrative control.* -- Verify each required ECCS injection/spray subsystem manual, power operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position.	[31 days <u>OR</u> In accordance with the Surveillance Frequency Control Program]

TSTF-542 SR changes to STS Revision 4:

SR 3.5.2.4	Verify, for ~~each~~ *the* required ECCS injection/spray subsystem, the piping is filled with water from the pump discharge valve to the injection valve.	[31 days <u>OR</u> In accordance with the Surveillance Frequency Control Program]

SR 3.5.2.5	Verify, ~~each~~ *for the* required ECCS injection/spray subsystem*, each* manual, power operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position.	[31 days <u>OR</u> In accordance with the Surveillance Frequency Control Program]

Including the changes from TSTF-523 in the TSTF-542 traveler would be confusing as TSTF-523 made changes to many SRs other than TS 3.5.2. Therefore, instead of incorporating portions of TSTF-523 into TSTF-542, the justification sections 3.2.4.3 and 3.2.4.4 are revised to provide the SR 3.5.2.4 and SR 3.5.2.5 wording for licensees that have previously adopted TSTF-523.

Attachment 2

Example Bounding Drain Time Calculation

An example table of Drain Time based on penetration flow path cross-sectional area and initial water height above the Top of Active Fuel (TAF) is provided based on an illustrative methodology[1] and the example BWR/4 Reactor Pressure Vessel (RPV) elevations shown in Figure 1.

Assumptions

The Drain Time is calculated by taking the water inventory above the break and dividing by the limiting drain rate until the TAF is reached. The limiting drain rate is a variable parameter depending on the break size and the reduction of elevation head above break location during the drain down event. For this example, the lowest discharge point is assumed to be equal to the reactor vessel bottom (i.e., zero elevation). In a plant-specific implementation, the discharge point will depend on the lowest potential drain point for each RPV penetration flow path. The curvature of the bottom reactor vessel head is ignored as it is below the TAF. The example assumes the reactor vessel head, steam dryer, and steam separator are removed from the vessel. Separate tables would be needed when the reactor vessel head is installed, and when the steam dryer and steam separator are in the vessel, to reflect the reduced water inventory. The calculation does not include the water volume in the steam dryer-steam separator pit, but that volume may be included in a plant-specific calculation.

Water Level at or Below the Reactor Flange

$$\text{Drain Time} = \frac{2A_{RPV}\left(\sqrt{h_{RPV} - h_{BREAK}} - \sqrt{h_{TAF} - h_{BREAK}}\right)}{C_d A_o \sqrt{2g}}$$

where: A_{RPV} = Cross-sectional area of the Reactor Pressure Vessel (RPV) (in^2)
h_{RPV} = Reactor water level elevation within the RPV (in)
h_{TAF} = Reactor water level elevation at top of active fuel (in)
h_{BREAK}= Elevation of the drain down point (in)
C_d = Discharge coefficient
A_o = Orifice area (in^2)
g = Gravitational acceleration (32.2 ft/sec^2 or 386.4 in/sec^2)

For this example, it is assumed that the drain point occurs a short distance from the vessel wall at an elevation equivalent to the bottom of the reactor vessel (i.e., zero elevation). A discharge coefficient (C_d) of 0.62 is used which represents an orifice with a short tube. Using Figure 1, the height difference between the TAF and the break, h_{TAF} - h_{BREAK}, equals 358.56 inches. The RPV diameter is 218 inches.

[1] Lindeburg, Mechanical Engineering Reference Manual, Ninth Edition, Equation 3.97.

Attachment 2

Example Bounding Drain Time Calculation

For a hypothetical 2" diameter penetration flow path with an initial water level at the RPV flange (722.75 inches above vessel zero), this results in the following:

$$\text{Drain Time} = \frac{2\pi 218^2/4(\sqrt{722.75}-\sqrt{358.56})}{0.62\times\pi 2^2/4\sqrt{2\times 386.4}} = \frac{2\times 218^2(\sqrt{722.75}-\sqrt{358.56})}{0.62\times 2^2\times 27.8}$$

=10,957.7 seconds (or 3 hours)

<u>Water Level Above RPV Flange with Fuel Pool Gates Installed</u>

With water level above the RPV flange with the fuel pool gates installed, an additional term is added for the height of water in the Reactor Cavity.

$$\text{Drain Time} = \frac{2A_{RPV}(\sqrt{h_{RPV}-h_{BREAK}}-\sqrt{h_{TAF}-h_{BREAK}})}{C_d A_o\sqrt{2g}} + \frac{2A_{CAVITY}(\sqrt{h_{CAVITY}-h_{BREAK}}-\sqrt{h_{RPV}-h_{BREAK}})}{C_d A_o\sqrt{2g}}$$

where: A_{CAVITY}= Cross-sectional area of the Reactor Cavity (in^2)
h_{CAVITY}= Reactor water level elevation within the Reactor Cavity (in)

The Reactor Cavity diameter used is 36'-9 ½" (441.5 inches). For the hypothetical 2" diameter penetration flow path and beginning at flood up conditions for refueling operations (21 feet above the RPV flange per Technical Specifications) with the fuel pool gates installed, this yields the following drain time:

$$\text{Drain Time} = 10{,}957.7+\frac{2\pi 441.5^2/4(\sqrt{974.8}-\sqrt{722.75})}{0.62\times\pi 2^2/4\sqrt{2\times 386.4}}$$

$$= 10{,}957.7+\frac{2\times 441.5^2(\sqrt{974.8}-\sqrt{722.75})}{0.62\times 2^2\times 27.8}$$

= 10,957.7+24,528.1
= 35,485.8 seconds (9.9 hours)

<u>Water Level Above Reactor Flange with Fuel Pool Gates Removed</u>

With the Reactor Cavity flooded up in preparation for refueling operations, the fuel pool gates are removed, allowing free communication between the Spent Fuel Pool and the Reactor Cavity via the transfer canal. With the refueling gates removed, an additional term is added for the height of water when in the flooded up condition.

Attachment 2

Example Bounding Drain Time Calculation

$$\text{Drain Time} = \frac{2A_{RPV}(\sqrt{h_{RPV} - h_{BREAK}} - \sqrt{h_{TAF} - h_{BREAK}})}{C_d A_o \sqrt{2g}} + \frac{2A_{CAVITY}(\sqrt{h_{CAVITY} - h_{BREAK}} - \sqrt{h_{RPV} - h_{BREAK}})}{C_d A_o \sqrt{2g}} + \frac{2A_{SFP}(\sqrt{h_{CAVITY} - h_{BREAK}} - \sqrt{h_{TRANSFER\ CANAL} - h_{BREAK}})}{C_d A_o \sqrt{2g}}$$

where: A_{SFP}= Cross-sectional area of the Spent Fuel Pool (in^2)
$h_{TRANSFER\ CANAL}$= Elevation of the floor of the transfer canal (in)

The Spent Fuel Pool dimensions used are 46 ft x 28 ft, yielding a cross-sectional area of 1288 ft^2 (185,472 in^2). The height of the floor of the transfer canal is 21 feet below the water surface level from the flooded up condition. Therefore:

$h_{TRANSFER\ CANAL} - h_{BREAK}$= 974.8 in – 252 inches = 722.8 in

For the hypothetical 2” penetration flow path starting at flood up conditions for refueling operations with the fuel pool gates removed, this yields the following drain time:

$$\text{Drain Time} = 35{,}485.8 + \frac{2 \times 185472(\sqrt{974.8} - \sqrt{722.8})}{0.62 \times \pi 2^2 / 4\sqrt{2 \times 386.4}}$$

Drain Time = 35,485.8 + 29709.7

= 65,195.5 seconds (18.1 hours)

This calculation is repeated for a variety of initial water levels and penetration flow path diameters to generate the example Table 1.

Attachment 2

Example Bounding Drain Time Calculation

Table 1

Example Table of Drain Time by Penetration Flow Path Size and Initial Water Level

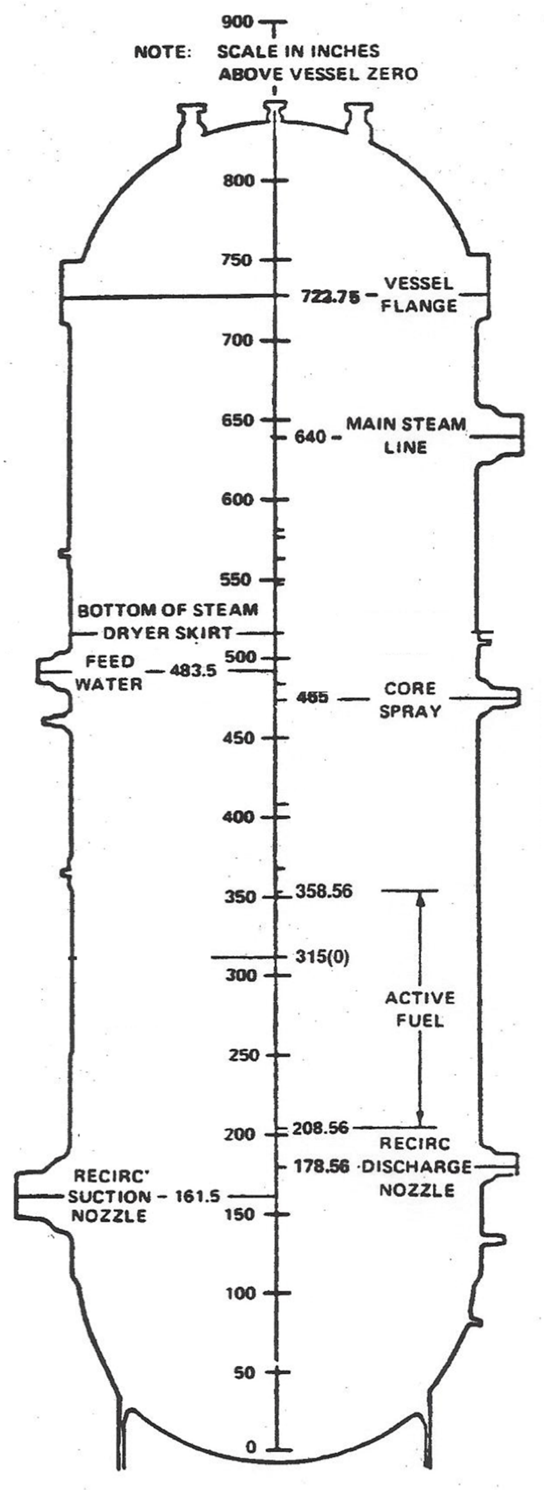
Penetration Flow Path Diameter (inches)							Drain Time (Hours)							
7	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.4	0.6	0.7	0.8	0.8
6.75	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.3	0.4	0.5	0.6	0.7	0.9	0.9
6.5	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.3	0.4	0.5	0.6	0.8	0.9	0.9
6.25	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.6	0.7	0.8	1.0	1.0
6	0.0	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.5	0.6	0.8	0.9	1.1	1.1
5.75	0.0	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.5	0.7	0.8	1.0	1.2	1.2
5.5	0.0	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.5	0.7	0.9	1.1	1.3	1.3
5.25	0.0	0.1	0.1	0.2	0.3	0.3	0.4	0.4	0.6	0.8	1.0	1.2	1.4	1.4
5	0.0	0.1	0.2	0.2	0.3	0.4	0.4	0.5	0.7	0.9	1.1	1.3	1.6	1.6
4.75	0.0	0.1	0.2	0.2	0.3	0.4	0.5	0.5	0.7	1.0	1.2	1.4	1.7	1.7
4.5	0.0	0.1	0.2	0.3	0.4	0.4	0.5	0.6	0.8	1.1	1.4	1.6	1.9	1.9
4.25	0.1	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.9	1.2	1.5	1.8	2.2	2.2
4	0.1	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1.0	1.4	1.7	2.0	2.5	2.5
3.75	0.1	0.1	0.3	0.4	0.5	0.6	0.7	0.9	1.2	1.6	1.9	2.3	2.8	2.8
3.5	0.1	0.2	0.3	0.5	0.6	0.7	0.8	1.0	1.3	1.8	2.2	2.7	3.2	3.2
3.25	0.1	0.2	0.4	0.5	0.7	0.8	1.0	1.2	1.5	2.1	2.6	3.1	3.7	3.7
3	0.1	0.2	0.4	0.6	0.8	1.0	1.1	1.4	1.8	2.4	3.0	3.6	4.4	4.4
2.75	0.1	0.3	0.5	0.7	1.0	1.2	1.4	1.6	2.2	2.9	3.6	4.3	5.2	5.2
2.5	0.2	0.3	0.6	0.9	1.2	1.4	1.6	1.9	2.6	3.5	4.4	5.2	6.3	6.3
2.25	0.2	0.4	0.7	1.1	1.4	1.7	2.0	2.4	3.2	4.3	5.4	6.4	7.8	7.8
2	0.2	0.5	0.9	1.4	1.8	2.2	2.6	3.0	4.1	5.5	6.8	8.2	9.8	9.8
1.75	0.3	0.6	1.2	1.8	2.3	2.9	3.4	4.0	5.3	7.2	8.9	10.7	12.9	12.9
1.5	0.4	0.9	1.7	2.5	3.2	3.9	4.6	5.4	7.2	9.7	12.2	14.5	17.5	17.5
1.25	0.6	1.3	2.4	3.5	4.6	5.6	6.6	7.8	10.4	14.0	17.5	20.9	25.2	25.2
1	1.0	2.0	3.8	5.5	7.2	8.8	10.3	12.2	16.3	21.9	27.4	32.6	> 36 hours	> 36 hours
0.75	1.8	3.5	6.7	9.8	12.8	15.6	18.3	21.6	29.0	> 36 hours	> 36 hours	> 36 hours	> 36 hours	> 36 hours
0.5	4.0	7.8	15.2	22.2	28.8	35.1	> 36 hours	> 36 hours	> 36 hours	> 36 hours	> 36 hours	> 36 hours	> 36 hours	> 36 hours
0.25	15.9	31.3	> 36 hours	> 36 hours	> 36 hours	> 36 hours	> 36 hours	> 36 hours	> 36 hours	> 36 hours	> 36 hours	> 36 hours	> 36 hours	> 36 hours
Reactor Vessel Water Level (Inches above TAF)	25	50	100	150	200	250	300	364	400	450	500	550	616	616
				Normal				RPV Flange					Cavity Flooded	Caviy Flooded
													Gates Installed	Gates Removed
Break Elevation Above Vessel Zero (in) =	0													
Discharge Coefficient =	0.62													
		- LCO 3.5.2 MET												
		- TS 3.5.2 CONDITION C												
		- TS 3.5.2 CONDITION D												
		- TS 3.5.2 CONDITION E												

Attachment 2

Example Bounding Drain Time Calculation

Figure 1

Example BWR/4 Reactor Pressure Vessel Elevations



Enclosure

TSTF-542, Revision 2, "Reactor Pressure Vessel Water Inventory Control"

Technical Specifications Task Force
Improved Standard Technical Specifications Change Traveler

Reactor Pressure Vessel Water Inventory Control

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

Classification: 1) Technical Change

Correction or Improvement: Improvement

Recommended for CLIIP?: Yes

NRC Fee Status: Exempt

Changes Marked on ISTS Rev 4.0

See attached justification.

Revision History

OG Revision 0 Revision Status: Closed

Revision Proposed by: BWROG

Revision Description:
Original Issue

Owners Group Review Information

Date Originated by OG: 24-Oct-13

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 18-Dec-13

TSTF Review Information

TSTF Received Date: 18-Dec-13 Date Distributed for Review 18-Dec-13

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

TSTF Comments:
(No Comments)

TSTF Resolution: Approved Date: 31-Dec-13

NRC Review Information

NRC Received Date: 31-Dec-13

NRC Comments: Date of NRC Letter: 10-Oct-14

On October 10, 2014, the NRC provided a Request for Additional Information on TSTF-542. In responding to the NRC questions, necessary changes were identified to TSTF-542, Revision 0.

Final Resolution: Superceded by Revision

TSTF Revision 1 Revision Status: Closed

TSTF Revision 1 Revision Status: Closed

Revision Proposed by: TSTF

Revision Description:
In responding to an October 10, 2014 Request for Additional Information, necessary changes to TSTF-542 were identified.

The following changes were made:

1. TSTF-542 is revised to include the instrumentation functions in a new instrumentation TS, TS 3.3.5.2, "RPV WIC Instrumentation." The instrumentation functions and SR 3.5.2.6 (Channel Calibration) are removed from TS 3.5.2, "RPV WIC." This is consistent with the Standard Technical Specifications (STS, NUREG-1433 and NUREG-1434). The existing TS 3.3.5.2, "RCIC System Instrumentation," is renumbered TS 3.3.5.3. This increases consistency within the STS as the Reactor Core Isolation Cooling (RCIC) System is discussed in TS 3.5.3. This approach provides appropriate presentation of the instrumentation function requirements for Modes 4 and 5 when TS 3.5.2 is applicable.

The proposed TS 3.3.5.2 contains the ECCS manual initiation functions for the ECCS subsystem required by TS 3.5.2 (BWR/4: Core Spray and Low Pressure Cooling Injection, BWR/6: Low Pressure Coolant Injection and Low Pressure Core Spray, and High Pressure Core Spray), as well as the Functions required for manual initiation operation (BWR/4: Reactor Steam Dome Pressure - Low and Low Flow Bypass, BWR/6: Reactor Steam Dome Pressure - Low, Low Flow Bypass, and HPCS Reactor Vessel Water Level - High, Level 8, Condensate Storage Tank Level - Low, and pump discharge pressure high and flow rate low bypasses).

The proposed TS 3.3.5.2 also includes instrument functions which may be credited in the Drain Time calculation to automatically isolate penetration flow path(s) below the Top of Active Fuel (TAF): RHR system isolation and Reactor Water Cleanup system isolation on low reactor vessel water level. For a standard plant, these are the only two automatic isolation functions on low reactor pressure vessel water level that have penetration flow paths below the TAF. The SDC isolation is currently required in Mode 4. The RWCU system isolation is not currently required in Mode 4. The new Applicability is when the function is credited for automatic isolation in the Drain Time calculation.

Two versions were created for each ISTS NUREG. TS 3.3.5.2A includes the Allowable Values in the Function table. TS 3.3.5.2B does not include the Allowable Values in the Function table and the Bases reference the Setpoint Control Program.

The new TS is described in Section 3.3 of the justification.

2. All references to a draining event being an Anticipated Operational Occurrence in the justification and Bases is removed.

3. The definition of Drain Time is revised to incorporate a dedicated, trained operator into the third exception, instead of simply stating a dedicated operator.

4. The No Significant Hazards Considerations Analysis is revised.

5. The model application is revised to include a note stating that licensees should revise the generic table to include the plant-specific TS that reference OPDRVs or related requirements.

6. The model application is revised to include a note stating the bulleted list of differences is not intended to encompass all possible differences, and the plant-specific list should describe all differences.

7. TS 3.6.1.3, Condition H is revised to only eliminate the phrase "or during operations with a potential for

TSTF Revision 1 **Revision Status: Closed**

draining the reactor vessel (OPDRVs)" and one Required Action was eliminated.

8. The proposed changes to TS 3.3.8.2, "RPS Electric Power Monitoring" were removed.

Owners Group Review Information

Date Originated by OG: 27-Jul-15

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 31-Aug-15

TSTF Review Information

TSTF Received Date: 02-Sep-15 Date Distributed for Review 02-Sep-15

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

TSTF Comments:

(No Comments)

TSTF Resolution: Approved Date: 15-Sep-15

NRC Review Information

NRC Received Date: 15-Sep-15

NRC Comments:

TSTF-542 is revised to reflect changes discussed in the response to the NRC's Request for Additional Information dated December 8, 2015.

Final Resolution: Superceded by Revision

TSTF Revision 2 **Revision Status: Active**

Revision Proposed by: TSTF

Revision Description:
TSTF-542 is revised to reflect changes discussed in the response to the NRC's Request for Additional Information dated December 8, 2015. The following changes are made in Revision 2:

Condition B is revised to require immediate action to establish a method of water injection capable of operating without offsite electrical power instead of restoring the Drain Time to greater than 72 hours when an ECCS subsystem is not restored within 4 hours.

The definition of Drain Time is revised to state that the dedicated operator is trained "in the task".

A new Surveillance is added which requires operating the required ECCS subsystem for greater than 10 minutes every 92 days.

The justification is revised to provide the wording for SR 3.5.2.4 and SR 3.5.2.5 for those plants that have previously adopted TSTF-523.

TSTF Revision 2 **Revision Status: Active**

The No Significant Hazards Analysis and Environmental Considerations sections are removed from the traveler justification and are retained in the model application.

The model application is revised to eliminate discussion of a Notice of Availability and to refer to an NRC safety evaluation provided to the TSTF.

The model application is revised to change the "Optional Changes and Variations" section to simply "Variations." Corresponding changes are made in the text of the section.

Owners Group Review Information

Date Originated by OG: 10-Feb-16

Owners Group Comments
(No Comments)

Owners Group Resolution: Approved Date: 26-Feb-16

TSTF Review Information

TSTF Received Date: 28-Feb-16 Date Distributed for Review 28-Feb-16

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

TSTF Comments:

(No Comments)

TSTF Resolution: Approved Date: 14-Mar-16

NRC Review Information

NRC Received Date: 14-Mar-16

Affected Technical Specifications

1.1	Definition	
	Change Description: Added "Drain Time" Definition	
Action 3.3.5.BA.A Bases	Reactor Core Isolation Cooling (RCIC) System Instrumentation	NUREG(s)- 1433 1434 Only
	Change Description: Renamed Table 3.3.5.2 to Table 3.3.5.3	
S/A 3.3.5.1A Bases	Emergency Core Cooling System (ECCS) Instrumentation	
	Change Description: Table 3.3.5.1-1	
S/A 3.3.5.1B Bases	Emergency Core Cooling System (ECCS) Instrumentation	
	Change Description: Table 3.3.5.1-1	

LCO 3.3.5.1B	Emergency Core Cooling System (ECCS) Instrumentation Change Description: Table 3.3.5.1-1	
LCO 3.3.5.1A	Emergency Core Cooling System (ECCS) Instrumentation Change Description: Table 3.3.5.1-1	
Action 3.3.5.1A.B	Emergency Core Cooling System (ECCS) Instrumentation	
Action 3.3.5.1B.B	Emergency Core Cooling System (ECCS) Instrumentation	
Action 3.3.5.1A.B Bases	Emergency Core Cooling System (ECCS) Instrumentation	
Action 3.3.5.1B.B Bases	Emergency Core Cooling System (ECCS) Instrumentation	
Action 3.3.5.1B.C	Emergency Core Cooling System (ECCS) Instrumentation	
Action 3.3.5.1A.C	Emergency Core Cooling System (ECCS) Instrumentation	
Action 3.3.5.1B.C Bases	Emergency Core Cooling System (ECCS) Instrumentation	
Action 3.3.5.1A.C Bases	Emergency Core Cooling System (ECCS) Instrumentation	
Action 3.3.5.1A.E	Emergency Core Cooling System (ECCS) Instrumentation	
Action 3.3.5.1B.E	Emergency Core Cooling System (ECCS) Instrumentation	
Action 3.3.5.1B.E Bases	Emergency Core Cooling System (ECCS) Instrumentation	
Action 3.3.5.1A.E Bases	Emergency Core Cooling System (ECCS) Instrumentation	
3.3.5.2B	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed 3.3.5.3	NUREG(s)- 1433 1434 Only
3.3.5.2A	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed 3.3.5.3	NUREG(s)- 1433 1434 Only
3.3.5.2B	Reactor Pressure Vessel Water Inventory Control Instrumentation Change Description: New Specification	
3.3.5.2A	Reactor Pressure Vessel Water Inventory Control Instrumentation Change Description: New Specification	
3.3.5.2A Bases	Reactor Pressure Vessel Water Inventory Control Instrumentation Change Description: New Specification	
3.3.5.2B Bases	Reactor Pressure Vessel Water Inventory Control Instrumentation Change Description: New Specification	
LCO 3.3.5.2A	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed Table 3.3.5.2 to Table 3.3.5.3	NUREG(s)- 1433 1434 Only

LCO 3.3.5.2B	Reactor Core Isolation Cooling (RCIC) System Instrumentation	NUREG(s)- 1433 1434 Only
	Change Description: Renamed Table 3.3.5.2 to Table 3.3.5.3	
Action 3.3.5.2A.A	Reactor Core Isolation Cooling (RCIC) System Instrumentation	NUREG(s)- 1433 1434 Only
	Change Description: Renamed Table 3.3.5.2 to Table 3.3.5.3	
Action 3.3.5.2B.A	Reactor Core Isolation Cooling (RCIC) System Instrumentation	NUREG(s)- 1433 1434 Only
	Change Description: Renamed Table 3.3.5.2 to Table 3.3.5.3	
Action 3.3.5.2A.A Bases	Reactor Core Isolation Cooling (RCIC) System Instrumentation	NUREG(s)- 1433 1434 Only
	Change Description: Renamed Table 3.3.5.2 to Table 3.3.5.3	
Action 3.3.5.2B.B	Reactor Core Isolation Cooling (RCIC) System Instrumentation	NUREG(s)- 1433 1434 Only
	Change Description: Renamed Table 3.3.5.2 to Table 3.3.5.3	
Action 3.3.5.2A.B	Reactor Core Isolation Cooling (RCIC) System Instrumentation	NUREG(s)- 1433 1434 Only
	Change Description: Renamed Table 3.3.5.2 to Table 3.3.5.3	
Action 3.3.5.2B.C	Reactor Core Isolation Cooling (RCIC) System Instrumentation	NUREG(s)- 1433 1434 Only
	Change Description: Renamed Table 3.3.5.2 to Table 3.3.5.3	
Action 3.3.5.2A.C	Reactor Core Isolation Cooling (RCIC) System Instrumentation	NUREG(s)- 1433 1434 Only
	Change Description: Renamed Table 3.3.5.2 to Table 3.3.5.3	
Action 3.3.5.2B.D	Reactor Core Isolation Cooling (RCIC) System Instrumentation	NUREG(s)- 1433 1434 Only
	Change Description: Renamed Table 3.3.5.2 to Table 3.3.5.3	
Action 3.3.5.2A.D	Reactor Core Isolation Cooling (RCIC) System Instrumentation	NUREG(s)- 1433 1434 Only
	Change Description: Renamed Table 3.3.5.2 to Table 3.3.5.3	
SR 3.3.5.2B.1	Reactor Core Isolation Cooling (RCIC) System Instrumentation	NUREG(s)- 1433 1434 Only
	Change Description: Renamed SR 3.3.5.3.1	
SR 3.3.5.2A.1	Reactor Core Isolation Cooling (RCIC) System Instrumentation	NUREG(s)- 1433 1434 Only
	Change Description: Renamed SR 3.3.5.3.1	
SR 3.3.5.2B.1 Bases	Reactor Core Isolation Cooling (RCIC) System Instrumentation	NUREG(s)- 1433 1434 Only
	Change Description: Renamed SR 3.3.5.3.1	
SR 3.3.5.2A.1 Bases	Reactor Core Isolation Cooling (RCIC) System Instrumentation	NUREG(s)- 1433 1434 Only
	Change Description: Renamed SR 3.3.5.3.1	
SR 3.3.5.2A.2	Reactor Core Isolation Cooling (RCIC) System Instrumentation	NUREG(s)- 1433 1434 Only
	Change Description: Renamed SR 3.3.5.3.2	
SR 3.3.5.2B.2	Reactor Core Isolation Cooling (RCIC) System Instrumentation	NUREG(s)- 1433 1434 Only
	Change Description: Renamed SR 3.3.5.3.2	
SR 3.3.5.2B.2 Bases	Reactor Core Isolation Cooling (RCIC) System Instrumentation	NUREG(s)- 1433 1434 Only
	Change Description: Renamed SR 3.3.5.3.2	
SR 3.3.5.2A.2 Bases	Reactor Core Isolation Cooling (RCIC) System Instrumentation	NUREG(s)- 1433 1434 Only
	Change Description: Renamed SR 3.3.5.3.2	

SR 3.3.5.2B.3	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed SR 3.3.5.3.3	NUREG(s)- 1433 1434 Only
SR 3.3.5.2A.3	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed SR 3.3.5.3.3	NUREG(s)- 1433 1434 Only
SR 3.3.5.2A.3 Bases	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed SR 3.3.5.3.3	NUREG(s)- 1433 1434 Only
SR 3.3.5.2B.3 Bases	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed SR 3.3.5.3.3	NUREG(s)- 1433 1434 Only
SR 3.3.5.2A.4	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed SR 3.3.5.3.4	NUREG(s)- 1433 1434 Only
SR 3.3.5.2B.4	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed SR 3.3.5.3.4	NUREG(s)- 1433 1434 Only
SR 3.3.5.2A.4 Bases	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed SR 3.3.5.3.4	NUREG(s)- 1433 1434 Only
SR 3.3.5.2B.4 Bases	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed SR 3.3.5.3.4	NUREG(s)- 1433 1434 Only
SR 3.3.5.2B.5	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed SR 3.3.5.3.5	NUREG(s)- 1433 1434 Only
SR 3.3.5.2A.5	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed SR 3.3.5.3.5	NUREG(s)- 1433 1434 Only
SR 3.3.5.2A.5 Bases	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed SR 3.3.5.3.5	NUREG(s)- 1433 1434 Only
SR 3.3.5.2B.5 Bases	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed SR 3.3.5.3.5	NUREG(s)- 1433 1434 Only
S/A 3.3.6.1A Bases	Primary Containment Isolation Instrumentation	
S/A 3.3.6.1B Bases	Primary Containment Isolation Instrumentation	
LCO 3.3.6.1A	Primary Containment Isolation Instrumentation Change Description: Table 3.3.6.1-1	
LCO 3.3.6.1B	Primary Containment Isolation Instrumentation Change Description: Table 3.3.6.1-1	
Action 3.3.6.1A.J	Primary Containment Isolation Instrumentation	
Action 3.3.6.1B.J	Primary Containment Isolation Instrumentation	
Action 3.3.6.1A.J Bases	Primary Containment Isolation Instrumentation	
Action 3.3.6.1B.J Bases	Primary Containment Isolation Instrumentation	

LCO 3.3.6.2A	Secondary Containment Isolation Instrumentation Change Description: Table 3.3.6.2-1
LCO 3.3.6.2B	Secondary Containment Isolation Instrumentation Change Description: Table 3.3.6.2-1
LCO 3.3.6.2A Bases	Secondary Containment Isolation Instrumentation
LCO 3.3.6.2B Bases	Secondary Containment Isolation Instrumentation
3.5.1	ECCS - Operating Change Description: Changed Section Title
3.5.1 Bases	ECCS - Operating Change Description: Changed Section Title
Appl. 3.5.1 Bases	ECCS - Operating
3.5.2	ECCS - Shutdown Change Description: Renamed "Reactor Pressure Vessel Water Inventory Control"
3.5.2 Bases	Reactor Pressure Vessel Water Inventory Control Change Description: Renamed "Reactor Pressure Vessel Water Inventory Control"
Bkgnd 3.5.2 Bases	ECCS - Shutdown
S/A 3.5.2 Bases	ECCS - Shutdown
LCO 3.5.2	ECCS - Shutdown
LCO 3.5.2 Bases	ECCS - Shutdown
Appl. 3.5.2	ECCS - Shutdown
Appl. 3.5.2 Bases	ECCS - Shutdown
Ref. 3.5.2 Bases	ECCS - Shutdown
Action 3.5.2.A	ECCS - Shutdown
Action 3.5.2.A Bases	ECCS - Shutdown
Action 3.5.2.B	ECCS - Shutdown
Action 3.5.2.B Bases	ECCS - Shutdown
Action 3.5.2.C	ECCS - Shutdown
Action 3.5.2.C Bases	ECCS - Shutdown
Action 3.5.2.D	ECCS - Shutdown
Action 3.5.2.D Bases	ECCS - Shutdown

Action 3.5.2.E	ECCS - Shutdown	
	Change Description:	New Action
Action 3.5.2.E Bases	ECCS - Shutdown	
	Change Description:	New Action
Action 3.5.2.F	ECCS - Shutdown	
	Change Description:	New Action
Action 3.5.2.F Bases	ECCS - Shutdown	
	Change Description:	New Action
SR 3.5.2.1	ECCS - Shutdown	
	Change Description:	Renamed SR 3.5.2.2
SR 3.5.2.1	ECCS - Shutdown	
	Change Description:	New SR
SR 3.5.2.1 Bases	ECCS - Shutdown	
	Change Description:	Renamed SR 3.5.2.2
SR 3.5.2.1 Bases	ECCS - Shutdown	
	Change Description:	New SR
SR 3.5.2.2	ECCS - Shutdown	
	Change Description:	Renamed SR 3.5.2.3
SR 3.5.2.2 Bases	ECCS - Shutdown	
	Change Description:	Renamed SR 3.5.2.3
SR 3.5.2.3	ECCS - Shutdown	
	Change Description:	Renamed SR 3.5.2.4
SR 3.5.2.3 Bases	ECCS - Shutdown	
	Change Description:	Renamed SR 3.5.2.4
SR 3.5.2.4	ECCS - Shutdown	
	Change Description:	Renamed SR 3.5.2.5
SR 3.5.2.4 Bases	ECCS - Shutdown	
	Change Description:	Renamed SR 3.5.2.5
SR 3.5.2.5	ECCS - Shutdown	
	Change Description:	Renamed SR 3.5.2.6
SR 3.5.2.5 Bases	ECCS - Shutdown	
	Change Description:	Renamed SR 3.5.2.6
SR 3.5.2.6	ECCS - Shutdown	
	Change Description:	Renamed SR 3.5.2.8
SR 3.5.2.6 Bases	ECCS - Shutdown	
	Change Description:	Renamed SR 3.5.2.8

SR 3.5.2.7	ECCS - Shutdown		
	Change Description:	New SR	
SR 3.5.2.7 Bases	ECCS - Shutdown		
	Change Description:	New SR	
3.5.3	RCIC		
	Change Description:	Changed Section Title	
3.5.3 Bases	RCIC		
	Change Description:	Changed Section Title	
Appl. 3.5.3 Bases	RCIC		
SR 3.5.3.5 Bases	RCIC		NUREG(s)- 1433 1434 Only
	Change Description:	Changed 3.3.5.2 reference to 3.3.5.3.	
Appl. 3.6.1.3 Bases	PCIVs		
Action 3.6.1.3.H	PCIVs		
Action 3.6.1.3.H Bases	PCIVs		
Appl. 3.6.2.2 Bases	Suppression Pool Water Level		
Appl. 3.6.4.1	[Secondary] Containment		
Appl. 3.6.4.1 Bases	[Secondary] Containment		
Action 3.6.4.1.C	[Secondary] Containment		
Action 3.6.4.1.C Bases	[Secondary] Containment		
Appl. 3.6.4.2	SCIVs		
Appl. 3.6.4.2 Bases	SCIVs		
Action 3.6.4.2.D	SCIVs		
Action 3.6.4.2.D Bases	SCIVs		
Appl. 3.6.4.3	SGT System		
Appl. 3.6.4.3 Bases	SGT System		
Action 3.6.4.3.C	SGT System		
Action 3.6.4.3.C Bases	SGT System		
Action 3.6.4.3.E	SGT System		
Action 3.6.4.3.E Bases	SGT System		

S/A 3.8.2 Bases	AC Sources - Shutdown	
LCO 3.8.2 Bases	AC Sources - Shutdown	
Appl. 3.8.2 Bases	AC Sources - Shutdown	
Action 3.8.2.A	AC Sources - Shutdown	
Action 3.8.2.A Bases	AC Sources - Shutdown	
Action 3.8.2.B	AC Sources - Shutdown	
Action 3.8.2.B Bases	AC Sources - Shutdown	
SR 3.8.2.1 Bases	AC Sources - Shutdown	
S/A 3.8.5 Bases	DC Sources - Shutdown	
LCO 3.8.5 Bases	DC Sources - Shutdown	
Appl. 3.8.5 Bases	DC Sources - Shutdown	
Action 3.8.5.B	DC Sources - Shutdown	
Action 3.8.5.B Bases	DC Sources - Shutdown	
S/A 3.8.8 Bases	Inverters - Shutdown	
LCO 3.8.8 Bases	Inverters - Shutdown	
Appl. 3.8.8 Bases	Inverters - Shutdown	
Action 3.8.8.A	Inverters - Shutdown	
Action 3.8.8.A Bases	Inverters - Shutdown	
S/A 3.8.10 Bases	Distribution Systems - Shutdown	
LCO 3.8.10 Bases	Distribution Systems - Shutdown	
Appl. 3.8.10 Bases	Distribution Systems - Shutdown	
Action 3.8.10.A	Distribution Systems - Shutdown	
Action 3.8.10.A Bases	Distribution Systems - Shutdown	
S/A 3.10.1 Bases	Inservice Leak and Hydrostatic Testing Operation	
5.5.16	Programs and Manuals Change Description: Setpoint Control Program	NUREG(s)- 1433 1434 Only
5.5.16	Setpoint Control Program Change Description: Changed reference to 3.3.5.2 to 3.3.5.3.	NUREG(s)- 1433 1434 Only

3.3.5.2A Bases	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed 3.3.5.3	NUREG(s)- 1433 Only
3.3.5.2B Bases	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed 3.3.5.3	NUREG(s)- 1433 Only
Bkgnd 3.3.5.2B Bases	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed Table 3.3.5.2 to Table 3.3.5.3	NUREG(s)- 1433 Only
Bkgnd 3.3.5.2A Bases	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed Table 3.3.5.2 to Table 3.3.5.3	NUREG(s)- 1433 Only
S/A 3.3.5.2A Bases	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed Table 3.3.5.2 to Table 3.3.5.3	NUREG(s)- 1433 Only
S/A 3.3.5.2B Bases	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed Table 3.3.5.2 to Table 3.3.5.3	NUREG(s)- 1433 Only
SR 3.3.5.2A.6	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed SR 3.3.5.3.5	NUREG(s)- 1433 Only
SR 3.3.5.2B.6	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed SR 3.3.5.3.5	NUREG(s)- 1433 Only
SR 3.3.5.2B.6 Bases	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed SR 3.3.5.3.5	NUREG(s)- 1433 Only
SR 3.3.5.2A.6 Bases	Reactor Core Isolation Cooling (RCIC) System Instrumentation Change Description: Renamed SR 3.3.5.3.5	NUREG(s)- 1433 Only
S/A 3.3.7.1A Bases	[MCREC] System Instrumentation Change Description: Table 3.3.7.1-1	NUREG(s)- 1433 Only
S/A 3.3.7.1B Bases	[MCREC] System Instrumentation Change Description: Table 3.3.7.1-1	NUREG(s)- 1433 Only
LCO 3.3.7.1A	[MCREC] System Instrumentation Change Description: Table 3.3.7.1-1	NUREG(s)- 1433 Only
LCO 3.3.7.1B	[MCREC] System Instrumentation Change Description: Table 3.3.7.1-1	NUREG(s)- 1433 Only
LCO 3.3.7.1B Bases	[MCREC] System Instrumentation Change Description: Table 3.3.7.1-1	NUREG(s)- 1433 Only
LCO 3.3.7.1A Bases	[MCREC] System Instrumentation Change Description: Table 3.3.7.1-1	NUREG(s)- 1433 Only
Appl. 3.7.4	[MCREC] System	NUREG(s)- 1433 Only
Appl. 3.7.4 Bases	[MCREC] System	NUREG(s)- 1433 Only
Action 3.7.4.D	[MCREC] System	NUREG(s)- 1433 Only

Action 3.7.4.D Bases	[MCREC] System	NUREG(s)- 1433 Only
Action 3.7.4.F	[MCREC] System	NUREG(s)- 1433 Only
Action 3.7.4.F Bases	[MCREC] System	NUREG(s)- 1433 Only
Appl. 3.7.5	[Control Room AC] System	NUREG(s)- 1433 Only
Appl. 3.7.5 Bases	[Control Room AC] System	NUREG(s)- 1433 Only
Action 3.7.5.D	[Control Room AC] System	NUREG(s)- 1433 Only
Action 3.7.5.D Bases	[Control Room AC] System	NUREG(s)- 1433 Only
Action 3.7.5.E	[Control Room AC] System	NUREG(s)- 1433 Only
Action 3.7.5.E Bases	[Control Room AC] System	NUREG(s)- 1433 Only
Action 3.3.6.1A.K	Primary Containment Isolation Instrumentation	NUREG(s)- 1434 Only
Action 3.3.6.1B.K	Primary Containment Isolation Instrumentation	NUREG(s)- 1434 Only
Action 3.3.6.1A.K Bases	Primary Containment Isolation Instrumentation	NUREG(s)- 1434 Only
Action 3.3.6.1B.K Bases	Primary Containment Isolation Instrumentation	NUREG(s)- 1434 Only
S/A 3.3.7.1A Bases	[CRFA] System Instrumentation Change Description: Table 3.3.7.1-1	NUREG(s)- 1434 Only
S/A 3.3.7.1B Bases	[CRFA] System Instrumentation Change Description: Table 3.3.7.1-1	NUREG(s)- 1434 Only
LCO 3.3.7.1A	[CRFA] System Instrumentation Change Description: Table 3.3.7.1-1	NUREG(s)- 1434 Only
LCO 3.3.7.1B	[CRFA] System Instrumentation Change Description: Table 3.3.7.1-1	NUREG(s)- 1434 Only
LCO 3.3.7.1A Bases	[CRFA] System Instrumentation Change Description: Table 3.3.7.1-1	NUREG(s)- 1434 Only
LCO 3.3.7.1B Bases	[CRFA] System Instrumentation Change Description: Table 3.3.7.1-1	NUREG(s)- 1434 Only
Appl. 3.7.3	[CRFA] System	NUREG(s)- 1434 Only
Appl. 3.7.3 Bases	[CRFA] System	NUREG(s)- 1434 Only
Action 3.7.3.D	[CRFA] System	NUREG(s)- 1434 Only
Action 3.7.3.D Bases	[CRFA] System	NUREG(s)- 1434 Only
Action 3.7.3.F	[CRFA] System	NUREG(s)- 1434 Only

Action 3.7.3.F Bases	[CRFA] System	NUREG(s)- 1434 Only
Appl. 3.7.4	[Control Room AC] System	NUREG(s)- 1434 Only
Appl. 3.7.4 Bases	[Control Room AC] System	NUREG(s)- 1434 Only
Action 3.7.4.D	[Control Room AC] System	NUREG(s)- 1434 Only
Action 3.7.4.D Bases	[Control Room AC] System	NUREG(s)- 1434 Only
Action 3.7.4.E	[Control Room AC] System	NUREG(s)- 1434 Only
Action 3.7.4.E Bases	[Control Room AC] System	NUREG(s)- 1434 Only

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1. SUMMARY DESCRIPTION

The existing requirements in the Technical Specifications (TS) related to "operations with a potential for draining the reactor vessel" (OPDRVs) are replaced with new requirements on Reactor Pressure Vessel Water Inventory Control (RPV WIC) to protect Safety Limit 2.1.1.3, which requires reactor pressure vessel (RPV) water level to be greater than the top of the active irradiated fuel.

2. DETAILED DESCRIPTION

2.1. Boiling Water Reactor Design

The pressure vessels of Boiling Water Reactors (BWRs) have a number of penetrations located below the top of the active fuel (TAF). These penetrations provide entry for control rods, recirculation flow, and shutdown cooling. Because these penetrations are below the TAF, there is the potential to drain reactor vessel water inventory and lose effective core cooling, potentially leading to fuel cladding failure and radioactive release.

During operation in Modes 1, 2, and 3 (power operation, startup, and hot shutdown, respectively, with average reactor coolant temperature > 200°F), TS requirements on instrumentation and the Emergency Core Cooling System (ECCS) ensure that large quantities of water will be injected into the RPV should the water level fall below the preset minimum. These requirements are primarily designed to protect against a loss of coolant accident (LOCA) resulting from a pipe break, but also serve to protect the fuel from water inventory loss due to other reasons.

During operation in Mode 4 (cold shutdown with average reactor coolant temperature ≤ 200°F), and Mode 5 (refueling, with one or more reactor vessel head closure bolts less than fully tensioned), the pressures and temperatures needed to cause a LOCA are not present. TS 3.5.2, "ECCS - Shutdown," is applicable in Mode 4 and in Mode 5 unless a large volume of water is available above the RPV (i.e., the RPV head is removed, the water level is ≥ [23 ft] over the top of the RPV flange, and the spent fuel storage pool gates are removed for BWR/4 plants, or the upper containment pool is connected to the RPV for BWR/6 plants). As stated in the TS Bases,

> OPERABILITY of the ECCS injection/spray subsystems is required in MODES 4 and 5 to ensure adequate coolant inventory and sufficient heat removal capability for the irradiated fuel in the core in case of an inadvertent drain down of the vessel.

Note that Pressurized Water Reactors (PWRs) do not have RPV penetrations below the TAF (with the exception of moveable detector tubes that are terminated at a seal table above the top of the fuel). Therefore, PWR TS do not have requirements equivalent to OPDRVs or a Safety Limit to maintain the water level above the top of the active fuel. In addition, the PWR TS do not specify ECCS requirements in cold shutdown or refueling (Modes 5 and 6 in PWR TS).

2.2. History of OPDRV Requirements

The phrase "operations with a potential for draining the reactor vessel" has appeared in early plant custom TS since at least 1971. The phrase appears in the initial BWR Standard Technical Specifications, NUREG-0123, beginning with Revision 0, issued October 1976, through the last

published version, Revision 3, issued December 1980. In the 1976 version, the term was only used in a few Actions that directed suspending OPDRVs. By the 1980 version, use of the term had expanded to the Applicability of some instrument functions and was included in many Actions.

Revision 0 of the Improved Standard Technical Specifications (ISTS), NUREG-1433 and NUREG-1434 for BWR/4 and BWR/6 plants, respectively, was published in 1992 after several years of development. While the term OPDRV is not a defined term in Section 1.1, "Definitions," of the ISTS, the phrase and acronym appear many times in the ISTS and associated Bases. It is never explicitly defined nor is its scope discussed.

Bulletin 93-03, "Resolution of Issues Related to Reactor Vessel Water Level Instrumentation in BWRs," addressed potential reactor coolant level instrumentation inaccuracies that could prevent the automatic isolation of a reactor vessel drain-down event. In the Short Term Compensatory Actions section, the Nuclear Regulatory Commission (NRC) directed licensees to take several actions within 15 days, including development of enhanced procedures or additional restrictions and controls for valve alignments and maintenance that have a potential to drain the RPV. A consequence of this direction was for licensees to develop definitions of what constitutes an OPDRV in plant procedures.

In an inspection report dated August 3, 2010, the NRC cited a licensee for a violation of 10 CFR 50.59 related to the definition of ODPRVs. The violation was based on the NRC's conclusion that the process by which the licensee chose to define OPDRVs was inappropriate, and the definition was inconsistent with the plain language contained in the licensee's licensing basis.

The NRC's denial of the licensee's appeal of the violation states:

> The term 'OPDRV' was meant to be a plain language definition and nothing more, and 'OPDRV' is not otherwise defined in either the [licensee] Updated Final Safety Analysis Report or [licensee] Safety Evaluation documents. ... [T]he plain language wording of OPDRV ... is intended to address the threat of any reactor coolant inventory loss. The TS wording does not contain a threshold below which OPDRV does not apply.

The NRC violation has led licensees to reconsider their understanding and implementation of the term OPDRV and the plant events that the TS OPDRV restrictions mitigate.

In public meetings between the Boiling Water Reactor Owners Group (BWROG) and the NRC, the BWROG stated that there was no clearly stated safety basis for the existing "one size fits all" OPDRV TS requirements. As a result, the BWROG proposed to perform a comprehensive review of the current TS requirements, which resulted in development of a graduated approach.

2.3. Current Technical Specifications Requirements Related to OPDRVs

There are many current requirements related to OPDRVs scattered throughout the TS, reflecting the expansion of the OPDRV requirements over many years. Various TS reference "Operations with a potential for draining the reactor vessel," "RHR Shutdown Cooling integrity maintained," or reference ECCS availability in Mode 4 or 5. All of the phrases are referring to controls during

OPDRVs. The following table lists the TS with OPDRV related requirements in NUREG-1433 (BWR/4 ISTS) and NUREG-1434 (BWR/6 ISTS).

NUREG-1433, BWR/4 ISTS	NUREG-1434, BWR/6 ISTS
3.3.5.1A & B, Emergency Core Cooling System (ECCS) Instrumentation	3.3.5.1A & B, Emergency Core Cooling System (ECCS) Instrumentation
3.3.6.1A & B, Primary Containment Isolation Instrumentation	3.3.6.1A & B, Primary Containment Isolation Instrumentation
3.3.6.2A & B, Secondary Containment Isolation Instrumentation	3.3.6.2A & B, Secondary Containment Isolation Instrumentation
3.3.7.1A & B, [Main Control Room Environmental Control (MCREC)] System Instrumentation	3.3.7.1A & B, [Control Room Fresh Air (CRFA)] System Instrumentation
3.5.2, ECCS - Shutdown	3.5.2, ECCS - Shutdown
3.6.1.3, Primary Containment Isolation Valves (PCIVs)	3.6.1.3, Primary Containment Isolation Valves (PCIVs)
3.6.4.1, [Secondary] Containment	3.6.4.1, [Secondary Containment]
3.6.4.2, Secondary Containment Isolation Valves (SCIVs)	3.6.4.2, Secondary Containment Isolation Valves
3.6.4.3, Standby Gas Treatment (SGT) System	3.6.4.3, Standby Gas Treatment (SGT) System
3.7.4, [Main Control Room Environmental Control (MCREC)] System	3.7.3, [Control Room Fresh Air (CRFA)] System
3.7.5, [Control Room Air Conditioning (AC)] System	3.7.4, [Control Room Air Conditioning (AC)] System
3.8.2, AC Sources - Shutdown	3.8.2, AC Sources - Shutdown
3.8.5, DC Sources - Shutdown	3.8.5, DC Sources - Shutdown
3.8.8, Inverters - Shutdown	3.8.8, Inverters - Shutdown
3.8.10, Distribution Systems - Shutdown	3.8.10, Distribution Systems - Shutdown

The current TS address OPDRVs in Modes 4 and 5 with the following requirements:

- The ECCS - Shutdown, Limiting Condition for Operation (LCO) requires two ECCS injection/spray subsystems to be Operable with a specified amount of water in the suppression pool or the condensate storage tank. The LCO also specifies minimum flow rates for the pumps and operability of automatic initiation instrumentation. As an alternative to the injection pumps, the BWR/4 spent fuel storage pool gate or BWR/6 upper containment pool gate can be removed with the water level ≥ [23] feet over the RPV flange.

- The [Secondary][1] Containment is required to be Operable during OPDRVs with all equipment hatches and access doors closed.

- The [Secondary] Containment Isolation Valves (SCIVs) are required to be Operable during OPDRVs and capable of being automatically closed. The [Secondary] Containment Isolation Instrumentation LCO requires the Reactor Vessel Water Level - Low Low, Level 2 Function (or corresponding plant-specific low reactor water level Function), the Reactor Building Exhaust Radiation - High Function, and as applicable, [the Refueling Floor Exhaust Radiation - High Function, and Manual Initiation Function] to be Operable during OPDRVs.

- The Standby Gas Treatment (SGT) System is required to be Operable during OPDRVs and capable of automatically starting.

- The Primary Containment Isolation Valves (PCIVs), Residual Heat Removal (RHR) Shutdown Cooling (SDC) System isolation valves are required to be Operable during OPDRVs and capable of being automatically closed. The Primary Containment Isolation Instrumentation LCO requires the Reactor Vessel Water Level - Low, Level 3 (or corresponding plant-specific low reactor water level) Function to be Operable in Modes 4 and 5. Normally two channels are required but only one channel is required if the RHR SDC system integrity is maintained.

- The [Main Control Room Environmental Control (MCREC)] System (BWR/4) and [Control Room Fresh Air (CRFA)] System (BWR/6) are required to be Operable and capable of being automatically started. The [Control Room Air Conditioning] System is required to be Operable. The [MCREC] System Instrumentation (BWR/4) and [CRFA] System

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[1] In the ISTS, plant-specific differences are placed in brackets. At the majority of BWR plants, the refueling cavity or floor is enclosed by the secondary containment, but not the primary containment. However, at some plants, the refueling cavity or floor is enclosed within a plant-specific enclosure. At some BWR/6 plants the refueling cavity or floor is enclosed within the primary containment. These design differences are reflected in the ISTS by using the term "[secondary] containment" in the BWR/4 ISTS and "[secondary containment]" in the BWR/6 ISTS. In this justification, when the term "secondary" is in brackets as in "[secondary] containment" it is understood that the phrase refers to the plant-specific enclosure around the refueling cavity, including the BWR/6 designs. When the terms "secondary containment" or "primary containment" are used without brackets, they refer to the named structure.

Instrumentation (BWR/6) LCOs require the Reactor Vessel Water Level - Low Low Low, Level 1 (or corresponding plant-specific low reactor water level) Function, the Refueling Floor Area Radiation - High Function, and the Control Room Air Inlet Radiation - High Function to be Operable during OPDRVs. This instrumentation automatically starts the [MCREC] (BWR/4) or CRFA (BWR/6) system.

In addition, the TS require suspending OPDRVs if:

- Selected Primary Containment Isolation Valves are inoperable and not isolated;
- A required offsite circuit, a required Diesel Generator, a required DC electrical power subsystem, a required inverter, or a required AC or DC electrical power distribution subsystem is inoperable.

2.4. Overview of the Proposed Change

The proposed change removes the TS term "operations with a potential for draining the reactor vessel," the acronym "OPDRVs," and related concepts such as "RHR integrity maintained," and Required Actions to "suspend OPDRVs" throughout the TS. Plant-specific TS requirements related to OPDRVs, the related concepts such as "RHR integrity maintained," and Required Actions to "suspend OPDRVs" that do not appear in the ISTS (e.g., NUREG-1433 and NUREG-1434) would also be removed in plant-specific license amendment requests to adopt the proposed change.

The proposed TS are based on a new concept, Reactor Pressure Vessel Water Inventory Control (RPV WIC). After consultation with licensees and licensed reactor operators, the industry has determined that the term "operations with a potential for draining the reactor vessel" and the acronym "OPDRVs" should no longer be used. There is a wide variation across the industry in the implementation of OPDRVs, and retaining the historical term invites further misinterpretation and confusion. As discussed in Section 3, "Technical Evaluation," the proposed RPV WIC concept differs from the OPDRVs concept in several fundamental ways.

All requirements necessary to maintain the RPV water level above the TAF are proposed to be contained in a new TS Section 1.1 definition, "Drain Time," a revised and renamed TS 3.5.2, "Reactor Pressure Vessel (RPV) Water Inventory Control, " and a new instrumentation TS 3.3.5.2, "Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation." The following provides an overview of the proposed TS changes.

The proposed change is based on a safety-based approach to outage activities that affect systems and components that penetrate the reactor vessel below the top of the active fuel. This approach proactively determines the minimum time that would be required to drain the reactor pressure vessel water level to the top of the active fuel (i.e., the drain time) if an unintended draining event occurred. Compensatory measures specified in the Required Actions provide increasing requirements for preventative and mitigating equipment as the drain time is shortened.

The proposed TS Section 1.1 definition of Drain Time states:

The DRAIN TIME is the time it would take for the water inventory in and above the Reactor Pressure Vessel (RPV) to drain to the top of the active fuel (TAF) seated in the RPV assuming:

a) The water inventory above the TAF is divided by the limiting drain rate;

b) The limiting drain rate is the larger of the drain rate through a single penetration flow path with the highest flow rate, or the sum of the drain rates through multiple penetration flow paths susceptible to a common mode failure (e.g., seismic event, loss of normal power, single human error), for all penetration flow paths below the TAF except:

1. Penetration flow paths connected to an intact closed system, or isolated by manual or automatic valves that are locked, sealed, or otherwise secured in the closed position, blank flanges, or other devices that prevent flow of reactor coolant through the penetration flow paths;

2. Penetration flow paths capable of being isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the TAF when actuated by RPV water level isolation instrumentation; or

3. Penetration flow paths with isolation devices that can be closed prior to the RPV water level being equal to the TAF by a dedicated operator trained in the task, who is in continuous communication with the control room, is stationed at the controls, and is capable of closing the penetration flow path isolation devices without offsite power.

c) The penetration flow paths required to be evaluated per paragraph b) are assumed to open instantaneously and are not subsequently isolated, and no water is assumed to be subsequently added to the RPV water inventory;

d) No additional draining events occur; and

e) Realistic cross-sectional areas and drain rates are used.

A bounding DRAIN TIME may be used in lieu of a calculated value.

The revised LCO 3.5.2 states:

DRAIN TIME of RPV water inventory to the top of active fuel (TAF) shall be $\geq$ 36 hours.

<u>AND</u>

One [low pressure] ECCS injection/spray subsystem shall be OPERABLE.

The BWR/6 ISTS do not include the phrase "low pressure" (bracketed above) because of differences in plant design. The LCO and two LCO Notes are discussed in more detail in the Technical Evaluation section.

The proposed LCO 3.5.2 is Applicable in Modes 4 and 5.

TS 3.5.2 is renamed from "ECCS - Shutdown" to "Reactor Pressure Vessel (RPV) Water Inventory Control." This name accurately describes the revised requirements.

The Actions provide increasingly stringent requirements on [secondary] containment, [secondary] containment isolation valves, SGT, and methods for water injection as the Drain Time decreases. If the Drain Time is one hour or less, immediate action must be taken to increase the Drain Time. The Actions are discussed in more detail in the Technical Evaluation section.

There are seven Surveillance Requirements (SRs). Four are existing TS 3.5.2 SRs. A new Surveillance requires verification every 12 hours that the Drain Time is ≥ 36 hours. There is a new Surveillance that requires testing of valves credited for automatically isolating RPV penetration flow paths. The Surveillances are discussed in more detail in the Technical Evaluation section.

The requirements to automatically isolate the primary and secondary containment (including isolation valves) and the main control room, start SGT, initiate ECCS injection, and maintain control room environment and temperature on low water level are incorporated into the Drain Time definition, the proposed TS 3.5.2 or TS 3.3.5.2, or their elimination is justified. The proposed TS 3.5.2 requirements ensure there is sufficient time for manual isolation of the [secondary] containment and manual initiation of ECCS and SGT.

A new TS 3.3.5.2, "RPV Water Inventory Control Instrumentation," is proposed, which contains instrument Functions needed to support manual ECCS subsystem initiation and automatic isolation of penetration flow path(s) assumed to be automatically isolated in the calculation of Drain Time. The proposed LCO 3.3.5.2 is consistent in format with existing instrumentation TS and contains a table listing the Functions governed by the TS. These Functions have been relocated from other existing TS to facilitate use and understanding of the RPV WIC requirements. The existing TS 3.3.5.2, "RCIC System Instrumentation," is renumbered TS 3.3.5.3. This increases consistency within the STS as the Reactor Core Isolation Cooling (RCIC) System is discussed in TS 3.5.3. Some licensees may choose to implement the new instrumentation TS as 3.3.5.3 to avoid the procedure revisions associated with renumbering the existing TS 3.3.5.2.

Table 1, "Changes to Current Technical Specifications," summarizes each change to the current TS requirements affected by the proposed change.

The proposed change includes changes to the TS Bases. 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 TS 5.5.11, "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).

A model application is included in the proposed change as Enclosure 1. The model may be used by licensees desiring to adopt TSTF-542 following NRC approval. Retyped versions of the definition and TS 3.5.2 are shown in Enclosures 2 and 3, respectively. The retyped proposed BWR/4 and BWR/6 TS 3.5.2 Bases are in Enclosure 4. The retyped proposed BWR/4 and BWR/6 TS 3.3.5.2 are in Enclosure 5. The retyped proposed BWR/4 and BWR/6 TS 3.3.5.2 Bases are in Enclosure 6. The BWR/4 TS and Bases markup for all affected specifications are shown in Enclosure 7. The BWR/6 TS and Bases markup for all affected specifications are shown in Enclosure 8.

2.5. Benefits of the Proposed Change

The current TS requirements do not differentiate between an RPV penetration flow path that has the potential to drain RPV water inventory at 1 gpm versus 1,000 gpm. As a result, restrictive plant operating controls may be in place when there is no corresponding plant risk. Replacing this "one size fits all" regulatory approach with the proposed approach in which the TS controls are strengthened as the plant risk increases results in many operational and safety benefits.

2.5.1. Operational Benefits

The TS controls applicable during Modes 4 and 5 are substantially clarified and simplified. Currently, the OPDRV-related requirements appear in 17 different specifications. Some of these requirements are obtuse and difficult to recognize. In the proposed change, all of the requirements appear in two specifications and one defined term. This consolidation has a significant, if unquantifiable, benefit to plant operation.

Refueling outage activities may generally be performed more efficiently when the [secondary] containment is allowed to be open, permitting the free movement of personnel, material, cables, and hoses. Under the proposed change, licensees may schedule their refueling and maintenance activities to avoid or minimize configurations in which the [secondary] containment must be isolated (e.g., when Drain Time ≤ 8 hours).

Under the current TS requirements, many instrumentation channels and systems are required to be operable and capable of automatic actuation even when the risk of a draining event is minimal. Further, the large volume of water in and above the RPV provides time for manual operator action to stop and mitigate a draining event. Under the proposed change, automatic instrumentation and systems are only required when credited for stopping a draining event or if needed for manual ECCS initiation. This reduces the number of instrument channels and systems required to be operable and simplifies system maintenance during a refueling outage.

The current TS require systems that would not be needed, even in the unlikely event of fuel damage caused by a loss of RPV inventory. The secondary containment and SGT can contain and process any radioactive releases from damaged fuel; the primary containment isolation

valves are not required for this Function. (See additional BWR/6-specific discussion in Section 3.2.3.2.) Similarly, there is no credible radioactive release from a draining event that would require control room environmental or temperature control. Requiring these systems to be operable in Modes 4 and 5 complicates maintenance and distracts the operators from safety-significant equipment.

The proposed TS utilize the concept of Drain Time. This concept is similar to the concept of "time to boil" in NUMARC 91-06, "Shutdown Risk Management Guidelines," for providing operator guidelines in responding to loss of decay heat removal events, which has been successfully used in U.S. nuclear power plants for over 20 years. The introduction of the new concept of Drain Time is not viewed as a significant burden on licensees.

2.5.2. Safety Benefits

The proposed approach focuses on preventing a draining event and fuel damage by placing controls on potential RPV drain paths, while still providing escalating mitigation capabilities as the potential for a significant draining event increases. This focus on prevention versus mitigation will increase plant safety by avoiding draining events.

Under the proposed change, licensees must be aware of the current Drain Time. If the Drain Time is maintained ≥ 36 hours, TS limitations are minimized and flexibility in performing refueling and maintenance work is maximized. If the Drain Time remains ≥ 8 hours, [secondary] containment may be open, facilitating refueling and maintenance activities. Only if the Drain Time is < 8 hours must licensees isolate the [secondary] containment and take other actions to be prepared to rapidly mitigate a draining event, should it occur. This arrangement encourages licensees to manage the plant configuration in a manner that maximizes Drain Time and minimizes the risk of a draining event occurring.

The current TS requires automatic initiation of ECCS on low RPV water level. The ECCS pumps have very large flow rates, on the order of thousands of gpm. Most potential drain paths from the RPV would have a flow rate of tens of gpm, or, in a few limited cases, hundreds of gpm. Automatic initiation of ECCS pumps could result in overfilling the refueling cavity or water flowing into the main steam lines, potentially damaging plant equipment. This requires operators to move their immediate attention during a draining event from stopping the event to stopping the ECCS pumps. The proposed change requires an ECCS subsystem to be operable and capable of manual initiation, but allows the operator to use other, more appropriately sized pumps if needed to mitigate a draining event. The size of the allowed RPV penetration flow paths and the proposed TS 3.5.2 will ensure the operator has time to take appropriate manual action.

The current TS have no defined safety basis and the controls provide an inconsistent set of requirements more suitable to mitigating a LOCA. The proposed change provides a justified safety basis and a consistent set of TS requirements to protect that safety basis.

The proposed changes provide defense-in-depth. When the Drain Time is ≥ 36 hours, normal operational controls are adequate to address any draining from the RPV. However, the LCO requires that an ECCS subsystem be operable and capable of being manually started. When

Drain Time is < 36 hours and ≥ 8 hours, the ECCS subsystem is required to be operable, and in addition, the [secondary] containment and the [secondary] containment isolation valves must be capable of being isolated, and an SGT train must be capable of being started within the Drain Time. When the Drain Time is < 8 hours, an ECCS train must be operable, action must be initiated immediately to establish an additional method of water injection, and one of these water injection methods must be capable of operating without offsite power. Further, the [secondary] containment must be isolated and [secondary] containment isolation valves must be closed or capable of being closed from the control room, and an SGT train must be ready to operate. In Modes 4 and 5 at various water levels and Drain Times, multiple layers of defense-in-depth are available to prevent and mitigate a draining event.

3. TECHNICAL EVALUATION

3.1. Safety Basis

3.1.1. Existing Safety Basis

An unplanned draining of the reactor vessel in the cold shutdown or refueling Modes is not an analyzed event defined in Chapter 15 of NUREG-0800, "Standard Review Plan." It is not a LOCA, which is defined in NUREG-0800, Section 15.6.4 as postulated accidents that would result from the loss of reactor coolant, at a rate in excess of the capability of the normal reactor coolant makeup system, from piping breaks in the reactor coolant pressure boundary. Given the low energy state of the RCS when the OPDRV term is used in TS and the TS LCO on RCS Pressure and Temperature limits, an unexpected draining event is not considered to be caused by piping breaks. Further, the term OPDRV encompasses any potential draining of the RPV, including those within the capability of the normal reactor coolant makeup system. Unplanned draining of the reactor vessel is not an ANSI N 18.2 (Reference 2) Category II, III, or IV event. A review of the Standard Review Plan, Branch Technical Positions, and Regulatory Guides did not identify any NRC guidance with respect to OPDRVs or RPV water inventory control in the cold shutdown or refueling Modes.

In Enforcement Guidance Memorandum EGM 11-003, "Enforcement Guidance Memorandum on Dispositioning Boiling Water Reactor Licensee Noncompliance with Technical Specification Containment Requirements During Operations with a Potential for Draining the Reactor Vessel," the NRC staff stated they had reviewed past licensing positions and staff interactions with the industry related to OPDRV practices. The review showed varied staff actions and communications resulting in a lack of clear regulatory guidance on the meaning of OPDRV. This has resulted in inconsistent implementation of OPDRVs by licensees.

As discussed previously, the TS OPDRV requirements have existed for over 40 years, but there is no clearly stated description of the event that is being prevented or mitigated. However, from the existing TS requirements, one can infer the postulated event that forms the basis of the existing TS.

- Despite the lower operating temperature in Mode 4 (i.e., ≤ 200°F) and being fully depressurized in both Modes 4 and 5, a draining event on the order of a large break loss of coolant accident (LBLOCA) occurs. The drain rate from the RCS is equivalent to the

LBLOCA drain rate, as inferred from the multiple ECCS pump Operability requirements, the associated ECCS pump flow rate SR requirement, and the automatic actuation requirements in TS 3.3.5.1.

- A limiting single failure or loss of offsite power is assumed, based on the requirement for redundant equipment and both offsite and onsite power.
- There is insufficient time for manual operator action to respond to a draining event, based on the required automatic ECCS initiation Functions on low RPV water level.
- There is insufficient time for manual operator actions to close secondary [or primary] containment, based on the required automatic containment isolation capability, and SGT system initiation.
- Fuel damage occurs rapidly and bypasses the secondary [or primary] containment, based on the requirement for automatic control room isolation (i.e., both environmental and temperature control).

The above scenario is implausible and is an unreasonable basis for TS requirements in Modes 4 and 5, when RCS temperature is ≤ 200°F and the RCS is fully depressurized. There is insufficient energy in the RCS to cause a pipe break (LOCA) or a draining event with a flow rate equivalent to a LBLOCA resulting in rapid fuel cladding damage (note that the PWR ISTS do not require ECCS to be operable in cold shutdown and refueling for the same reasons.) Other Chapter 15 events postulated in Modes 4 and 5 (e.g., fuel handling accident, waste gas tank rupture) do not assume a loss of offsite power. During Mode 4 and 5, monitoring RPV water level is a high priority for reactor operators. Any credible draining event would allow adequate time for manual operator action either to isolate the drain path or to add sufficient makeup inventory to the RPV to maintain water level above TAF. Even if these actions were not successful, there is sufficient response time for manual action to isolate the [secondary] containment. Given the slow progression of a draining event that could be postulated to ultimately result in fuel cladding damage and a radiological release capable of affecting the operators in the control room, there is sufficient time to take manual action to protect the operators; thus, neither automatic protection nor TS mandated Actions are needed for control room habitability.

The requirement for multiple ECCS pumps to respond automatically to a draining event in Modes 4 and 5 can have negative consequences. ECCS pumps have large flow rates (i.e. thousands of gallons per minute) while typical drain rates through RPV penetration flow paths are in the tens of gallons per minute. Use of an ECCS pump to respond to a small draining event could easily result in overfilling the RPV or refueling cavity, potentially overflowing onto the refueling floor or into the main steam lines, and damage to other plant equipment.

3.1.2. Proposed Safety Basis

There is a fundamental difference between the existing requirements and the proposed safety basis. The existing requirements only provide methods of mitigating a draining event and any resulting fuel damage. The proposed safety basis focuses on preventing a draining event and fuel

damage by placing controls on potential RPV drain paths, while still providing escalating mitigation capabilities as the calculated rate of an unexpected draining event increases. This focus on prevention versus mitigation will increase plant safety by avoiding draining events.

Because there is no existing regulatory basis for an RPV draining event during plant shutdown conditions (Modes 4 and 5), the industry proposes that the defined safety basis for the new TS requirements related to RPV WIC be protection of Safety Limit 2.1.1.3. The Safety Limit states:

> Reactor vessel water level shall be greater than the top of active irradiated fuel.

There is established precedent for Chapter 3 LCOs being used to protect a Safety Limit. For example, TS 3.2.2, "Minimum Critical Power Ratio," (MCPR) protects against violation of Safety Limit 2.1.1.2 which provides upper limits on MCPR during reactor core power excursion transients. Reactor Protection System (RPS) Instrumentation, Function 3, "Reactor Vessel Steam Dome Pressure - High," protects against a violation of Safety Limit 2.1.2, which provides an upper limit on reactor steam dome pressure during pressurization transients.

In developing the requirements, no additional single failure or operator error beyond the initiating event is considered. This is consistent with other TS applicable during shutdown, such as TS 3.8.2, "AC Sources - Shutdown", which requires a single offsite and onsite power source and do not require redundant features to address a limiting single failure. Consistent with TS 3.8.2, a loss of offsite power is considered. In addition, common mode failures (i.e., single initiating events that affect more than one RPV penetration flow path) are considered when appropriate.

The proposed TS LCO satisfies 10 CFR 50.36(c)(2)(ii), Criterion 4, "A structure, system, or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety." Operating experience highlights that RPV draining events are potentially significant to public health and safety, as established in the following NRC documents:

1. Information Notice 84-81 "Inadvertent Reduction in Primary Coolant Inventory in Boiling Water Reactors During Shutdown and Startup," November 1984.

2. Information Notice 86-74, "Reduction of Reactor Coolant Inventory Because of Misalignment of RHR Valves," August 1986.

3. Generic Letter 92-04, "Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs Pursuant to 10 CFR 50.54(f), " August 1992.

4. NRC Bulletin 93-03, "Resolution of Issues Related to Reactor Vessel Water Level Instrumentation in BWRs," May 1993.

The purpose of the proposed RPV WIC TS requirements is to prevent a draining event and to ensure mitigating measures are available should a draining event occur. Note that it is not the intent of the proposed TS to apply only when a draining event occurs, just as the ECCS specifications are not intended to apply only when a design basis accident occurs. Rather, in both cases, the TS ensure that the licensee is capable of responding to an event should it occur.

3.2. Proposed LCO 3.5.2, Reactor Pressure Vessel Water Inventory Control

3.2.1. TS 3.5.2 LCO - Drain Time

10 CFR 50.36 defines a Limiting Condition for Operation (LCO) as:

> Limiting conditions for operation are the lowest functional capability or performance levels of equipment required for safe operation of the facility. When a limiting condition for operation of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the technical specifications until the condition can be met.

The proposed LCO 3.5.2 has two parts. The first part states:

> DRAIN TIME of RPV water inventory to the top of active fuel (TAF) shall be ≥ 36 hours.

The defined term "Drain Time" (discussed below) is the time it would take the RPV water inventory to drain from the current level to the TAF assuming the most limiting of the RPV penetration flow paths with the largest flow rate, or a combination of penetration flow paths that could open due to a common mode failure, were to open. The time to drain the water inventory to the TAF was chosen because it directly relates to the likelihood of fuel damage: a short time to drain to the TAF is a greater challenge to the Safety Limit than a longer one.

Drain Time also has the advantage of being independent of plant Mode and design. For a given water level above the fuel, a small reactor vessel or refueling cavity contains less water than a large reactor vessel and refueling cavity. A limit based on water level would be inherently plant-specific, while a limit based on Drain Time provides generic Actions based on an equivalent challenge to plant safety. In addition, the use of Drain Time provides flexibility to address various operating scenarios, accounting for both the current Mode, the size of the drain path, and the pre-existing RPV water inventory.

The proposed LCO provides assurance that the lowest functional capability required for safe operation of the facility will be maintained and that the Safety Limit will be protected.

3.2.1.1. Top of Active Fuel (TAF)

The TAF was chosen as the limiting water level in order to be consistent with Safety Limit 2.1.1.3. The term "active fuel" distinguishes between the top of the stack of uranium dioxide fuel pellets versus the top of the fuel assembly bundle, including the handle. Fuel damage is not likely as long as the active fuel is covered with water.

3.2.1.2. LCO Drain Time Limit ≥ 36 hours

The proposed LCO places a limit of greater than or equal to 36 hours on an acceptable Drain Time. During Modes 4 and 5, removal and makeup of RCS inventory is a normal operational occurrence. Activities that result in a Drain Time greater than 36 hours, assuming no intervention by the licensee, represent such a slow loss of RCS inventory that they can be

addressed using normal operational controls. In this case, the LCO is met and no additional requirements are needed. The period of 36 hours is considered sufficiently long (e.g., three typical licensed operator shifts) to identify and initiate action to mitigate draining of reactor coolant. Loss of RPV water inventory that would result in a Drain Time greater than 36 hours does not represent a significant challenge to Safety Limit 2.1.1.3, since it is managed as part of normal plant operation.

Note that "Drain Time" is similar to the concept of "time to boil" in NUMARC 91-06, "Shutdown Risk Management Guidelines," for providing operator guidelines in responding to loss of decay heat removal events, which has been successfully used in U.S. nuclear power plants for over 20 years.

3.2.1.3. Proposed Drain Time Defined Term

The proposed Drain Time definition represents the time it would take for the water inventory in and above the RPV to drain to the TAF. It is a straightforward calculation that depends only on the area of the penetration flow path and the height and volume of the water above the penetration flow path. The definition provides assumptions for the calculation:

- The water inventory above the TAF is divided by the limiting drain rate;
- Realistic cross-sectional areas and drain rates are used;
- The penetration flow path(s) are assumed to be opened instantaneously and are not subsequently isolated (i.e., the draining is assumed to continue until the water level is equal to the TAF);
- No water is assumed to be subsequently added to the RPV water inventory; and
- No additional draining events are assumed to occur;

These assumptions support a realistic calculation that excludes actions that would increase the Drain Time (additional water inventory, isolating penetration flow paths) and excludes multiple initiating events consistent with the treatment of other events during shutdown.

The Drain Time calculation is based on a single initiating draining event with the largest flow rate. That is the largest of:

- A single RPV penetration flow path below the TAF with the highest flow rate; or
- Multiple RPV penetration flow paths below the TAF that are susceptible to a common mode failure (e.g., seismic event, loss of normal power, single human error).

This results in the largest penetration flow rate (i.e., shortest Drain Time) for a single initiating draining event. A realistic drain rate may be determined using a single, step-wise, or integrated calculation considering the changing RPV water level during a draining event.

The definition recognizes that not all RPV penetration flow paths below the TAF are susceptible to a draining event, and excludes those penetrations from the Drain Time calculation. Unlike the current OPDRV TS approach which does not address prevention, the proposed definition encourages licensees to place RPV penetration flow paths in a condition to prevent draining.

- The determination of the RPV penetration flow path(s) with the largest flow rate excludes penetration flow paths connected to an intact closed system, or isolated by manual or automatic valves that are locked, sealed, or otherwise secured in the closed position, blank flanges, or other devices that prevent flow of reactor coolant through the penetration flow paths. These actions preclude creating a drain path due to a single initiating event. Valves are locked, sealed, or otherwise secured under the licensee's administrative program for securing valves for the purpose of ensuring that a single operator error cannot open the valves. Sufficient administrative controls exist to prevent the inadvertent initiation of a draining event due to the improper removal of a flange or other closure device.

- RPV Penetration flow paths that are capable of being isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the TAF when actuated by RPV water level isolation instrumentation are excluded. The proposed TS 3.3.5.2 includes instrument Functions, Surveillances, and Actions on instrumentation credited with automatically isolating penetration flow paths, as well as the instrumentation to manually start the required ECCS injection/spray subsystem. TS 3.5.2 requires periodic verification that the valves will actuate on an actual or simulated signal to ensure the valves will stop a draining event through that penetration flow path. The qualifier "without offsite power" recognizes that a draining event may be initiated by a loss of offsite power.

- Recognizing that refueling outages are dynamic situations and that it is not possible to identify all possible plant configurations that may occur during an outage, the definition allows excluding penetration flow paths with isolation devices that can be closed prior to the RPV water level being lowered to the TAF by a dedicated operator trained in the task, who is in continuous communication with the control room, is stationed at the controls, and is capable of closing the penetration flow paths without offsite power. Because plant operators are a limited resource, it is anticipated that this option would be used infrequently for limited periods of time to support required outage work. The use of a dedicated operator is well established in the ISTS. For example, TS 3.6.1.2 allows the use of a dedicated operator to control entry and exit from containment when the containment air lock interlock is inoperable, and TS 3.3.6.1 allows containment isolation valves to be unisolated intermittently if a dedicated operator in continuous communication with the control room is stationed at the controls of the valve.

The Drain Time definition allows a bounding Drain Time to be used in lieu of a calculated value. It is anticipated that licensees may predetermine bounding Drain Times for a range of expected plant configurations (i.e., water level and largest flow path cross-section) and then evaluate changes in plant conditions to determine if the limiting RPV penetration flow path(s) or flow rate has changed. For example, a licensee could quickly estimate the Drain Time based on a predetermined chart of RPV water level and RPV penetration flow path cross sectional area. A

bounding (i.e., shorter) Drain Time is acceptable as long as it is less than or equal to an exact value.

SR 3.5.2.1 requires verifying every 12 hours that the Drain Time is ≥ 36 hours. Implementation details for the Drain Time calculation are in the proposed SR 3.5.2.1 Bases. For example, the SR Bases discuss determining the realistic cross-sectional areas for control rod drive RPV penetrations, the number of bolts required on a blank flange or other sealing device, and the determination of whether the Residual Heat Removal (RHR) Shutdown Cooling (SDC) System can be considered an intact closed system.

3.2.1.4. Proposed TS 3.5.2 LCO - ECCS Subsystem

The second portion of LCO 3.5.2 states:

BWR/4 TS:

> One low pressure ECCS injection/spray subsystem shall be OPERABLE.

BWR/6 TS:

> One ECCS injection/spray subsystem shall be OPERABLE.

The term "low pressure" does not appear in the BWR/6 LCO because the BWR/6 High Pressure Core Spray (HCPS) System may be used to satisfy the LCO.

This LCO requirement is similar to the existing LCO 3.5.2 requirement for two ECCS injection/spray subsystems to be operable. The LCO Bases definition of an ECCS injection/spray subsystem is unchanged.

Unlike the current LCO 3.5.2 requirement, the primary purpose of the LCO is to prevent an unexpected draining event through the controls on Drain Time. However, in order to provide defense-in-depth against an unexpected draining event, one ECCS injection/spray subsystem is also required to be operable. The existing TS 3.5.2 "Applicable Safety Analysis" Bases states that two ECCS injection/spray subsystems are required to provide redundancy. However, this redundancy is not required for a defense-in-depth measure when, consistent with other events considered during shutdown, no additional single failure is assumed. The Drain Time controls, in addition to the required ECCS injection/spray subsystem, provide reasonable assurance that an unexpected draining event can be prevented or mitigated before the RPV water level would be lowered to the TAF.

In the proposed TS 3.3.5.2 and TS 3.5.2, the ECCS injection/spray subsystem is manually initiated by the licensee. TS 3.5.2 contains a Surveillance Requirement to periodically verify the required ECCS injection/spray subsystem actuates on a manual initiation signal. TS 3.3.5.2 requires the necessary instrumentation and logic to be operable to support manual initiation of the ECCS subsystem. The ECCS pumps are high-capacity pumps, with flow rates of thousands of gallons per minute. Most RPV penetration flow paths would only permit a drain rate of tens or hundreds of gallons per minute and automatic initiation of an ECCS pump could result in overflowing the reactor cavity. There are smaller pumps available to the reactor operator to add

water to the RPV if needed. When the drain time is 8 hours or less, the proposed TS 3.5.2 Actions require immediate action to establish an additional method of adding water to the RPV with a flow rate and water inventory capable of maintaining the RPV water level above the TAF for 36 hours.

The proposed LCO 3.5.2 is modified by a Note applicable to the required ECCS injection/spray subsystem. The Note is retained from the existing LCO 3.5.2 and allows a Low Pressure Coolant Injection (LPCI) subsystem to be considered operable during alignment and operation for decay heat removal if capable of being manually realigned and not otherwise inoperable. Alignment and operation for decay heat removal includes when the required RHR pump is not operating or when the system is realigned from or to the RHR shutdown cooling mode. This allowance is necessary since the RHR System may be required to operate in the shutdown cooling mode to remove decay heat and sensible heat from the reactor. Because of the restrictions on Drain Time, sufficient time will be available following an unexpected draining event to manually align and initiate LPCI subsystem operation if needed to maintain RPV water inventory prior to the RPV water level being equal to the TAF. Some plants have removed the LCO 3.5.2 Note after determining that it is not needed or that realignment to the LPCI mode is not possible. The model application states that absence of the LCO 3.5.2 Note is an acceptable deviation from the Traveler.

By requiring that an ECCS subsystem be available to add water inventory to the RPV, the proposed LCO provides assurance that the lowest functional capability required for safe operation of the facility will be maintained and that the Safety Limit will be protected.

3.2.2. Proposed Applicability

The proposed LCO 3.5.2 is applicable in Modes 4 and 5. Requirements on water inventory control in other MODES are contained in LCOs in Section 3.3, "Instrumentation," and in the other LCOs in the renamed Section 3.5, "Emergency Core Cooling System (ECCS), RPV Water Inventory Control, and Reactor Core Isolation Cooling (RCIC) System."

The existing ISTS Applicability does not require the two ECCS injection/spray subsystems to be operable in Mode 5 with: (BWR/4) the spent fuel storage pool gate removed and water level ≥ [23 ft] over the top of the reactor pressure vessel flange; (BWR/6) the upper containment [cavity to dryer] pool [gate] removed and water level ≥ [23 ft] over the top of the reactor pressure vessel flange. This allowance is removed. The allowance recognized that the large water inventory was sufficient to allow operator action to terminate an inventory loss prior to the water level being equal to the TAF. This concept is now included in the defined term "Drain Time" and the LCO and Actions in the revised TS 3.5.2.

The proposed, expanded Applicability provides assurance that the Safety Limit will also be protected in Modes 4 and 5.

3.2.3. Proposed TS 3.5.2 Actions

10 CFR 50.36 states that when an LCO is not met:

> … the licensee shall shut down the reactor <u>or follow any remedial action permitted by the technical specifications until the condition can be met</u>. (Emphasis added)

Because these TS only apply in Modes 4 and 5 and the reactor is already shut down, the appropriate remedial actions to be taken must be specified in the TS. The proposed TS provides a set of Conditions, Required Actions, and Completion Times (collectively referred to using the TS defined term "Actions") that provide assurance that Safety Limit 2.1.1.3 will be met. The Actions provide increasingly stringent requirements as the Drain Time becomes shorter.

3.2.3.1. <u>Actions A and B: Required ECCS Injection/Spray Subsystem Inoperable</u>

If the required ECCS injection/spray subsystem is inoperable, 4 hours is provided to restore it to operable status. Alternatively, another operable ECCS injection/spray subsystem may be credited for meeting the LCO. In this Condition, the LCO controls on Drain Time minimize the possibility that an unexpected draining event could necessitate the use of the ECCS injection/spray subsystem; however the defense-in-depth provided by the ECCS injection/spray subsystem is lost. The 4 hour Completion Time for restoring the required ECCS injection/spray subsystem to operable status is based on engineering judgment that considers the LCO controls on DRAIN TIME, the time needed to change between credited ECCS subsystems for operational reasons, other available water injection sources, and the low probability of an unexpected draining event that would result in loss of RPV water inventory. As already used throughout the TS Bases, the conclusion of a "low probability of an event" is based on qualitative engineering judgment. In this case, the judgment that there is a low probability of a vessel draining event is based on a review of industry operating experience that did not identify any draining events that violated Safety Limit 2.1.1.3.

It is recognized that the existing Required Action applies when one of two required ECCS subsystems are inoperable and the proposed Required Action applies when the one required ECCS subsystem is inoperable. However, the existing requirement for two operable ECCS subsystems provides the only requirement to prevent or mitigate a draining event. In the proposed LCO 3.5.2, the primary protection is provided by the Drain Time limitations and an ECCS subsystem is only provided for defense-in-depth. Therefore, retaining the 4 hour Completion Time is justified.

In the proposed TS 3.5.2, when the Drain Time is less than 36 hours, the [secondary] containment boundary must be established or capable of being established within the Drain Time, the [secondary] containment penetration flow paths must be isolated or capable of being isolated, and a standby gas treatment subsystem must be capable of being started immediately or within the Drain Time, regardless of the condition of the ECCS subsystem. In other words, in the current TS 3.5.2, containment isolation is a backup when ECCS is not operable, but in the proposed TS 3.5.2, ECCS and containment isolation are used in parallel to ensure plant safety. This provides a greater level of safety than the existing requirements.

If an ECCS injection/spray subsystem is not restored to operable status within 4 hours, action must be immediately initiated establish a method of water injection capable of operating without offsite electrical power. This method maybe used to restore RPV inventory should an unexpected draining event occur. Similar to the Note on proposed Required Action D.1, the Bases for Required Action B.1 describe an adequate water injection method. The method of water injection includes the necessary instrumentation and controls, water sources, and pumps and valves needed to add water to the RPV or refueling cavity should an unexpected draining event occur. It may be manually initiated and may consist of one or more systems or subsystems, and must be able to access water inventory capable of maintaining the RPV water level above the TAF for ≥ 36 hours. In determining the necessary water volume any recirculation of the injected water may be credited.

The proposed Actions A and B provide acceptable remedial actions until the LCO can be met as required by 10 CFR 50.36.

3.2.3.2. Action C: Drain Time < 36 hours and ≥ 8 hours

With the Drain Time less than the LCO limit of 36 hours but greater than or equal to 8 hours, compensatory measures are taken to ensure the availability of mitigating equipment should an unexpected draining event occur. For a discussion of the selection of the 8 hour Drain Time breakpoint, see Section 3.2.3.3.

Should an unexpected draining event occur and the reactor coolant were to drain to below the TAF, there is the potential for reactor fuel cladding damage and a subsequent release of radioactive material to the [secondary] containment. The Condition C Required Actions ensure that the [secondary] containment can be isolated, the [secondary] containment isolation valves can be closed, and an SGT subsystem can be put into service in less than the Drain Time as a contingency, should an unexpected draining event occur during the activity.

The [secondary] containment provides a control volume into which fission products can be contained, diluted[, and processed] prior to release to the environment. Required Action C.1 requires verification of the capability to establish the [secondary] containment boundary in less than the Drain Time. The required verification confirms actions to establish the [secondary] containment boundary are preplanned and necessary materials are available. [The [secondary] containment boundary is considered established when one SGT subsystem is capable of maintaining a negative pressure with respect to the environment.] Verification that the [secondary] containment boundary can be established must be performed within 4 hours. The required verification is an administrative activity and does not require manipulation or testing of equipment.

[Secondary] containment penetration flow paths (i.e., valves, dampers, and doors) are a support system to the [secondary] containment boundary. Required Action C.2 verifies the capability to isolate each [secondary] containment penetration flow path in less than the Drain Time. The required verification confirms actions to isolate the [secondary] containment penetration flow paths are preplanned and necessary materials are available, if needed. Power-operated valves and dampers are not required to receive automatic isolation signals if they can be closed remotely within the Drain Time. Verification that the [secondary] containment penetration flow

paths can be isolated must be performed within 4 hours. The required verification is an administrative activity and does not require manipulation or testing of equipment.

One SGT subsystem is capable of maintaining the [secondary] containment at a negative pressure with respect to the environment and filter gaseous releases. Required Action C.3 verifies the capability to place one SGT subsystem in operation in less than the Drain Time. The required verification confirms actions to place a SGT subsystem in operation are preplanned and necessary materials are available. Verification that a SGT subsystem can be placed in operation must be performed within 4 hours. Since the actions establish contingencies in anticipation of an unexpected draining event, the required verification is an administrative activity and does not require actual manipulation or testing of equipment.

At some BWR plants, the primary containment is larger and provides a barrier around the refueling cavity or floor. For the "primary containment-only" plants, the SGT system does not process all the radioactive release that might result from fuel cladding damage caused by a draining event in Modes 4 and 5. These plants utilize primary containment and the primary containment isolation valves to contain and dilute any such releases from the fuel, to reduce any subsequent release to the environment. Therefore, to represent these plants, the BWR/6 ISTS proposed Actions bracket the term "secondary containment" (i.e., indicating it is plant specific) and bracket Required Action C.3. If necessary, plants will propose Actions to establish the applicable containment boundary and to close the applicable containment penetration flow paths per their design. Those plants will not propose an Action to verify one SGT subsystem is capable of being placed into operation, as SGT is not effective for this situation. If it should be determined necessary to perform a release from the primary containment, the release would be filtered and monitored using the primary containment purge path that processes and monitors releases when the plant is at power, or through other emergency venting paths available per the plant design.

The Completion Time of 4 hours ensures that the required verifications are performed in one-half the shortest allowed Drain Time. The Completion Time is reasonable based on engineering judgment that considers the LCO controls on Drain Time, the defense-in-depth provided by the required ECCS subsystem, and the low probability of an unexpected draining event that would result in loss of RPV water inventory. As already used throughout the TS Bases, the conclusion of a "low probability of an event" is based on qualitative engineering judgment. In this case, the judgment that there is a low probability of a vessel draining event is based on the operating experience that there have been no such draining events that violated Safety Limit 2.1.1.3.

The proposed Action C provides acceptable remedial actions until the LCO can be met as required by 10 CFR 50.36.

3.2.3.3. Action D: Drain Time < 8 hours

With the Drain Time less than 8 hours, compensatory measures are implemented to ensure the ability to mitigate a radioactive release resulting from an unexpected draining event. Note that if the Drain Time is less than 1 hour, Condition E also applies. Condition E requires immediate action to restore the Drain Time to ≥ 36 hours.

The 8 hour Drain Time in Action D was chosen to allow most anticipated maintenance to be performed without entering the action. Considering a very small RPV with the refueling cavity flooded and the spent fuel pool gates or cavity to dryer pool gates removed, a very large 1,000 gpm draining event would result in a Drain Time > 8 hours. Under the current TS, this configuration would be outside the Applicability of LCO 3.5.2 and no ECCS subsystems would be required to be operable. However, as discussed below, in the proposed specifications an additional method of water injection, to augment the newly required ECCS subsystem, is also required when the Drain Time is less than 8 hours. This is a substantial safety improvement over the current TS. Note that 8 hours provides a large window of time for the licensed operators to identify, terminate, and mitigate an unexpected draining event.

When the Drain Time is less than 8 hours, Required Action D.1 requires immediate action to establish an additional method of water injection to augment the required ECCS subsystem. The additional method of water injection provides defense-in-depth when the Drain Time is short (< 8 hours). A Note to Required Action D.1 states that either the required ECCS injection/spray subsystem or the additional method of water injection must be capable of operating without offsite electrical power. The additional method of water injection must have a flow rate and available water sources capable of maintaining the RPV water level above the TAF for ≥ 36 hours. It may be manually initiated and may consist of one or more systems or subsystems.

As noted, the additional method of water injection must be able to access water inventory capable of being injected to maintain the RPV water level above the TAF for ≥ 36 hours. For example, if the Drain Time is 28 hours and the largest flow rate assumed in the Drain Time calculation is 100 gpm, the available water volume must be ≥48,000 gallons ((36 hours – 28 hours) * 100 gpm * 60 minutes per hour). If recirculation of water from the leakage path back to the suction source of the injection pump(s) would occur, it may be credited in determining the necessary water volume. The additional method of water injection and the ECCS injection/spray subsystem may share all or part of the same water sources.

If the reactor coolant were to drain to below the TAF, there is the potential for reactor fuel cladding damage and a subsequent release of radioactive material to the [secondary] containment. The Condition D Required Actions recognize the shorter Drain Time and require the [secondary] containment, the [secondary] containment isolation valves, and an SGT subsystem are capable of containing or filtering a radioactive release.

The [secondary] containment provides a control volume into which fission products can be contained, diluted[, and processed] prior to release to the environment. Required Action D.2 requires immediate action to establish the [secondary] containment boundary. The [secondary] containment boundary is established if one SGT subsystem is capable of maintaining a negative pressure with respect to the environment.

[Secondary] containment penetration flow paths (i.e., valves, dampers, and doors) are a support system to the [secondary] containment boundary. Required Action D.3 requires immediate action to isolate each [secondary] containment penetration flow path or to verify it can be manually isolated from the control room.

One SGT subsystem is capable of maintaining the [secondary] containment at a negative pressure with respect to the environment and filter gaseous releases. Required Action D.4 requires immediate verification that one SGT subsystem is capable of being placed in operation. As described previously in more detail, at some BWR plants the SGT System cannot maintain a negative pressure or filter releases from the area around the RPV cavity. The BWR/6 ISTS proposed Actions bracket the term "secondary containment" (i.e., indicating it is plant specific) and bracket Required Action D.4.

The proposed Action D provides acceptable remedial actions until the LCO can be met as required by 10 CFR 50.36.

3.2.3.4. <u>Action E: Default Action and Drain Time < 1 hour</u>

If the Drain Time is < 1 hour, or if a Required Action and associated Completion Time of Conditions B or C are not met, immediate action must be taken to restore the Drain Time to ≥ 36 hours in order to minimize the possibility that an unexpected draining event could result in the RPV water inventory dropping to the TAF and potentially violating Safety Limit 2.1.1.3. Note that if the Drain Time is < 1 hour, the Required Actions of Condition D also apply, requiring immediate action to verify that [secondary] containment, [secondary] containment isolation valves, and a SGT subsystem are capable of mitigating any radioactive release resulting from an unexpected draining event.

The one hour Drain Time limit was chosen as a conservative restriction such that, should an unexpected draining event occur, the operators would have ample time to identify the event, isolate the drain path, and add water to the RPV before the water level reaches the TAF. Determination that a planned evolution has a Drain Time less than one hour means the activity is not permitted to be performed; this restriction is a new requirement, not enforced by the current TS.

In Modes 4 and 5, when the reactor is subcritical, the RPV water level is a closely watched parameter by the licensed operators. Should an unexpected draining event occur, the control room personnel will be aware of abnormal water level conditions. Actions will be taken to mitigate the event prior to the RPV water level reaching the TAF. Injection under these conditions may be accomplished by the manual initiation logic (arming and depressing a pushbutton), or by manual startup of the ECCS and manually opening the associated injection valve. These actions are performed in the control room by the operating shift crew using established procedures and training should a draining event be detected. No additional shift manning would be needed to perform the actions.

If a dedicated operator is being credited for isolating a penetration flow path, the operator is required to be trained on how to close the penetration, to be in direct communication with the control room, and to be capable of closing the valve without the benefit of offsite power. The 1 hour Drain Time limit provides sufficient time for a draining event to be identified and for the operator to close the penetration.

The proposed Action E provides acceptable remedial actions until the LCO can be met as required by 10 CFR 50.36.

3.2.4. Proposed TS 3.5.2 Surveillances

The proposed TS 3.5.2 SRs provide assurance that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the LCO will be met.

The existing and proposed TS 3.5.2 Surveillances provide the option to place the Frequencies under licensee control in accordance with the Surveillance Frequency Control Program (SFCP) for those plants that have adopted an SFCP by an NRC approved license amendment. The SFCP was added by TSTF-425, "Relocate Surveillance Frequencies to Licensee Control - RITSTF Initiative 5b." The NRC model Safety Evaluation for TSTF-425 (74 FR 31996, July 6, 2009) states:

> All surveillance frequencies can be relocated except:
>
> - Frequencies that reference other approved programs for the specific interval (such as the Inservice Testing Program or the Primary Containment Leakage Rate Testing Program),
> - Frequencies that are purely event-driven (e.g., "Each time the control rod is withdrawn to the 'full out' position"),
> - Frequencies that are event-driven but have a time component for performing the surveillance on a one-time basis once the event occurs (e.g., "within 24 hours after thermal power reaching ≥ 95% RTP"), and
> - Frequencies that are related to specific conditions (e.g., battery degradation, age and capacity) or conditions for the performance of a surveillance requirement (e.g., "drywell to suppression chamber differential pressure decrease").

All of the existing and proposed surveillance Frequencies are simple periodic Frequencies (e.g., 12 hours, 18 months) and do not satisfy any of the exclusion criteria in the NRC model Safety Evaluation for TSTF-425. Therefore, for plants that have adopted an SFCP, the periodic Frequency is under licensee control and the initial Frequency is the fixed Frequency specified in the current TS.

3.2.4.1. <u>SR 3.5.2.1, Verify Drain Time</u>

SR 3.5.2.1 requires verification every 12 hours (or in accordance with the Surveillance Frequency Control Program) that the Drain Time is ≥ 36 hours.

The Frequency is 12 hours, which for most licensees equates to once per operating crew shift. This Frequency is sufficient in view of the indications of RPV water level available to the licensed operators in the control room or on the refueling floor. Under SR 3.0.1, Surveillances must be met while in the Applicability during and <u>between performances</u>. (Emphasis added). Therefore, as plant conditions change the Drain Time must be confirmed to be ≥ 36 hours or the LCO must be declared not met and the appropriate Actions followed.

The option to place this Frequency in the licensees SFCP is appropriate and consistent with similar LCOs and Surveillances. For example, the periodic verification Frequency is placed in the licensee's SFCP for LCO 3.2.1, "Average Planar Linear Heat Generator Rate (APLHGR)," LCO 3.2.2, "Minimum Critical Power Ratio (MCPR)," LCO 3.2.3, "Linear Heat Generation Rate (LHGR)," LCO 3.2.4, "Average Power Range Monitor (APRM) Gain and Setpoints," and BWR/4 LCO 3.4.4 and BWR/6 LCO 3.4.5, "RCS Operational LEAKAGE." Similar to the proposed LCO 3.5.2, each of these LCOs is based on a variable (similar to Drain Time), and the Frequency of the surveillance that periodically monitors the variable may be controlled by the SFCP.

While there are many instruments available to the licensed operator to monitor RPV water inventory, the proposed TS do not specify the instruments to be used to measure the RPV water level when determining the Drain Time. This is appropriate and consistent with similar existing TS. For example, in BWR/4 LCO 3.6.1.4, "Drywell Pressure," SR 3.6.1.4.1 states, "Verify drywell pressure is within limit." The instrument to be used to perform the measurement is not specified. The same is true for many other variable measurements, such as BWR/4 LCO 3.6.1.5, "Drywell Air Temperature," LCO 3.6.2.1, "Suppression Pool Average Temperature," and LCO 3.6.2.2, "Suppression Pool Water Level." Similar examples exist in the BWR/6 ISTS. There was a deliberate design decision made when creating the ISTS to specify in the Surveillances the variable to be measured and its limit, but not the method of measuring the variable. The licensee has the responsibility to use an appropriate instrument or method to perform the measurement.

Implementation details for the Drain Time calculation are in the proposed SR 3.5.2.1 Bases. These details do not alter the TS definition, but provide guidance to ensure consistent application of the requirements for particular situations. The Bases state:

> The definition of DRAIN TIME states that realistic cross-sectional areas and drain rates are used in the calculation. For a Control Rod RPV penetration flow path with the Control Rod Drive Mechanism removed and not replaced with a blank flange, the cross-sectional area is based on the control rod blade seated in the control rod guide tube. If the control rod blade will be raised from the penetration to adjust or verify seating of the blade, the exposed cross-sectional area of the RPV penetration flow path is used.
>
> The definition of DRAIN TIME excludes from the calculation those penetration flow paths connected to an intact closed system, or isolated by manual or automatic valves that are locked, sealed, or otherwise secured in the closed position, blank flanges, or other devices that prevent flow of reactor coolant through the penetration flow paths. A blank flange or other bolted device must be connected with a sufficient number of bolts to prevent draining in the event of an Operating Basis Earthquake. Normal or expected leakage from closed systems or past isolation devices is permitted. Determination that a

system is intact and closed or isolated must consider the status of branch lines and ongoing plant maintenance and testing activities.

The Residual Heat Removal (RHR) Shutdown Cooling System is only considered an intact closed system when misalignment issues (Reference 6[2]) have been precluded by functional valve interlocks or by isolation devices, such that redirection of RPV water out of an RHR subsystem is precluded. Further, RHR Shutdown Cooling System is only considered an intact closed system if its controls have not been transferred to Remote Shutdown, which disables the interlocks and isolation signals.

The exclusion of penetration flow paths from the determination of DRAIN TIME must consider the potential effects of a single operator error or initiating event on items supporting maintenance and testing (rigging, scaffolding, temporary shielding, piping plugs, snubber removal, freeze seals, etc.). If failure of such items could result and would cause a draining event from a closed system or between the RPV and the isolation device, the penetration flow path may not be excluded from the DRAIN TIME calculation.

Surveillance Requirement 3.0.1 requires SRs to be met between performances. Therefore, any changes in plant conditions that would change the DRAIN TIME requires that a new DRAIN TIME be determined.

The proposed SR 3.5.2.1 meets 10 CFR 50.36 requirements for surveillances by ensuring that the LCO will be met.

3.2.4.2. SR 3.5.2.2 and SR 3.5.2.3, ECCS Injection/Spray Subsystem Water Inventory

SR 3.5.2.2 and SR 3.5.2.3 verify that the water sources for the required ECCS injection/spray subsystem are available. The SRs are unchanged from the existing TS 3.5.2 requirements.

The BWR/4 Surveillances state:

SR 3.5.2.2	Verify, for a required low pressure coolant injection (LPCI) subsystem, the suppression pool water level is ≥ [12 ft 2 inches].

[2] Reference 6 is General Electric Service Information Letter No. 388, "RHR Valve Misalignment During Shutdown Cooling Operation for BWR 3/4/5/6," February 1983.

SR 3.5.2.3 Verify, for a required Core Spray (CS) subsystem, the:

a. Suppression pool water level is ≥ [12 ft 2 inches] or

b. Condensate storage tank water level is ≥ [12 ft].

The BWR/6 Surveillances state:

SR 3.5.2.2 Verify, for a required low pressure ECCS injection/spray subsystem, the suppression pool water level is ≥ [12.67 ft].

SR 3.5.2.3 Verify, for a required High Pressure Core Spray (HPCS) System, the:

a. Suppression pool water level is ≥ [12.67 ft] or

b. Condensate storage tank water level is ≥ [18 ft].

The Frequencies are unchanged, and are 12 hours or in accordance with the SFCP. In some BWR designs, the LPCI subsystem takes suction from the condensate storage tank. That design is reflected in SR 3.5.2.2. This is an acceptable deviation from the Traveler.

The proposed SR 3.5.2.2 and SR 3.5.2.3 meet the 10 CFR 50.36 requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the LCO will be met.

3.2.4.3. <u>SR 3.5.2.4, Verify Piping is Full of Water</u>

SR 3.5.2.4 verifies, for the required ECCS injection/spray subsystem, that the piping is filled with water from the pump discharge valve to the injection valve. This SR is unchanged from the existing SR 3.5.2.3 except as needed to reflect the changes to the LCO. The Frequency is unchanged, and is every 31 days or in accordance with the SFCP.

It is recognized that this SR is affected by TSTF Traveler TSTF-523, "Generic Letter 2008-01, Managing Gas Accumulation," which was approved by the NRC on January 15, 2014. The changes in TSTF-523 to the existing SR 3.5.2.3 are also applicable to the proposed SR 3.5.2.4. However, to avoid the complications of linking the staff review of a licensee requests to adopt TSTF-523 and TSTF-542, the changes in TSTF-523 are not incorporated into TSTF-542. Those licensees that have previously adopted TSTF-523 should use the following wording for SR 3.5.2.4:

> Verify, for the required ECCS injection/spray subsystem, locations susceptible to gas accumulation are sufficiently filled with water.

The proposed SR 3.5.2.4 meets the 10 CFR 50.36 requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the LCO will be met.

3.2.4.4. SR 3.5.2.5, Verify ECCS Injection/Spray Flow Path Valves are in the Correct Position

SR 3.5.2.5 verifies, for the required ECCS injection/spray subsystem, that each manual, power operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position. This SR is unchanged from the existing SR 3.5.2.4 except as needed to reflect the changes to the LCO. The Frequency is unchanged, and is every 31 days or in accordance with the SFCP.

It is recognized that this SR is affected by TSTF Traveler TSTF-523, "Generic Letter 2008-01, Managing Gas Accumulation," which was approved by the NRC on January 15, 2014. The changes in TSTF-523 to the existing SR 3.5.2.4 are also applicable to the proposed SR 3.5.2.5. However, to avoid the complications of linking the staff review of a licensee requests to adopt TSTF-523 and TSTF-542, the changes in TSTF-523 are not incorporated into TSTF-542.

Those licensees that have previously adopted TSTF-523 should use the following wording for SR 3.5.2.5:

> -------------------------------NOTE---------------------------
> Not required to be met for system vent flow paths
> opened under administrative control.
> --
> Verify, for the required ECCS injection/spray subsystem, each manual, power operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position.

The proposed SR 3.5.2.5 meets the 10 CFR 50.36 requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the LCO will be met.

3.2.4.5. SR 3.5.2.6, ECCS Subsystem Operation

Existing SR 3.5.2.5 requires verification that each ECCS pump develops a specified flow rate at a corresponding specified reactor pressure. This test is not included in the proposed TS 3.5.2. TS 3.5.1, "ECCS - Operating," which is applicable in Modes 1, 2, and 3, contains SR 3.5.1.7, SR 3.5.1.8, and SR 3.5.1.9, which require verification that the ECCS pumps develop the specified flow rate. It is not necessary to perform similar flow rate tests during the relatively small fraction of an operating cycle when the plant is in Modes 4 and 5 to ensure the pumps are capable of maintaining water level above the TAF. Further, the current SR 3.5.2.5 requires the containment spray pumps and low pressure injection pumps to demonstrate flow rates in the thousands of gallons a minute (the values in the Standard Technical Specifications are 4,250 gpm and 7,700 gpm, but may vary by plant.) As discussed in Section 3.2.1.4 of the justification, most RPV penetration flow paths would only permit a drain rate of tens or hundreds of gallons per minute. Therefore, the flow rates specified in the existing SR are not needed to mitigate an unexpected draining event. As discussed in Section 3.2.4.7 of the justification, there are no safety analyses which establish a minimum pump flow needed to respond to an unexpected draining event. Therefore, there is no basis for establishing a minimum flow rate for the SR that is consistent with the specified safety function in Modes 4 and 5.

As an alternative to the existing SR, SR 3.5.2.5 is renumbered SR 3.5.2.6 and calls for operation of the required ECCS injection/spray subsystem through the recirculation line for ≥ 10 minutes. The proposed test will ensure that the required ECCS injection/spray subsystem is capable to being manually stated and will operate to mitigate an unexpected draining event. Testing the ECCS injection/spray subsystem through the recirculation line is necessary to avoid overfilling the refueling cavity. The minimum operating time of 10 minutes was based on engineering judgement. The performance frequency of 92 days or in accordance with the Surveillance Frequency Control Program was retained from the existing ISTS and is consistent with the at-power testing requirement of SR 3.5.1.7.

3.2.4.6. <u>SR 3.5.2.7, Verification of Valve Actuation</u>

SR 3.5.2.7 requires verification that each valve credited in the Drain Time calculation for automatically isolating a penetration flow path actuates to the isolation position on an actual or simulated isolation signal. The definition of Drain Time states that RPV penetration flow paths may be excluded from the Drain Time calculation if the penetration flow paths are capable of being isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the TAF when actuated by RPV water level isolation instrumentation. This SR verifies that the valves will actuate when a signal is received and, together with TS 3.3.5.2, ensures valves assumed to close on low RPV water level will do so.

The Frequency is [18] months or in accordance with the SFCP. The Frequency is consistent with similar valve actuation tests in the TS. Operating experience has shown these components usually pass the Surveillance when performed at the [18] month Frequency and is acceptable for demonstrating reliable operation.

The proposed SR 3.5.2.7 meets the 10 CFR 50.36 requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the LCO will be met.

3.2.4.7. <u>SR 3.5.2.8, Verification of Manual ECCS Injection/Spray Subsystem</u>

SR 3.5.2.8 requires verification that the required ECCS injection/spray subsystem actuates on a manual initiation signal. This is similar to existing SR 3.5.2.6, except that a manual initiation signal is required instead of an automatic signal. As discussed previously, the ECCS pumps are high-capacity pumps, with flow rates of thousands of gallons per minute. Most RPV penetration flow paths would only permit a drain rate of tens or hundreds of gallons per minute and automatic initiation of an ECCS pump could result in overflowing the reactor cavity. The Drain Time restrictions ensure there is sufficient time for manual operator action to respond to an unexpected draining event that requires use of the ECCS injection/spray subsystem. The SR is modified by a Note (also in the current SR), which excludes vessel injection spray from the SR. Since all active components are testable and full flow can be demonstrated by recirculation through the test line, coolant injection into the RPV is not required during the Surveillance. The instrumentation and logic needed for manual initiation of an ECCS injection/spray subsystem are required by TS 3.3.5.2.

The Frequency of this Surveillance is [18] months or in accordance with the SFCP. The Frequency is unchanged from the current SR and is consistent with the Frequency of

SR 3.3.5.1.6. The [18] month Frequency is based on the need to perform the Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance was performed with the reactor at power. Operating experience has shown these components usually pass the Surveillance when performed at the [18] month Frequency and is acceptable for demonstrating reliable operation.

The proposed SR 3.5.2.8 meets the 10 CFR 50.36 requirements for surveillances by ensuring that the necessary quality of systems and components is maintained and that the LCO will be met.

3.3. Proposed TS 3.3.5.2, Reactor Pressure Vessel Water Inventory Control Instrumentation

A new TS 3.3.5.2, "Reactor Pressure Vessel Water Inventory Control Instrumentation," is proposed, which will describe the instrumentation requirements associated with LCO 3.5.2, "Reactor Pressure Vessel Water Inventory Control." This follows the BWR TS format convention of an instrumentation TS numbered in the form "3.X.Y.Z" containing the instrumentation requirements for the system TS numbered "X.Y.Z." The existing TS 3.3.5.2, "RCIC System Instrumentation," is renumbered TS 3.3.5.3. This increases consistency within the BWR TS as the Reactor Core Isolation Cooling (RCIC) System is discussed in TS 3.5.3.

The current TS contain instrumentation requirements related to OPDRVs in four TS. The proposed TS 3.3.5.2 consolidates the instrumentation requirements in a single location to simplify the presentation and provide requirements consistent with TS 3.5.2.

The following sections describe the requirements in the proposed TS 3.3.5.2. Section 3.4.1 discusses changes to other instrumentation TS, which includes relocation of requirements to TS 3.3.5.2 and other changes.

3.3.1. Proposed TS 3.3.5.2 LCO and Applicability

The proposed LCO 3.3.5.2 states:

> The RPV Water Inventory Control instrumentation for each Function in Table 3.3.5.2-1 shall be OPERABLE.

The Applicability states, "According to Table 3.3.5.2-1."

Table 3.3.5.2-1 contains those instrumentation Functions needed to support manual initiation of the ECCS injection/spray subsystem required by LCO 3.5.2, and automatic isolation of penetration flow paths that may be credited in a calculation of Drain Time. The Functions in Table 3.3.5.2-1 are moved from existing TS 3.3.5.1, "ECCS Instrumentation," and TS 3.3.6.1, "Primary Containment Isolation Instrumentation" Functions that are required in Modes 4 or 5 or during OPDRVs. Creation of TS 3.3.5.2 places these Functions in a single location with requirements appropriate to support the safety function for TS 3.5.2.

If plant-specific design and TS require different functions to support manual initiation of an ECCS subsystem, those functions should be included in TS 3.3.5.2.

If the plant-specific design and TS provide different automatic functions that can be credited for isolating penetration flow paths below the TAF on low RPV water level, those functions should be included in TS 3.3.5.2.

3.3.2. Proposed TS 3.3.5.2 Actions

TS 3.3.5.2 contains Actions to be followed when the LCO is not met.

3.3.2.1. BWR/4 and BWR/6 Action A

Action A applies when one or more channels are inoperable and directs the licensee to immediately enter the Condition referenced in Table 3.3.5.2-1 for the channel. This construction of an Action that directs the licensee to immediately enter the Condition referenced in the Function table is the usual construction of instrumentation TS in the BWR STS.

3.3.2.2. BWR/4 and BWR/6 Action B

Action B is referenced in Table 3.3.5.2-1 by the RHR System Isolation and Reactor Water Cleanup (RWCU) Isolation Functions. These Functions are applicable when automatic isolation of the associated penetration flow path is credited in calculating Drain Time. If the instrumentation is inoperable, Required Action B.1 directs an immediate declaration that the associated penetration flow path(s) are incapable of automatic isolation. Required Action B.2 requires calculation of Drain Time. The calculation cannot credit automatic isolation of the affected penetration flow paths.

3.3.2.3. BWR/4 and BWR/6 Action C

Action C is referenced in Table 3.3.5.2-1 by permissive Functions necessary for ECCS subsystem manual initiation. If the permissive is inoperable, manual initiation of ECCS using the control board pushbuttons is prevented. Therefore, the Function must be placed in the trip condition within 1 hour. With the permissive in the trip condition, manual initiation may be performed using the control board pushbuttons. However, prior to placing the permissive in the tripped condition, the operator can take manual control of the pump and the injection valve to inject water into the RPV. Therefore, providing a Completion Time of 1 hour is appropriate to allow the operator time to evaluate any discovered inoperabilities and to place the channel in trip.

3.3.2.4. BWR/4 Action D and BWR/6 Action F

BWR/4 Action D and BWR/6 Action F are referenced in Table 3.3.5.2-1 by bypass Functions and the manual initiation Functions. If the bypass is inoperable, there is a risk that the associated ECCS pump could overheat when the pump is operating and the associated injection valve is not fully open. In this condition, the operator can take manual control of the pump and the injection valve to ensure the pump does not overheat. If a manual initiation Function is inoperable, the ECCS subsystem pumps can be started manually and the valves can be opened manually, but this is not the preferred condition. Because the functions can be performed manually, a 24 hour Completion Time was chosen to allow time for the operator to evaluate and repair any discovered inoperabilities. The Completion Time is appropriate given the ability to manually

start the ECCS pumps and open the injection valves and to manually ensure a pump does not overheat.

3.3.2.5. BWR/6 Action D and Action E

BWR/6 Action D ensures that appropriate actions are taken if multiple, inoperable channels within the same Function result in a loss of automatic suction swap for the associated High Pressure Core Spray (HPCS) system from the condensate storage tank to the suppression pool. The HPCS system must be declared inoperable within 1 hour or the HPCS pump suction must be aligned to the suppression pool, since, if aligned, the Function is already performed. One hour is provided to take the action in order to minimize the risk of HPCS being needed without an adequate water source, while allowing time for restoration or alignment of HPCS pump suction to the suppression pool.

BWR/6 Action E ensures that appropriate actions are taken if the HPCS Reactor Vessel Water Level - High, Level 8 function is inoperable. If the inoperability results in the channel being tripped, the HPCS pump discharge valve will not open and HPCS injection is prevented. In such a situation, the HPCS system must be declared inoperable within 1 hour, and the function must be restored to Operable status within 24 hours. The 1 hour Completion Time is provided to declare the HPCS inoperable. The 24 hour Completion Time was chosen to allow time for the operator to evaluate and repair any discovered inoperabilities. The Completion Time is appropriate given the ability to manually start the HPCS and open the discharge valve.

3.3.2.6. BWR/4 Action E and BWR/6 Action G

If the Required Action and associated Completion Time of Required Action of BWR/4 Condition C or D, or BWR/6 Condition C, D, E, or F are not met, the associated low pressure ECCS injection/spray subsystem may be incapable of performing the intended function, and the ECCS subsystem must be declared inoperable immediately.

3.3.3. Proposed TS 3.3.5.2 Surveillances

The TS 3.3.5.2 Surveillance Requirements include Channel Checks, Channel Functional Tests, and Logic System Functional Tests. These tests are adequate to ensure the Function is operable (i.e., capable of performing its specified safety function). TS 3.3.5.2 does not include Surveillances to verify or adjust the instrument setpoint derived from the Allowable Value using a Channel Calibration or a Surveillance to calibrate the trip unit. A draining event in Mode 4 or 5 is not an analyzed accident and, therefore, there is no accident analysis on which to base the calculation of a setpoint. The purpose of the Functions is to allow ECCS manual initiation or to automatically isolate a penetration flow path, but no specific RPV water level is assumed for those actions. Therefore, the Mode 3 Allowable Value was chosen for use in Modes 4 and 5 as it will perform the desired function. Calibrating the Functions in Modes 4 and 5 is not necessary, as TS 3.3.5.1 and TS 3.3.6.1 continue to require the Functions to be calibrated on an [18] month Frequency. This is adequate to ensure the channel responds with the required accuracy.

TS 3.3.5.2 also does not include ECCS Response Time testing and Isolation System Response Time testing. ECCS Response Time and Isolation System Response Time testing ensure that the individual channel response times are less than or equal to the maximum values assumed in the

accident analysis. A draining event in Mode 4 or 5 is not an analyzed accident and, therefore, there are no accident analysis assumptions on response time.

3.3.3.1. SR 3.3.5.2.1

SR 3.3.5.2.1 requires a Channel Check and is applied to all Functions except manual initiation. Performance of the Channel Check ensures that a gross failure of instrumentation has not occurred. A Channel Check is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A Channel Check guarantees that undetected outright channel failure is limited; thus, it is key to verifying the instrumentation continues to operate properly between each Channel Functional Test. The Frequency of 12 hours, or in accordance with the Surveillance Frequency Control Program, is consistent with the existing requirements.

3.3.3.2. SR 3.3.5.2.2

SR 3.3.5.2.2 requires a Channel Functional Test and is applied to all Functions except manual initiation. A Channel Functional Test is the injection of a simulated or actual signal into the channel as close to the sensor as practicable to verify operability of all devices in the channel required for channel operability, and is performed on each required channel to ensure that the entire channel will perform the intended function. The Frequency of 92 days, or in accordance with the Surveillance Frequency Control Program, is consistent with the existing requirements for these Functions and is based upon operating experience that demonstrates channel failure is rare.

3.3.3.3. SR 3.3.5.2.3

SR 3.3.5.2.3 requires a Logic System Functional Test and is only applied to the manual initiation Functions. The Logic System Functional Test is 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, and demonstrates the operability of the required manual initiation logic for a specific channel. The ECCS subsystem functional testing performed in proposed SR 3.5.2.7 overlaps this Surveillance to complete testing of the assumed safety function. The Frequency of [18] months, or in accordance with the Surveillance Frequency Control Program, is consistent with the existing requirements, and is based upon operating experience that that has shown that these components usually pass the Surveillance when performed at this Frequency.

3.3.4. Proposed Table 3.3.5.2-1, "RPV Water Inventory Control Instrumentation"

For each Function in Table 3.3.5.2-1, the following discusses the purpose of the Function, the Applicability, the number of required channels, the Condition to be entered if the Function is inoperable, the applicable Surveillance Requirements, and the selection of the Allowable Value. Justification of differences between the existing TS requirements and the proposed requirements are also discussed.

3.3.4.1. 1.a and 2.a, BWR/4 Core Spray System and Low Pressure Coolant Injection (LPCI) System Reactor Steam Dome Pressure - Low (Injection Permissive)

Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS injection/spray subsystem manual initiation Functions. This function ensures that, prior to opening the injection valves of the low pressure ECCS subsystems, the reactor pressure has fallen to a value below these subsystems' maximum design pressure. While it is assured during Modes 4 and 5 that the reactor steam dome pressure will be below the ECCS maximum design pressure, the Reactor Steam Dome Pressure - Low signals are required to be operable and capable of permitting initiation of the ECCS.

The Reactor Steam Dome Pressure - Low signals are initiated from four pressure transmitters that sense the reactor dome pressure. The transmitters are connected to four trip units. The outputs of the trip units are connected to relays whose contacts are arranged in a one-out-of-two taken twice logic. As a result, all four pressure transmitter channels are required to permit manual initiation of an ECCS train required to be operable and capable of manual initiation by LCO 3.5.2.

The Allowable Value specified in LCO 3.3.5.2A is low enough to prevent overpressurizing the equipment in the low pressure ECCS. The lower limit Allowable Values, applicable in Modes 1, 2, and 3, are not included for Modes 4 and 5, such that only a maximum pressure is specified.

These Functions were moved from TS 3.3.5.1, Function 1.c and Function 2.c. The following changes are made:

- The Applicability is changed. The TS 3.3.5.1 Applicability for these Functions in Modes 4 and 5 is modified by a Note that limits the Applicability to when the associated ECCS subsystem(s) are required to be operable per LCO 3.5.2, "ECCS - Shutdown." The proposed Applicability is Modes 4 and 5 without exception, to be consistent with the Applicability of LCO 3.5.2, "RPV Water Inventory Control."

- The number of required channels per Function is unchanged.

- The TS 3.3.5.1 Required Actions B.1 and B.3 for an inoperable channel is to declare the supported feature(s) inoperable within 1 hour of discovery when its redundant feature ECCS initiation capability is inoperable, and to place the channel in trip within 24 hours. The proposed TS 3.3.5.2, Action C, requires placing the channel in trip within 1 hour. No redundant ECCS subsystem is required by TS 3.5.2. This more restrictive action is appropriate because when the Function is inoperable, manual initiation of ECCS may be prohibited. With the permissive in the trip condition, manual initiation may be performed.

- A Channel Check and Channel Functional Test are required at the existing Frequency. Calibration of the trip units, Channel Calibration, Logic System Functional Test, and ECCS Response Time tests are no longer required in Modes 4 and 5, as discussed in Section 3.3.3.

- In LCO 3.3.5.2A, the Allowable Value is revised to eliminate the low pressure limit and to retain the high pressure limit. The RPV is well below the lower limit in Modes 4 and 5, so the low pressure limit is not needed.

3.3.4.2. <u>1.b and 2.b, BWR/4 Core Spray System and Low Pressure Coolant Injection (LPCI) System Core Spray Pump Discharge Flow - Low (Bypass)</u>

The minimum flow instruments are provided to protect the associated low pressure ECCS pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow is sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump.

One flow transmitter per ECCS pump is used to detect the associated subsystems' flow rates. The logic is arranged such that each transmitter causes its associated minimum flow valve to open. The logic will close the minimum flow valve once the closure setpoint is exceeded. The LPCI minimum flow valves are time delayed such that the valves will not open for 10 seconds after the switches detect low flow. The time delay is provided to limit reactor vessel inventory loss during the startup of the RHR shutdown cooling mode.

The Allowable Values specified in LCO 3.3.5.2A are high enough to ensure that the pump flow rate is sufficient to protect the pump, yet low enough to ensure that the closure of the minimum flow valve is initiated to allow full flow into the core.

One channel of the Pump Discharge Flow - Low Function is required to be operable in Modes 4 and 5 when the associated Core Spray or LPCI pump is required to be operable by LCO 3.5.2 to ensure the pumps are capable of injecting into the Reactor Pressure Vessel when manually initiated.

These Functions were moved from TS 3.3.5.1, Function 1.d and Function 2.g. The following changes are made:

- The Applicability is changed. The TS 3.3.5.1 Applicability for these Functions in Modes 4 and 5 is modified by a Note that limits the Applicability to when the associated ECCS subsystem(s) are required to be operable per LCO 3.5.2, "ECCS - Shutdown." The proposed Applicability is Modes 4 and 5 without exception, to be consistent with the Applicability of LCO 3.5.2, "RPV Water Inventory Control."

- The number of required channels per Function is changed from "[2] or [4]" or "[1 per pump]," to "[1 per pump]" and is modified by a note stating "Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, 'Reactor Pressure Vessel Water Inventory Control'." TS 3.5.2 only requires a single ECCS subsystem and the change in required channels reflects that requirement.

- The TS 3.3.5.1 Required Actions E.1 and E.2 for an inoperable channel is to declare the supported feature(s) inoperable within 1 hour of discovery when its redundant feature ECCS initiation capability is inoperable, and to restore the channel to operable status within 7 days. The proposed TS 3.3.5.2, Action D, requires restoring the channel to

operable status within 24 hours. No redundant ECCS subsystem is required by TS 3.5.2. When this Function is inoperable, the ECCS subsystem is capable of injecting but is vulnerable to a low flow condition if the injection valve is not open. This equipment protective function can be performed by the operator by manually starting and stopping the pump and opening the injection valve. Therefore, allowing 24 hours to restore the equipment protective function is a reasonable period.

- A Channel Check and Channel Functional Test are required at the existing Frequency. A Channel Calibration and Logic System Functional Test are no longer required in Modes 4 and 5, as discussed in Section 3.3.3.

- In LCO 3.3.5.2A, the allowable value is unchanged.

3.3.4.3. <u>1.c and 2.c, BWR/4 Core Spray System and Low Pressure Coolant Injection (LPCI) System Core Spray Manual Initiation</u>

The Manual Initiation push button channels introduce signals into the appropriate ECCS logic to provide manual initiation capability. There is one push button for each of the CS and LPCI subsystems (i.e., two for CS and two for LPCI).

There is no Allowable Value for this Function specified in LCO 3.3.5.2A or LCO 3.3.5.2B since the channels are mechanically actuated based solely on the position of the push buttons.

A channel of the Manual Initiation Function (one channel per subsystem) is required to be OPERABLE in MODES 4 and 5 when the associated ECCS subsystems are required to be OPERABLE per LCO 3.5.2.

These Functions were moved from TS 3.3.5.1, Function 1.e and Function 2.h. The following changes are made:

- The Applicability is changed. The TS 3.3.5.1 Applicability for these Functions in Modes 4 and 5 is modified by a Note that limits the Applicability to when the associated ECCS subsystem(s) are required to be operable per LCO 3.5.2, "ECCS - Shutdown." The proposed Applicability is Modes 4 and 5 without exception, to be consistent with the Applicability of LCO 3.5.2, "RPV Water Inventory Control."

- The number of required channels per Function is changed from "[2]" or "[1 per subsystem]," to "[1 per subsystem]" and is modified by a note stating "Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, 'Reactor Pressure Vessel Water Inventory Control'." TS 3.5.2 only requires a single ECCS subsystem and the change in required channels reflects that requirement.

- The TS 3.3.5.1 Required Actions C.1 and C.2 for an inoperable channel are to declare the supported feature(s) inoperable within 1 hour of discovery when its redundant feature ECCS initiation capability is inoperable, and to restore the channel to operable status within 24 hours. The proposed TS 3.3.5.2, Action D, requires restoring the channel to operable status within 24 hours. No redundant ECCS subsystem is required by TS 3.5.2.

When this Function is inoperable, the ECCS pumps can be started manually and valves can be opened manually, but cannot be manually initiated with the control board push buttons. This is not the preferred condition. Therefore, allowing 24 hours to restore the Function to operable status is a reasonable period.

- Both the existing TS 3.3.5.1 and the proposed TS 3.3.5.2 require a Logic System Functional Test on this Function at the same Frequency.

- There is no allowable value for this Function.

3.3.4.4. <u>3.a, BWR/4 RHR System Isolation Reactor Vessel Water Level - Low, Level 3</u>

The definition of Drain Time allows crediting the closing of penetration flow paths that are capable of being automatically isolated by RPV water level isolation instrumentation prior to the RPV water level being equal to the TAF. The Reactor Vessel Water Level - Low, Level 3 Function may be credited for automatic isolation of penetration flow paths associated with the RHR System.

Reactor Vessel Water Level - Low, Level 3 signals are initiated from two channels per trip system that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Two channels per trip system are required when automatic isolation of the associated penetration flow path(s) is credited in calculating DRAIN TIME to meet LCO 3.5.2.

In LCO 3.3.5.2A, the Reactor Vessel Water Level - Low, Level 3 Allowable Value was chosen to be the same as the Primary Containment Isolation Instrumentation Reactor Vessel Water Level - Low, Level 3 Allowable Value (LCO 3.3.6.1), since the capability to cool the fuel may be threatened.

The Reactor Vessel Water Level - Low, Level 3 Function is only required to be operable when automatic isolation of the associated penetration flow path is credited in calculating Drain Time.

This Function was moved from TS 3.3.6.1, Function 6.b. The following changes are made:

- The function name is changed from "Shutdown Cooling System Isolation Reactor Vessel Water Level - Low, Level 3" to "Residual Heat Removal System Isolation Reactor Vessel Water Level - Low, Level 3." The current title is a misnomer in the Standard Technical Specifications as the Level 3 instruments isolate more than Shutdown Cooling isolation valves.

- The Applicability is changed. The TS 3.3.6.1 Applicability for this Function is Modes 4 and 5. The proposed Applicability is "when automatic isolation of the associated penetration flow path is credited in calculating Drain Time." In other words, if the Drain Time calculation assumes the RHR System would be automatically isolated, this Function must be operable to perform that function. This is consistent with the definition of Drain Time and the TS 3.5.2 requirements.

- The number of required channels is changed from [2], with a column header that states "Required Channels per Trip System," to [2 in one trip system]. This retains the requirement that the two channels must be associated with the same trip system. Only one trip system is required to ensure automatic isolation of one of the two isolation valves will occur on low reactor vessel water level.

- The TS 3.3.6.1 Required Action J.1 and J.2 for an inoperable channel is to immediately initiate action to restore the channel to operable status or to immediately initiate action to isolate the RHR Shutdown Cooling system. The TS 3.5.2 Action B requires declaring the associated penetration flow path(s) incapable of automatic isolation. This will require Drain Time to be recalculated without crediting automatic isolation of the affected penetration flow paths and following any applicable Actions. The proposed Actions are consistent with the definition of Drain Time and the requirements of LCO 3.5.2.

- A Channel Check and Channel Functional Test are required at the existing Frequency. A calibration of the trip unit, Channel Calibration, and Logic System Functional Test are no longer required in Modes 4 and 5, as discussed in Section 3.3.3.

- The allowable value is unchanged.

3.3.4.5. <u>4.a, BWR/4 Reactor Water Cleanup (RWCU) System Isolation, Reactor Vessel Water Level - Low Low, Level 2</u>

The definition of DRAIN TIME allows crediting the closing of penetration flow paths that are capable of being automatically isolated by RPV water level isolation instrumentation prior to the RPV water level being equal to the TAF. The Reactor Vessel Water Level - Low Low, Level 2 Function associated with RWCU System isolation may be credited for automatic isolation of penetration flow paths associated with the RWCU System.

Reactor Vessel Water Level - Low Low, Level 2 is initiated from two channels per trip system that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Each trip system isolates one of two redundant isolation valves and only one trip system is required to be operable when automatic isolation of the associated penetration flow path(s) is credited in calculating Drain Time to meet LCO 3.5.2.

The Reactor Vessel Water Level - Low Low, Level 2 Allowable Value was chosen to be the same as the ECCS Reactor Vessel Water Level - Low Low, Level 2 Allowable Value (LCO 3.3.5.1), since the capability to cool the fuel may be threatened.

The Reactor Vessel Water Level - Low Low, Level 2 Function is only required to be OPERABLE when automatic isolation of the associated penetration flow path is credited in calculating DRAIN TIME.

This Function was copied from TS 3.3.6.1, Function 5.e. The following changes are made:

- The Applicability is changed. The TS 3.3.6.1 Applicability for this Function is Modes 1, 2, and 3. The proposed Applicability is "when automatic isolation of the associated penetration flow path is credited in calculating Drain Time." In other words, if the Drain Time calculation assumes the RWCU System will be automatically isolated, this Function must be operable to perform that function. This is consistent with the definition of Drain Time and the TS 3.5.2 requirements.

- The number of required channels is changed from [2], with a column header that states "Required Channels per Trip System," to [2 in one trip system]. This retains the requirement that the two channels must be associated with the same trip system. Only one trip system is required to ensure that automatic isolation of one of the two isolation valves will occur on low reactor vessel water level.

- The TS 3.3.6.1 Required Action F.1 for an inoperable channel is to isolate the affected penetration flow path(s) within 1 hour. The TS 3.5.2 Action B requires declaring the associated penetration flow path(s) incapable of automatic isolation. This will require Drain Time to be recalculated without crediting automatic isolation of the affected penetration flow paths and following any applicable Actions. The proposed Actions are consistent with the definition of Drain Time and the requirements of LCO 3.5.2.

- A Channel Check and Channel Functional Test are required at the existing Frequency. A calibration of the trip unit, Channel Calibration, Logic System Functional Test, and Isolation System Response Time tests are no longer required in Modes 4 and 5, as discussed in Section 3.3.3.

- The allowable value is unchanged.

3.3.4.6. <u>1.a and 2.a, BWR/6 Low Pressure Core Spray and Low Pressure Coolant Injection Systems Reactor Steam Dome Pressure - Low (Injection Permissive)</u>

Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS subsystems. This ensures that, prior to opening the injection valves of the low pressure ECCS subsystems, the reactor pressure has fallen to a value below these subsystems' maximum design pressure. While it is assured during Modes 4 and 5 that the reactor steam dome pressure will be below the ECCS maximum design pressure, the Reactor Steam Dome Pressure - Low signals are assumed to be operable and capable of permitting initiation of the ECCS.

The Reactor Steam Dome Pressure - Low signals are initiated from four pressure transmitters that sense the reactor dome pressure. The four pressure transmitters each drive a master and slave trip unit. The outputs of the trip units are connected to relays whose contacts are arranged in a one-out-of-two taken twice logic for each Division.

In LCO 3.3.5.2A, the Allowable Value is low enough to prevent overpressurizing the equipment in the low pressure ECCS.

Three channels of Reactor Steam Dome Pressure - Low Function per associated ECCS Division are only required to be OPERABLE in MODES 4 and 5 when ECCS Manual Initiation is required to be OPERABLE, since these channels support the manual initiation Function. In addition, the channels are only required when the associated ECCS subsystem is required to be OPERABLE by LCO 3.5.2.

These Functions were moved from TS 3.3.5.1, Function 1.d and Function 2.d[3]. The following changes are made:

- The Applicability is changed. The TS 3.3.5.1 Applicability for these Functions in Modes 4 and 5 is modified by a Note that limits the Applicability to when the associated ECCS subsystem(s) are required to be operable per LCO 3.5.2, "ECCS - Shutdown." The proposed Applicability is Modes 4 and 5 without exception, to be consistent with the Applicability of LCO 3.5.2, "RPV Water Inventory Control."

- The number of required channels per Function remains [3] and is modified by a note stating "Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, 'Reactor Pressure Vessel Water Inventory Control'." TS 3.5.2 only requires a single ECCS subsystem to be operable and the change reflects that requirement.

- The TS 3.3.5.1 Required Actions B.1 and B.3 for an inoperable channel is to declare the supported feature(s) inoperable within 1 hour of discovery when its redundant feature ECCS initiation capability is inoperable, and to place the channel in trip within 24 hours. The proposed TS 3.3.5.2, Action C, requires placing the channel in trip within 1 hour. No redundant ECCS subsystem is required by TS 3.5.2. This more restrictive action is appropriate because when the Function is inoperable, manual initiation of ECCS is prohibited. With the permissive in the trip condition, manual initiation may be performed.

- A Channel Check and Channel Functional Test are required at the existing Frequency. Calibration of the trip units, Channel Calibration, Logic System Functional Test, and ECCS Response Time tests are no longer required in Modes 4 and 5, as discussed in Section 3.3.3.

- In LCO 3.3.5.2A, the allowable value is revised to eliminate the low pressure limit and to retain the high pressure limit. The RPV is well below the lower limit in Modes 4 and 5, so the low pressure limit is not needed.

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[3] NUREG-1434 (BWR/6 STS) does not include Mode 4 and 5 applicability for this function. This appears to be an error and a survey of the applicable plants indicates that Mode 4 and 5 applicability is in the design and has been included in their TS. Therefore, it is added to the proposed TS 3.3.5.2 functions.

3.3.4.7. 1.b, 1.c, and 2.b, BWR/6 Low Pressure Core Spray and Low Pressure Coolant Injection Systems Low Pressure Coolant Injection and Low Pressure Core Spray Pump Discharge Flow - Low (Bypass)

The minimum flow instruments are provided to protect the associated low pressure ECCS pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow is sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump.

One flow transmitter per ECCS pump is used to detect the associated subsystems' flow rates. The logic is arranged such that each transmitter causes its associated minimum flow valve to open. The logic will close the minimum flow valve once the closure setpoint is exceeded. The LPCI minimum flow valves are time delayed such that the valves will not open for 10 seconds after the switches detect low flow. The time delay is provided to limit reactor vessel inventory loss during the startup of the RHR shutdown cooling mode (for RHR A and RHR B).

The Allowable Values specified in LCO 3.3.5.2A are high enough to ensure that the pump flow rate is sufficient to protect the pump, yet low enough to ensure that the closure of the minimum flow valve is initiated to allow full flow into the core.

One channel of the Pump Discharge Flow - Low Function is required to be operable in Modes 4 and 5 when the associated LPCS or LPCI pump is required to be operable by LCO 3.5.2 to ensure the pumps are capable of injecting into the Reactor Pressure Vessel when manually initiated.

These Functions were moved from TS 3.3.5.1, Function 1.e, 1.f, and 2.e. The following changes are made:

- The Applicability is changed. The TS 3.3.5.1 Applicability for these Functions is Modes 4 and 5 when the associated ECCS subsystem(s) are required to be operable per LCO 3.5.2, "ECCS - Shutdown." The proposed Applicability is Modes 4 and 5 without exception, to be consistent with the Applicability of LCO 3.5.2, "RPV Water Inventory Control."

- The number of required channels per Function is changed from "[1]" to "[1 per pump]" and is modified by a note stating "Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, 'Reactor Pressure Vessel Water Inventory Control'." TS 3.5.2 only requires a single ECCS subsystem and the change in required channels reflects that requirement.

- The TS 3.3.5.1 Required Actions E.1 and E.2 for an inoperable channel is to declare the supported feature(s) inoperable within 1 hour of discovery when its redundant feature ECCS initiation capability is inoperable, and to restore the channel to operable status within 7 days. The proposed TS 3.3.5.2, Action E, requires restoring the channel to operable status within 24 hours. No redundant ECCS subsystem is required by TS 3.5.2. When this Function is inoperable, the ECCS subsystem is capable of injecting but is vulnerable to a low flow condition if the injection valve is not open. This equipment

protective function can be performed by the operator by manually starting and stopping the pump and opening the injection valve. Therefore, allowing 24 hours to restore the equipment protective function is a reasonable period.

- A Channel Check and Channel Functional Test are required at the existing Frequency. Calibrating the trip unit, Channel Calibration and Logic System Functional Test are no longer required in Modes 4 and 5, as discussed in Section 3.3.3.

- In LCO 3.3.5.2A, the allowable value is unchanged.

3.3.4.8. 2.c, BWR/6 Low Pressure Core Spray and Low Pressure Coolant Injection Systems Manual Initiation

The Manual Initiation push button channels introduce signals into the appropriate ECCS logic to provide manual initiation capability. There is one push button for each of the two Divisions of low pressure ECCS (i.e., Division 1 ECCS, LPCS and LPCI A; Division 2 ECCS, LPCI B and LPCI C). The only the manual initiation function required to be OPERABLE is that associated with the ECCS subsystem required to be OPERABLE by LCO 3.5.2.

There is no Allowable Value for this Function in LCO 3.3.5.2A or LCO 3.3.5.2B since the channels are mechanically actuated based solely on the position of the push buttons.

These Functions were moved from TS 3.3.5.1, Function 1.g and Function 2.f. The following changes are made:

- The Applicability is changed. The TS 3.3.5.1 Applicability for these Functions in Modes 4 and 5 is modified by a Note that limits the Applicability to when the associated ECCS subsystem(s) are required to be operable per LCO 3.5.2, "ECCS - Shutdown." The proposed Applicability is Modes 4 and 5 without exception, to be consistent with the Applicability of LCO 3.5.2, "RPV Water Inventory Control."

- The number of required channels per Function is changed from "[1]" to "[1 per subsystem]" and is modified by a note stating "Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, 'Reactor Pressure Vessel Water Inventory Control'." TS 3.5.2 only requires a single ECCS subsystem and the change in required channels reflects that requirement.

- The TS 3.3.5.1 Required Actions C.1 and C.2 for an inoperable channel is to declare the supported feature(s) inoperable within 1 hour of discovery when its redundant feature ECCS initiation capability is inoperable, and to restore the channel to operable status within 24 hours. The proposed TS 3.3.5.2, Action E, requires restoring the channel to operable status within 24 hours. No redundant ECCS subsystem is required by TS 3.5.2. When this Function is inoperable, the ECCS pumps can be started manually and valves can be opened manually, but manual initiation with the control board push buttons is inoperable. This is not the preferred condition. Therefore, allowing 24 hours to restore the function to operable status is a reasonable period.

- Both the existing TS 3.3.5.1 and the proposed TS 3.3.5.2 require a Logic System Functional Test on this Function at the same Frequency.

- There is no allowable value for this Function.

3.3.4.9. 3.a, BWR/6 High Pressure Core Spray System Reactor Vessel Water Level - High, Level 8

The high RPV water level Level 8 signal is used to close the HPCS injection valve to prevent overflow into the main steam lines (MSLs). Reactor Vessel Water Level - High, Level 8 signals for HPCS are initiated from two level transmitters from the narrow range water level measurement instrumentation. One channel associated with the HPCS System required to be operable by LCO 3.5.2 is required to be operable.

The LCO 3.3.5.2A Allowable Value is chosen to isolate flow from the HPCS System prior to water overflowing into the MSLs.

One channel of Reactor Vessel Water Level - High, Level 8 Function is required to be operable in Modes 4 and 5 when the associated HPCS is required to be operable by LCO 3.5.2 to ensure to the HPCS is capable of injecting into the Reactor Pressure Vessel when manually initiated.

This Function was moved from TS 3.3.5.1, Function 3.c. The following changes are made:

- The Applicability is changed. The TS 3.3.5.1 Applicability for this Function is Modes 4 and 5 when the associated ECCS subsystem(s) are required to be operable per LCO 3.5.2, "ECCS - Shutdown." The proposed Applicability is Modes 4 and 5 without exception, to be consistent with the Applicability of LCO 3.5.2, "RPV Water Inventory Control."

- The number of required channels per Function is changed from [2] to [1] and is modified by a note stating "Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, 'Reactor Pressure Vessel Water Inventory Control'." TS 3.5.2 only requires a single ECCS subsystem and the change in required channels reflects that requirement.

- The TS 3.3.5.1 Required Action C.2 requires the inoperable channel to be restored to operable status within 24 hours. The proposed TS 3.3.5.2, Required Actions E.1 and E.2 requires declaring HPCS inoperable within 1 hour and restoring the channel to operable status within 24 hours. This more restrictive change is appropriate because the HPCS pump discharge valve will not open if the Level 8 function is in trip.

- A Channel Check and Channel Functional Test are required at the existing Frequency. Calibration of the trip units, Channel Calibration, and Logic System Functional Test tests are no longer required in Modes 4 and 5, as discussed in Section 3.3.3.

- The allowable value in LCO 3.3.5.2A is unchanged.

3.3.4.10. <u>3.b, BWR/6 High Pressure Core Spray System Condensate Storage Tank Level – Low</u>

Low level in the CST indicates the unavailability of an adequate supply of makeup water from this normal source. Normally the suction valves between HPCS and the CST are open and water for HPCS injection would be taken from the CST. However, if the water level in the CST falls below a preselected level, first the suppression pool suction valve automatically opens, and then the CST suction valve automatically closes. This ensures that an adequate supply of makeup water is available to the HPCS pump. To prevent losing suction to the pump, the suction valves are interlocked so that the suppression pool suction valve must be open before the CST suction valve automatically closes.

Condensate Storage Tank Level - Low signals are initiated from two level transmitters. The logic is arranged such that either transmitter and associated trip unit can cause the suppression pool suction valve to open and the CST suction valve to close.

The Condensate Storage Tank Level - Low Function Allowable Value is high enough to ensure adequate pump suction head while water is being taken from the CST.

One channel of the Condensate Storage Tank Level - Low Function is only required to be OPERABLE when HPCS is required to be OPERABLE to fulfill the requirements of LCO 3.5.2 and HPCS is aligned to the CST.

This Function was moved from TS 3.3.5.1, Function 3.d. The following changes are made:

- The Applicability is changed. The TS 3.3.5.1 Applicability for this Function is Modes 4 and 5 when the associated ECCS subsystem(s) are required to be operable per LCO 3.5.2, "ECCS - Shutdown." The proposed Applicability is Modes 4 and 5 when HPCS is operable for compliance with LCO 3.5.2 and aligned to the Condensate Storage Tank. If HPCS is not being credited for meeting the LCO 3.5.2 requirement for an operable ECCS subsystem, or if HPCS is being credited but is aligned to the suppression pool, this Function is unneeded.

- The number of required channels per Function is changed from [2] to [1]. TS 3.5.2 only requires a single ECCS subsystem and the change in required channels reflects that requirement.

- The TS 3.3.5.1 Required Actions D.1, D.2.1 and D.2.2 for an inoperable channel is to declare HPCS inoperable within 1 hour if HPCS pump suction is not aligned to the suppression pool, and either place the channel in trip or align HPCS to the suppression pool within 24 hours. The proposed TS 3.3.5.2, Action D, requires declaring the HPCS system inoperable or aligning the suction of the HPCS pump to the suppression pool within 1 hour. The change to the Applicability eliminates the need for the exception in the TS 3.3.5.1 Required Action. This more restrictive action is appropriate because when the Function is inoperable and HPCS pump suction is aligned to the Condensate Storage Tank, manual initiation of the ECCS subsystem is prohibited.

- A Channel Check and Channel Functional Test are required at the existing Frequency. Calibration of the trip units, Channel Calibration, and Logic System Functional Test are no longer required in Modes 4 and 5, as discussed in Section 3.3.3.

- The allowable value in LCO 3.3.5.1A is unchanged.

3.3.4.11. 3.c and 3.d, BWR/6 High Pressure Core Spray System HPCS Pump Discharge Pressure - High (Bypass) and HPCS System Flow Rate - Low (Bypass)

The minimum flow instruments are provided to protect the HPCS pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow and high pump discharge pressure are sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump or the discharge pressure is low (indicating the HPCS pump is not operating).

One flow transmitter is used to detect the HPCS System's flow rate. The logic is arranged such that the transmitter causes the minimum flow valve to open, provided the HPCS pump discharge pressure, sensed by another transmitter, is high enough (indicating the pump is operating). The logic will close the minimum flow valve once the closure setpoint is exceeded. (The valve will also close upon HPCS pump discharge pressure decreasing below the setpoint.)

In LCO 3.3.5.2A, the HPCS System Flow Rate - Low and HPCS Pump Discharge Pressure - High Allowable Values are chosen to ensure that pump flow rate is sufficient to protect the pump, yet low enough to ensure that the closure of the minimum flow valve is initiated to allow full flow into the core. The HPCS Pump Discharge Pressure - High Allowable Value is set high enough to ensure that the valve will not be open when the pump is not operating.

These Functions were moved from TS 3.3.5.1, Function 3.f and 3.g. The following changes are made:

- The Applicability is changed. The TS 3.3.5.1 Applicability for this Function is Modes 4 and 5 when the associated ECCS subsystem(s) are required to be operable per LCO 3.5.2, "ECCS - Shutdown." The proposed Applicability is Modes 4 and 5. The proposed Applicability is Modes 4 and 5 without exception, to be consistent with the Applicability of LCO 3.5.2, "RPV Water Inventory Control."

- The number of required channels per Function is changed from [1] to [1 per pump] and is modified by a note stating "Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, 'Reactor Pressure Vessel Water Inventory Control'." TS 3.5.2 only requires a single ECCS subsystem and the change in required channels reflects that requirement.

- The TS 3.3.5.1 Required Actions E1 and E.2 for an inoperable channel is to declare the supported feature(s) inoperable within 1 hour of discovery when its redundant feature ECCS initiation capability is inoperable, and to restore the channel to operable status within 7 days. The proposed TS 3.3.5.2, Action E, requires restoring the channel to operable status within 24 hours. No redundant ECCS subsystem is required by TS 3.5.2.

When this Function is inoperable, the ECCS subsystem is capable of injecting but is vulnerable to a low flow condition if the injection valve is not open. This equipment protective function can be performed by the operator by manually starting and stopping the pump and opening the injection valve. Therefore, allowing 24 hours to restore the equipment protective function is a reasonable period.

- A Channel Check and Channel Functional Test are required at the existing Frequency. Calibration of the trip units, Channel Calibration, and Logic System Functional Test are no longer required in Modes 4 and 5, as discussed in Section 3.3.3.

- The allowable value is unchanged.

3.3.4.12. <u>3.e, BWR/6 High Pressure Core Spray System Manual Initiation</u>

The Manual Initiation push button channel introduces a signal into the HPCS logic to provide manual initiation capability. There is one push button for the HPCS System. One channel of the Manual Initiation Function is only required to be operable in Modes 4 and 5 when the associated ECCS subsystem is required to be operable per LCO 3.5.2.

There is no Allowable Value for this Function in LCO 3.3.5.2A or LCO 3.3.5.2B since the channel is mechanically actuated based solely on the position of the push button.

This Function is moved from TS 3.3.5.1, Function 3.h. The following changes are made:

- The Applicability is changed. The TS 3.3.5.1 Applicability for these Functions in Modes 4 and 5 is modified by a Note that limits the Applicability to when the associated ECCS subsystem(s) are required to be operable per LCO 3.5.2, "ECCS - Shutdown." The proposed Applicability is Modes 4 and 5 without exception, to be consistent with the Applicability of LCO 3.5.2, "RPV Water Inventory Control."

- The number of required channels per Function is changed from [1] to [1 per subsystem] and is modified by a note stating "Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, 'Reactor Pressure Vessel Water Inventory Control'." TS 3.5.2 only requires a single ECCS subsystem and the change in required channels reflects that requirement.

- The TS 3.3.5.1 Required Action C.2 for an inoperable channel is to restore the channel to operable status within 24 hours. The proposed TS 3.3.5.2, Action E, requires restoring the channel to operable status within 24 hours. When this Function is inoperable, the ECCS pumps can be started manually and valves can be opened manually, but manual initiation with the control board push buttons is inoperable. This is not the preferred condition. Therefore, allowing 24 hours to restore the Function to operable status is a reasonable period.

- Both the existing TS 3.3.5.1 and the proposed TS 3.3.5.2 require a Logic System Functional Test on this Function at the same Frequency.

- There is no allowable value for this Function.

3.3.4.13. <u>4.a, BWR/6 RHR System Isolation Reactor Vessel Water Level - Low, Level 3</u>

The definition of Drain Time allows crediting the closing of penetration flow paths that are capable of being automatically isolated by RPV water level isolation instrumentation prior to the RPV water level being equal to the TAF. The Reactor Vessel Water Level - Low, Level 3 Function is only required to be operable when automatic isolation of the associated RHR penetration flow path is credited in calculating Drain Time.

Reactor Vessel Water Level - Low, Level 3 signals are initiated from four level transmitters (two per trip system) that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Two channels per trip system are required to be OPERABLE when automatic isolation of the associated penetration flow path(s) is credited in calculating DRAIN TIME to meet LCO 3.5.2.

In LCO 3.3.5.2A, the Reactor Vessel Water Level - Low, Level 3 Allowable Value was chosen to be the same as the RPS Reactor Vessel Water Level - Low, Level 3 Allowable Value (LCO 3.3.1.1), since the capability to cool the fuel may be threatened.

This Function was moved from TS 3.3.6.1, Function 5.c. The following changes are made:

- The function name is changed from "Shutdown Cooling System Isolation Reactor Vessel Water Level - Low, Level 3" to "Residual Heat Removal System Isolation Reactor Vessel Water Level - Low, Level 3." This is a misnomer in the Standard Technical Specifications as the Level 3 instruments isolate more than Shutdown Cooling isolation valves.

- The Applicability is changed. The TS 3.3.6.1 Applicability for this Function is Modes 4 and 5. The proposed Applicability is "when automatic isolation of the associated penetration flow path is credited in calculating Drain Time." In other words, if the Drain Time calculation assumes the RHR System would be automatically isolated, this Function must be operable to perform that function. This is consistent with the definition of Drain Time and the TS 3.5.2 requirements.

- The number of required channels is changed from [2], with a column header that states "Required Channels per Trip System," to [2 in one trip system]. This retains the requirement that the two channels must be associated with the same trip system. Only one trip system is required to ensure automatic isolation of one of the two isolation valves will occur on low reactor vessel water level.

- The TS 3.3.6.1 Required Action J.1 and J.2 for an inoperable channel is to immediately initiate action to restore the channel to operable status or to immediately initiate action to isolate the RHR Shutdown Cooling system. The TS 3.3.5.2 Action B requires declaring the associated penetration flow path(s) incapable of automatic isolation. This Action would require Drain Time to be recalculated without crediting automatic isolation of the

affected penetration flow paths. The proposed Actions are consistent with the definition of Drain Time and the requirements of LCO 3.5.2.

- A Channel Check and Channel Functional Test are required at the existing Frequency. A calibration of the trip unit, Channel Calibration, Logic System Functional Test, and Isolation System Response Time tests are no longer required in Modes 4 and 5, as discussed in Section 3.3.3.

- The LCO 3.3.5.1A allowable value is unchanged.

3.3.4.14. <u>5.a, BWR/6 Reactor Water Cleanup (RWCU) System Isolation, Reactor Vessel Water Level - Low Low, Level 2</u>

The definition of DRAIN TIME allows crediting the closing of penetration flow paths that are capable of being automatically isolated by RPV water level isolation instrumentation prior to the RPV water level being equal to the TAF. The Reactor Vessel Water Level - Low Low, Level 2 Function associated with RWCU System isolation may be credited for automatic isolation of penetration flow paths associated with the RWCU System.

This Function is not applicable in Modes 4 or 5 in TS 3.3.6.1, but is being added to TS 3.3.5.2 to support crediting the automatic isolation of the RWCU system in calculating Drain Time.

Reactor Vessel Water Level - Low Low, Level 2 is initiated from two channels per trip system that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Each trip system isolates one of two redundant isolation valves and only one trip system is required to be operable when automatic isolation of the associated penetration flow path(s) is credited in calculating Drain Time to meet LCO 3.5.2.

The Reactor Vessel Water Level - Low Low, Level 2 Allowable Value was chosen to be the same as the ECCS Reactor Vessel Water Level - Low Low, Level 2 Allowable Value (LCO 3.3.5.1), since the capability to cool the fuel may be threatened.

The Reactor Vessel Water Level - Low Low, Level 2 Function is only required to be operable when automatic isolation of the associated penetration flow path is credited in calculating DRAIN TIME.

This Function was copied from TS 3.3.6.1, Function 4.k. The following changes are made:

- The Applicability is changed. The TS 3.3.6.1 Applicability for this Function is Modes 1, 2, and 3. The proposed Applicability is "when automatic isolation of the associated penetration flow path is credited in calculating Drain Time." In other words, if the Drain Time calculation assumes the RWCU system would be automatically isolated, this Function must be operable to perform that function. This is consistent with the definition of Drain Time and the TS 3.5.2 requirements.

- The number of required channels is changed from [2], with a column header that states "Required Channels per Trip System," to [2 in one trip system]. This retains the

requirement that the two channels must be associated with the same trip system. Only one trip system is required to ensure that automatic isolation of one of the two isolation valves will occur on low reactor vessel water level.

- The TS 3.3.6.1 Required Action F.1 for an inoperable channel is to isolate the affected penetration flow path(s) within 1 hour. TS 3.3.5.2 Action B requires immediately declaring the associated penetration flow path(s) incapable of automatic isolation. This Action would require Drain Time to be recalculated without crediting automatic isolation of the affected penetration flow paths. The proposed Actions are consistent with the definition of Drain Time and the requirements of LCO 3.5.2.

- A Channel Check and Channel Functional Test are required at the existing Frequency. A calibration of the trip unit, Channel Calibration, Logic System Functional Test, and Isolation System Response Time tests are no longer required in Modes 4 and 5, as discussed in Section 3.3.3.

- The allowable value in LCO 3.3.5.2A is unchanged.

3.4. Evaluation of Other Differences between the Current and Proposed TS Requirements

The following discussion evaluates other differences between the current TS requirements related to OPDRVs and the proposed TS requirements for RPV WIC.

Table 1, "Changes to Current Technical Specifications," summarizes each change to the current TS requirements affected by the proposed change.

3.4.1. Other Proposed Changes to Instrumentation Requirements

The current ISTS contain requirements related to instrumentation that are applicable during OPDRVS and when the existing LCO 3.5.2 is Applicable. The proposed TS 3.3.5.2 addresses the instrument functions needed to support TS 3.5.2, such as ECCS manual initiation and RPV penetration flow paths that may be excluded from the Drain Time calculation due to automatic isolation on low RPV water level. The following sections discuss the disposition of existing instrumentation functions. Instrument functions moved to the proposed TS 3.3.5.2 (including associated Actions and Surveillance Requirements) are discussed in Section 3.3. Instrument functions that will no longer be required by the TS are discussed below.

3.4.1.1. TS 3.3.5.1A and 3.3.5.1B, ECCS Instrumentation

Many of the TS 3.3.5.1 instrumentation functions provide automatic initiation of ECCS water injection on low RPV water level. Plant-specific TS may contain different instrumentation functions that are applicable during OPDRVs or when TS 3.5.2 is applicable that serve the same or similar purposes. Those plant-specific functions are encompassed in this discussion.

TS 3.3.5.1A and 3.3.5.1B, ECCS Instrumentation	
NUREG-1433 (BWR/4 Plants) Functions Applicable in Mode 4 or 5	
Function 1.a, Reactor Vessel Water Level - Low Low Low, Level 1	Removed - Related to automatic ECCS initiation function.
Function 1.c, Reactor Steam Dome Pressure - Low (Injection Permissive)	Moved to TS 3.3.5.2
Function 1.d, Core Spray Pump Discharge Flow - Low (Bypass)	Moved to TS 3.3.5.2
Function 1.e, Manual Initiation	Moved to TS 3.3.5.2
Function 2.a, Low Pressure Coolant Injection (LPCI) System Reactor Vessel Water Level - Low Low Low, Level 1	Removed - Related to automatic ECCS initiation function.
Function 2.c Reactor Steam Dome Pressure - Low (Injection Permissive)	Moved to TS 3.3.5.2
Function 2.f, Low Pressure Coolant Injection Pump Start - Time Delay Relay	Removed - Related to automatic ECCS initiation function.
Function 2.g, Low Pressure Coolant Injection Pump Discharge Flow - Low Bypass	Moved to TS 3.3.5.2
Function 2.h, Manual Initiation	Moved to TS 3.3.5.2
NUREG-1434 (BWR/6 Plants) Functions Applicable in Mode 4 or 5	
Function 1.a, Reactor Vessel Water Level - Low Low Low, Level 1	Removed - Related to automatic ECCS initiation function.
Function 1.c, LPCI Pump A Start - Time Delay Relay	Removed - Related to automatic ECCS initiation function.
Function 1.d, Reactor Steam Dome Pressure - Low (Injection Permissive)	Moved to TS 3.3.5.2
Function 1.e, [LPCS Pump Discharge Flow - Low (Bypass)]	Moved to TS 3.3.5.2
Function 1.f, [LPCI Pump A Discharge Flow - Low (Bypass)]	Moved to TS 3.3.5.2
Function 1.g, Manual Initiation	Moved to TS 3.3.5.2
Function 2.a, Reactor Vessel Water Level - Low Low Low, Level 1	Removed - Related to automatic ECCS initiation function.
Function 2.c, LPCI Pump B Start - Time Delay Relay	Removed - Related to automatic ECCS initiation function.
Function 2.d, Reactor Steam Dome Pressure - Low (Injection Permissive)[4]	Moved to TS 3.3.5.2

[4] NUREG-1434 (BWR/6 STS) does not include Mode 4 and 5 applicability for this function. This appears to be an error and a survey of BWR/6 plants indicates that Mode 4 and 5 applicability is in the design and has been included in the TS. Therefore, it is added to the proposed TS 3.3.5.2 functions.

TS 3.3.5.1A and 3.3.5.1B, ECCS Instrumentation	
Function 2.e, [LPCI Pump B and LPCI Pump C Discharge Flow - Low (Bypass)]	Moved to TS 3.3.5.2
Function 2.f, Manual Initiation	Moved to TS 3.3.5.2
Function 3.a, High Pressure Core Spray (HPCS) System Reactor Vessel Water Level - Low Low, Level 2	Removed - Related to automatic ECCS initiation function.
Function 3.c, Reactor Vessel Water Level - High, Level 8	Moved to TS 3.3.5.2
Function 3.d, Condensate Storage Tank Level - Low	Moved to TS 3.3.5.2
Function 3.f, [HPCS Pump Discharge Pressure - High (Bypass)]	Moved to TS 3.3.5.2
Function 3.g, [HPCS System Flow Rate - Low (Bypass)]	Moved to TS 3.3.5.2
Function 3.h, Manual Initiation	Moved to TS 3.3.5.2

The following TS 3.3.5.1 Functions applicable in Modes 4 and 5 are removed from TS 3.3.5.1 and not included in the proposed TS 3.3.5.2:

<u>NUREG-1433 (BWR/4 Plants)</u>

Function 1.a, Reactor Vessel Water Level - Low Low Low, Level 1
Function 2.a, Low Pressure Coolant Injection (LPCI) System Reactor Vessel Water Level - Low Low Low, Level 1
Function 2.f, Low Pressure Coolant Injection Pump Start - Time Delay Relay

<u>NUREG-1434 (BWR/6 Plants)</u>

Function 1.a, Reactor Vessel Water Level - Low Low Low, Level 1
Function 1.c, LPCI Pump A Start - Time Delay Relay
Function 2.a, Reactor Vessel Water Level - Low Low Low, Level 1
Function 2.c, LPCI Pump B Start - Time Delay Relay
Function 3.a, High Pressure Core Spray (HPCS) System Reactor Vessel Water Level - Low Low, Level 2

BWR/4 Functions 1.a and 2.a and BWR/6 Functions 1.a, 2.a, and 3.a initiate automatic ECCS injection on low water level. A draining event is a slow evolution when compared to a design basis LOCA assumed to occur at full power, and thus there is adequate time to take manual actions (hours versus minutes). The proposed TS 3.5.2, Action E, prohibits plant conditions that could result in Drain Times less than one hour. Therefore, there is sufficient time for the licensed operators to take manual action to stop the draining event, and to manually start an ECCS injection/spray subsystem or the additional method of water injection. Consequently, there is no need for automatic initiation of ECCS to respond to an unexpected draining event. As discussed previously, automatic initiation of an ECCS injection/spray subsystem, with injection rates of thousands of gpm, may be undesirable as it can lead to overflowing the RPV cavity.

BWR/4 Function 2.f and BWR/6 Functions 1.c and 2.c provide pump start time delays. The purpose of the time delay is to stagger the automatic start of the two ECCS pumps that are in each of Division in order to limit the transients on the 4.16 kV emergency buses. This staggering

is unnecessary for manual initiation. Therefore, these Functions can be removed from the TS because the required ECCS subsystem is started either by manual operation or manual initiation.

TS 3.3.5.1 Required Actions B.1, C.1, and E.1 Notes are revised to delete Note 1. Note 1 states that the Required Action is only applicable in Modes 1, 2, and 3. Under the proposed change to TS 3.3.5.1, all of the Functions are applicable in Modes 1, 2, and 3. Therefore, the Note is no longer needed.

The proposed change to LCO 3.3.5.1 meets the 10 CFR 50.36 requirements by ensuring that the lowest functional capability for the necessary systems is met, by providing acceptable remedial actions, and by ensuring that the necessary quality of systems and components is maintained and that the LCOs will be met.

3.4.1.2. TS 3.3.6.1A and 3.3.6.1B, Primary Containment Isolation Instrumentation

These instrumentation Functions provide the RHR System isolation on low water level and, for BWR/6 plants, isolate the primary containment and drywell ventilation exhaust on elevated radiation; as well as providing manual initiation of primary containment isolation. Plant-specific TS may contain different instrumentation Functions that are applicable during OPDRVs or when TS 3.5.2 is applicable that serve the same or similar purposes. Those plant-specific Functions are encompassed in this discussion.

TS 3.3.6.1A and 3.3.6.1B, Primary Containment Isolation Instrumentation	
NUREG-1433 (BWR/4 Plants) Functions Applicable in Mode 4 or 5	
Function 6.b, Shutdown Cooling Isolation, Reactor Vessel Water Level - Low, Level 3	Moved to TS 3.3.5.2
NUREG-1434 (BWR/6 Plants) Functions Applicable in Mode 4 or 5	
Function 2.g, Primary Containment Isolation, Containment and Drywell Ventilation Exhaust Radiation-High	Removed - Related to automatic primary containment isolation
Function 5.c, Shutdown Cooling System Isolation, Reactor Vessel Water Level - Low, Level 3	Moved to TS 3.3.5.2

The following TS 3.3.6.1 Functions applicable in Modes 4 and 5 are removed from TS 3.3.6.1 and not included in the proposed TS 3.3.5.2:

NUREG-1433 (BWR/4 Plants)

None

NUREG-1434 (BWR/6 Plants)

Function 2.g, Primary Containment Isolation, Containment and Drywell Ventilation Exhaust Radiation-High

BWR/6 Function 2.g is applicable during movement of [recently] irradiated fuel assemblies in the [primary or secondary containment] and during OPDRVs. The Applicability during OPDRVs is eliminated. Function 2.g serves to isolate primary containment on elevated radiation. An unexpected draining event is a slow evolution when compared to a design basis LOCA assumed to occur at full power, and thus there is adequate time to take manual actions (hours versus minutes) to stop or mitigate the event. Waiting for fuel damage to occur before isolating the RPV from the environment is not reasonable. The Required Actions of proposed TS 3.5.2 will require [secondary containment] isolation, or verification that it can be manually isolated, when the Drain Time is less than 8 hours and no draining event has occurred. This provides a greater level of safety.

With the movement of BWR/4 Function 6.b and BWR/6 Function 5.c to proposed TS 3.3.5.2, and the removal of the OPDRV applicability of Function 2.g, changes to the TS 3.3.6.1 Required Actions is necessary. Required Action K.2.2, which requires action to suspend OPDRVs, is removed because OPDRVs is no longer in the Applicability of the Function.

The proposed change meets the 10 CFR 50.36 requirements by ensuring the functional capability for the necessary systems, by providing acceptable remedial actions, and by ensuring that the necessary quality of systems and components is maintained and that the LCOs will be met.

3.4.1.3. <u>TS 3.3.6.2A and 3.3.6.2B, Secondary Containment Isolation Instrumentation</u>

These instrumentation Functions provide manual and automatic isolation of the Secondary Containment on low water level, elevated radiation, or manual initiation. Plant-specific TS may contain different instrumentation Functions that are applicable during OPDRVs or when TS 3.5.2 is applicable that serve the same or similar purposes. Those plant-specific Functions are encompassed in this discussion.

The following TS 3.3.6.2 Functions that are applicable in Modes 4 and 5 are removed from TS 3.3.6.2 and not included in the proposed TS 3.3.5.2:

<u>NUREG-1433 (BWR/4 Plants)</u>

Function 1, Reactor Vessel Water Level - Low Low, Level 2
Function 3, Reactor Building Exhaust Radiation - High
Function 4, Refueling Floor Exhaust Radiation - High
Function 5, Manual Initiation

<u>NUREG-1434 (BWR/6 Plants)</u>

Function 1, Reactor Vessel Water Level - Low Low, Level 2
Function 3, Fuel Handling Area Ventilation Exhaust Radiation - High High
Function 4, Fuel Handling Area Pool Sweep Exhaust Radiation - High High
Function 5, Manual Initiation

Function 1 automatically initiates [secondary] containment isolation on low water level and is applicable during OPDRVs. The Applicability during OPDRVs is eliminated. Under the proposed RPV WIC requirements, [secondary] containment must be isolated or capable of being

isolated in less than the Drain Time when the Drain Time is less than 36 hours, but automatic [secondary] containment isolation is not required. A draining event is a slow evolution when compared to a design basis LOCA assumed to occur at full power, and thus there is adequate time to take manual actions (hours versus minutes). The proposed TS 3.5.2, Action E, prohibits plant conditions that could result in Drain Times less than one hour. Therefore, there is sufficient time for the licensed operators to take manual action to stop the draining event, or to establish the [secondary] containment boundary and to isolate the [secondary] containment penetration flow paths before [secondary] containment isolation would be required. Consequently, there is no need for automatic initiation of [secondary] containment isolation to respond to an unexpected draining event.

Functions 3 and 4 are applicable during OPDRVs. The Applicability during OPDRVs is eliminated. These Functions serve to isolate [secondary] containment on elevated radiation. An unexpected draining event is a slow evolution when compared to a design basis LOCA assumed to occur at full power, and thus there is adequate time to take manual actions (hours versus minutes) to stop or mitigate the event. Waiting for fuel damage to occur before isolating the RPV from the environment is not reasonable. The Required Actions of proposed TS 3.5.2 will require [secondary] containment isolation when the Drain Time is less than 8 hours, even though no draining event has occurred, providing a greater level of safety.

Function 5 is applicable during OPDRVs. The Applicability during OPDRVs is eliminated. The [secondary] containment isolation valves can be closed manually without the secondary containment isolation instrumentation function. A draining event is a slow evolution when compared to a design basis LOCA assumed to occur at full power, and thus there is adequate time to take manual actions (hours versus minutes). The proposed TS 3.5.2, Action E, prohibits plant conditions that could result in Drain Times less than one hour. When the Drain Time is less than 36 hours, the proposed TS 3.5.2 Actions require the [secondary] containment boundary to be closed or capable of being closed within the Drain Time, and the [secondary] containment isolation valves must be closed or capable of being closed within the Drain Time. Therefore, there is sufficient time for the licensed operators to isolate the [secondary] containment without the manual initiation function.

The proposed change meets the 10 CFR 50.36 requirements by ensuring the functional capability for the necessary systems, by providing acceptable remedial actions, and by ensuring that the necessary quality of systems and components is maintained and that the LCOs will be met.

3.4.1.4. TS 3.3.7.1A and 3.3.7.1B, {BWR/4} [MCREC] System Instrumentation / {BWR/6} [CRFA] System Instrumentation

NUREG-1433 (BWR/4 Plants)

Function 1, Reactor Vessel Water Level - Low Low Low, Level 1
Function 4, Refueling Floor Area Radiation - High
Function 5, Control Room Air Inlet Radiation - High

NUREG-1434 (BWR/6 Plants)

Function 1, Reactor Vessel Water Level - Low Low, Level 2
Function 3, Control Room Ventilation Radiation Monitors

These instrumentation Functions provide automatic isolation of the control room on low water level. Plant-specific TS may contain different instrumentation Functions that are applicable during OPDRVs or when TS 3.5.2 is applicable that serve the same or similar purposes. Those plant-specific Functions are encompassed in this discussion.

The systems supported by these instrumentation Functions are proposed to be revised to no longer be required. Therefore, the associated instrumentation Functions are not required. See Section 3.4.3.

3.4.2. Other Proposed Changes - Containment, Containment Isolation Valves, and Standby Gas Treatment System Requirements

The following TS are applicable during OPDRVs and/or contain Actions to suspend OPDRVS when the LCO is not met:

NUREG-1433 (BWR/4 plants)

3.6.1.3, Primary Containment Isolation Valves (PCIVs)
3.6.4.1, [Secondary] Containment
3.6.4.2, Secondary Containment Isolation Valves (SCIVs)
3.6.4.3, Standby Gas Treatment System

NUREG-1434 (BWR/6 plants)

3.6.1.3, Primary Containment Isolation Valves (PCIVs)
3.6.4.1, [Secondary] Containment
3.6.4.2, Secondary Containment Isolation Valves (SCIVs)
3.6.4.3, Standby Gas Treatment System

Plant-specific TS may contain different system names or may combine or separate the primary and secondary containment, PCIVs and SCIVs, and SGT system Functions in the TS, but the requirements serve similar purposes. Those plant-specific requirements are encompassed by this discussion.

The proposed TS 3.5.2 requires RHR System isolation valves and instrumentation when they are credited for automatically isolating the RHR System penetration flow path. Therefore, the existing TS 3.6.1.3 requirements are replaced with 1) the definition of Drain Time, 2) by TS 3.3.5.2, which verifies the required instrumentation is operable, and 3) by SR 3.5.2.7, which verifies that the valves will isolate on receipt of an isolation signal from the instrumentation.

The [secondary] containment, SCIV, [and Standby Gas Treatment system] requirements are contained in Actions C and D of the proposed TS 3.5.2. When the Drain Time is short (less than 8 hours), the proposed requirements are similar to the existing requirements, but more flexibility

is provided when the Drain Time is longer and the likelihood of fuel damage from an unexpected draining event is lower. Therefore, the existing TS 3.6.4.1, TS 3.6.4.2, and TS 3.6.4.3 requirements are replaced with proposed TS 3.5.2 Actions C and D.

The proposed change meets the 10 CFR 50.36 requirements by ensuring the functional capability for the necessary systems, by providing acceptable remedial actions, and by ensuring that the necessary quality of systems and components is maintained and that the LCOs will be met.

3.4.3. Other Proposed Changes - Control Room Habitability and Temperature Control Requirements

The following TS are applicable during OPDRVs and/or contain Actions to suspend OPDRVs when the LCO is not met:

<u>NUREG-1433 (BWR/4 plants)</u>

3.7.4, [MCREC] System
3.7.5, [Control Room AC] System

<u>NUREG-1434 (BWR/6 plants)</u>

3.7.3, [CRFA] System
3.7.4, [Control Room AC] System

Plant-specific TS may contain different system names or may combine or separate the control room habitability Functions in the TS, but the requirements serve the same or similar purposes. Those plant-specific requirements are encompassed by this discussion.

A draining event is a slow evolution compared to design basis accidents assumed to occur at full power. The proposed TS 3.5.2 prohibits plant conditions that would result in a Drain Time less than one hour. The proposed TS requires an ECCS injection/spray subsystem and, when Drain Time is less than 8 hours, an additional method of water injection sufficient to maintain the fuel covered for at least 36 hours. The proposed TS also requires the actions or capability to isolate the [secondary] containment and containment isolation valves and the ability to start a SGT subsystem before the water inventory can drain to the TAF. Given these requirements, it is highly unlikely that a draining event would require control room habitability systems to protect the operators in the control room similar to those required by design basis accidents. Even in the highly unlikely case that operator protection would be required, there would be sufficient time to manually isolate the control room or for the operators to take protective actions. Therefore, these prescriptive control room habitability requirements are also not needed and can be removed from the TS. The corresponding automatic instrumentation Functions to actuate these systems can also be removed. If the control room is not required to be isolated, control room temperature control is not required and can be removed.

The proposed change meets the 10 CFR 50.36 requirements by ensuring the functional capability for the necessary systems, by providing acceptable remedial actions, and by ensuring that the necessary quality of systems and components is maintained and that the LCOs will be met.

3.4.4. Other Proposed Changes - Electrical Sources Requirements

The following TS contain Actions to suspend OPDRVs when the LCO is not met:

NUREG-1433 (BWR/4 plants) and NUREG-1434 (BWR/6 plants)

3.8.2, AC Sources - Shutdown
3.8.5, DC Sources - Shutdown
3.8.8, Inverters - Shutdown
3.8.10, Distribution Systems - Shutdown

Plant-specific TS may contain different system names or may combine or separate the electrical power Functions in the TS, but the requirements serve the same or similar purposes. Those plant-specific requirements are encompassed in this discussion.

The required ECCS injection/spray subsystem is required to be operable and the electrical power requirements in Modes 4 and 5 support the required ECCS injection/spray subsystem. TS 3.8.10 requires the necessary portions of the AC, DC, [and AC vital bus] electrical power distribution subsystems to be operable to support equipment required to be operable in Modes 4 and 5. TS 3.8.8 requires the inverter(s) to be operable to support the onsite Class 1E AC vital bus electrical power distribution subsystem(s) required by LCO 3.8.10. TS 3.8.8 requires the DC electrical power subsystems shall be operable to support the DC electrical power distribution subsystem(s) required by LCO 3.8.10. LCO 3.8.2 requires one qualified circuit between the offsite transmission network and the onsite Class 1E AC electrical power distribution subsystem(s) required by LCO 3.8.10, one diesel generator (DG) capable of supplying one division of the onsite Class 1E AC electrical power distribution subsystem(s) required by LCO 3.8.10.

If the required electrical power is lost, these TS require declaring the affected required features inoperable. In this situation, the affected instrumentation or ECCS injection/spray subsystem would be declared inoperable and the Actions followed. This provides appropriate actions, and specific Required Actions related to OPDRVs in the Section 3.8 specifications are not needed to protect plant safety and to ensure that Safety Limit 2.1.1.3 is protected.

When the Drain Time is < 8 hours, Required Action D.1 requires an additional method of water injection and either the ECCS injection/spray subsystem or the additional method of water injection must be capable of operating without offsite power.

If an RPV penetration flow path is excluded from the Drain Time calculation due to automatic isolation or use of a trained, dedicated operator, the definition of Drain Time requires the automatic isolation or operator action is able to be performed without offsite power. If this requirement cannot be met, the penetration flow paths cannot be excluded and a new Drain Time must be calculated.

These requirements ensure reliable power to the equipment credited to prevent or mitigate an unexpected draining event, even if the draining event is caused by a loss of offsite power.

The proposed change meets the 10 CFR 50.36 requirements by ensuring the functional capability for the necessary systems, by providing acceptable remedial actions, and by ensuring that the necessary quality of systems and components is maintained and that the LCOs will be met.

3.5. Conclusion

The proposed requirements satisfy the requirements of 10 CFR 50.36 and provide adequate assurance that Safety Limit 2.1.1.3 will be protected. In addition, the proposed requirements provide multiple layers of defense-in-depth, while providing greater flexibility and providing Actions commensurate with the potential challenge to the Safety Limit.

4. REGULATORY ANALYSIS

The following NRC requirements and guidance documents are applicable to the proposed change.

The regulations at 10 CFR Part 50, Appendix A, General Design Criteria (GDC) 13, "Instrumentation and control," states that instrumentation shall be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems. Appropriate controls shall be provided to maintain these variables and systems within prescribed operating ranges.

The regulations at 10 CFR Part 50, Appendix A, GDC 14, "Reactor coolant pressure boundary," states that the reactor coolant pressure boundary shall be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture.

The regulations at 10 CFR Part 50, Appendix A, GDC 30, "Quality of reactor coolant pressure boundary," states that systems be designed with a means for detecting and, to the extent practical, identifying the source of reactor coolant leakage.

The regulations at 10 CFR Part 50, Appendix A, GDC 33, "Reactor coolant makeup," states that a system be designed to supply reactor coolant makeup for protection against small breaks in the reactor coolant pressure boundary.

The proposed change is consistent with these GDCs in that the design requirements for instrumentation, reactor coolant leak detection, the reactor coolant pressure boundary, and reactor coolant makeup are unaffected.

The regulations at 10 CFR 50.36 "Technical specifications," establish the requirements related to the content of the TS. TS are required to include items in the following five categories: (1) safety limits, limiting safety system settings, and limiting control settings; (2) LCOs; (3) SRs; (4) design features; and (5) administrative controls.

Section 50.36(c)(1)(i)(A) states, in part, "Safety limits for nuclear reactors are limits upon important process variables that are found to be necessary to reasonably protect the integrity of certain of the physical barriers that guard against the uncontrolled release of radioactivity."

Section 50.36(c)(2) states, "Limiting conditions for operation. Limiting conditions for operation are the lowest functional capability or performance levels of equipment required for safe operation of the facility. When a limiting condition for operation of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the technical specifications until the condition can be met."

Section 50.36(c)(2)(ii) specifies four criteria to be used in determining whether a TS LCO needs to be established for a particular item. These criteria are summarized as follows:

> Criterion 1 - Installed instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant pressure boundary.
>
> Criterion 2 - A process variable, design feature, or operating restriction that is an initial condition of a design-basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.
>
> Criterion 3 - A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design-basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.
>
> Criterion 4 - A structure, system, or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety.

As discussed in Section 3.1.2, the proposed LCO 3.5.2 satisfies Criterion 4.

Section 50.36(c)(3) states, "Surveillance requirements are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met."

The regulatory requirements in 10 CFR 50.36 are not specific regarding the actions to be followed when TS requirements are not met, other than directing an operating plant to shut down. Because the proposed change only applies in Modes 4 and 5 (i.e., the reactor is already shut down), appropriate remedial actions to prevent or mitigate an inadvertent draining event affecting the water inventory in the RPV are specified in the proposed TS.

The NRC's guidance for the format and content of BWR TS can be found in NUREG-1433, "Standard Technical Specifications, General Electric BWR/4 Plants," and NUREG-1434, "Standard Technical Specifications, General Electric BWR/6 Plants." The proposed change is consistent with the format and content of these NUREGs.

The proposed change does not affect plant compliance with these regulations or guidance documents and will ensure that the lowest functional capabilities or performance levels of equipment required for safe operation are met.

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 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

1. TSTF-GG-05-01, "Writer's Guide for Plant-Specific Improved Technical Specifications," Revision 1, dated August 2010.

2. American Nuclear Society, ANSI-N-18.2A-1975, "Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plants."

Table 1
Changes to Current Technical Specifications

NUREG-1433, BWR/4 ISTS	NUREG-1434, BWR/6 ISTS	Changes
Table of Contents	Table of Contents	TS 3.5.2 is renamed "RPV Water Inventory Control." See justification Section 3.2. Section 3.5 is renamed "Emergency Core Cooling Systems (ECCS), RPV Water Inventory Control, and Reactor Core Isolation Cooling (RCIC) System" A new TS 3.3.5.2, "RPV Water Inventory Control Instrumentation," is added. TS 3.3.5.2 is renamed "RCIC System Instrumentation"
1.1, Definitions	1.1, Definitions	DRAIN TIME definition added. See justification Section 3.2.1.3.
3.3.5.1A & B, Emergency Core Cooling System (ECCS) Instrumentation	3.3.5.1A & B, Emergency Core Cooling System (ECCS) Instrumentation	As described in Section 3.4.1.1, some Functions applicable in Modes 4 and 5 or when the associated ECCS subsystem is required to be operable are moved to TS 3.3.5.2. The remaining functions applicable in Modes 4 and 5 or when the associated ECCS subsystem is required to be operable are removed. Corresponding changes to the Actions are made.

NUREG-1433, BWR/4 ISTS	NUREG-1434, BWR/6 ISTS	Changes
3.3.5.2, Reactor Pressure Vessel Water Inventory Control Instrumentation	3.3.5.2, Reactor Pressure Vessel Water Inventory Control Instrumentation	A new TS is created which contains the instrumentation requirements associated with TS 3.5.2, Reactor Pressure Vessel Water Inventory Control
3.3.5.2A & B, Reactor Core Isolation Cooling (RCIC) System Instrumentation	3.3.5.2A & B, Reactor Core Isolation Cooling (RCIC) System Instrumentation	The specification is renumbered 3.3.5.3A & B. The Table and Surveillances, as well as internal references, are revised to reflect the new TS number. The Bases are revised to reflect the new number.
3.3.6.1A & B, Primary Containment Isolation Instrumentation	3.3.6.1A & B, Primary Containment Isolation Instrumentation	As described in Section 3.4.1.2, the Shutdown Cooling System Isolation, Reactor Vessel Water Level - Low Level 3 function applicability in Modes 4 and 5 is moved to TS 3.3.5.2 and renamed "RHR System Isolation." Corresponding changes to the Actions are made.
3.3.6.2A & B, Secondary Containment Isolation Instrumentation	3.3.6.2A & B, Secondary Containment Isolation Instrumentation	Table 3.3.6.2-1, footnote (a), which makes the affected functions applicable during OPDRVs, is removed. Footnote (b) is renumbered. Automatic isolation of secondary containment is replaced with proposed LCO 3.5.2 Required Action C.2, "Verify each [secondary] containment penetration flow path is capable of being isolated in less than the DRAIN TIME," and proposed LCO 3.5.2 Required Action D.3, "Initiate action to isolate each

NUREG-1433, BWR/4 ISTS	NUREG-1434, BWR/6 ISTS	Changes
		[secondary] containment penetration flow path or verify it can be manually isolated from the control room." See justification Section 3.4.1.
3.3.7.1A & B, [Main Control Room Environmental Control (MCREC)] System Instrumentation	3.3.7.1A & B, [Control Room Fresh Air (CRFA)] System Instrumentation	Table 3.3.7.1-1, footnote (a), which makes the affected functions applicable during OPDRVs, is removed. Footnote (b) is renumbered. Automatic isolation of the control room and control room temperature control are no longer required. See justification Sections 3.4.1 and 3.4.3.
3.5.1, ECCS - Operating Section Title Applicability Bases	3.5.1, ECCS - Operating Section Title Applicability Bases	Section 3.5 is renamed "Emergency Core Cooling Systems (ECCS), RPV Water Inventory Control, and Reactor Core Isolation Cooling (RCIC) System. The Applicability Bases are revised to reference LCO 3.5.2 for RPV inventory control in Modes 4 and 5.

NUREG-1433, BWR/4 ISTS	NUREG-1434, BWR/6 ISTS	Changes
3.5.2, ECCS - Shutdown Section Title LCO Applicability Actions Surveillances	3.5.2, ECCS - Shutdown Section Title LCO Applicability Actions Surveillances	Section 3.5 is renamed "Emergency Core Cooling Systems (ECCS), RPV Water Inventory Control, and Reactor Core Isolation Cooling (RCIC) System. TS 3.5.2 is renamed "Reactor Pressure Vessel Water Inventory Control (RPV WIC)." The LCO is revised to add a new requirement on Drain Time and to only require one ECCS subsystem to be operable. See justification Section 3.2. The Applicability is changed to Modes 4 and 5 and the existing exceptions are removed. See justification Section 3.2.2. The Actions are revised. See justification Section 3.2.3. The Surveillance Requirements are revised. See justification Section 3.2.4.

NUREG-1433, BWR/4 ISTS	NUREG-1434, BWR/6 ISTS	Changes
3.5.3, RCIC System Section Title Applicability Bases	3.5.3, RCIC System Section Title Applicability Bases	Section 3.5 is renamed "Emergency Core Cooling Systems (ECCS), RPV Water Inventory Control, and Reactor Core Isolation Cooling (RCIC) System. The Applicability Bases are revised to reference LCO 3.5.2 for RPV inventory control in Modes 4 and 5. The SR 3.5.3.5 Bases are revised to refer to TS 3.3.5.3 instead of TS 3.3.5.2.

NUREG-1433, BWR/4 ISTS	NUREG-1434, BWR/6 ISTS	Changes
3.6.1.3, Primary Containment Isolation Valves (PCIVs) Action H Applicability Bases	3.6.1.3, Primary Containment Isolation Valves (PCIVs) Applicability Action H Applicability Bases	LCO 3.6.1.3 is applicable in Modes 1, 2, and 3 and when associated instrumentation is required to be operable per LCO 3.3.6.1, "Primary Containment Isolation Instrumentation." For BWR/6 plants, all TS 3.3.6.1 instrumentation functions not in Modes 1, 2, and 3 are related to OPDRVs and are proposed to be removed or relocated to TS 3.3.5.2. Therefore, the TS 3.6.1.3 Applicability statement is removed. BWR/4 plants retain functions in TS 3.3.6.1 not related to OPDRVs that require the TS 3.3.6.1 Applicability statement be retained. See justification Section 3.4.1for discussion of changes to TS 3.3.6.1. Action H is the default Condition and applies during OPDRVs. It requires suspending OPDRVs or initiating action to restore the inoperable valve(s) to operable status. OPDRV-related requirements have been removed from TS 3.3.6.1, and therefore, TS 3.6.1.4. As a result, the default condition no longer applies and Action H is removed. See justification Section 3.4.1 for discussion of changes to TS 3.3.6.1. A Primary Containment Isolation Valve may be credited for isolating an RPV

NUREG-1433, BWR/4 ISTS	NUREG-1434, BWR/6 ISTS	Changes
		penetration flow path. If so, the definition of Drain Time, TS 3.3.5.2, and SR 3.5.2.7 ensure the valve is capable of performing its function. If the valve cannot perform its function, proposed TS 3.5.2, Action E or F apply. See justification Sections 3.2.1.3, 3.2.3.4, and 3.2.4.5.
3.6.2.2, Suppression Pool Water Level Applicability Bases	3.6.2.2, Suppression Pool Water Level Applicability Bases	The Applicability Bases reference to LCO 3.5.2 is revised to reflect the changed title of TS 3.5.2.
3.6.4.1, [Secondary] Containment Applicability Action C	3.6.4.1, [Secondary Containment] Applicability Action C	LCO 3.6.4.1 is revised to remove OPDRVs from the Applicability. Condition C and Required Action C.2 are revised to remove requirements related to inoperable secondary containment during OPDRVs. Proposed LCO 3.5.2, Actions C and D contain the requirements on secondary containment. See justification Sections 3.2.3.2 and 3.2.3.3.
3.6.4.2, Secondary Containment Isolation Valves (SCIVs) Applicability Action D	3.6.4.2, Secondary Containment Isolation Valves Applicability Action D	LCO 3.6.4.2 is revised to remove OPDRVs from the Applicability. Condition D and Required Action D.2 are revised to remove requirements related to inoperable secondary containment isolation valves during OPDRVs. Proposed LCO 3.5.2, Actions C and D contain the requirements on secondary containment isolation valves. See

NUREG-1433, BWR/4 ISTS	NUREG-1434, BWR/6 ISTS	Changes
		justification Sections 3.2.3.2 and 3.2.3.3.
3.6.4.3, Standby Gas Treatment (SGT) System Applicability Action C Action E	3.6.4.3, Standby Gas Treatment (SGT) System Applicability Action C Action E	LCO 3.6.4.3 is revised to remove OPDRVs from the Applicability. Condition C and Required Action C.2 and Condition E and Required Action E.2 are revised to remove requirements related to inoperable SGT during OPDRVs. Proposed LCO 3.5.2, Actions C and D contain the requirements on SGT. See justification Sections 3.2.3.2 and 3.2.3.3.
3.7.4, [Main Control Room Environmental Control (MCREC)] System Applicability Action D Action F	3.7.3, [Control Room Fresh Air (CRFA)] System Applicability Action D Action F	The specification is revised to remove OPDRVs from the Applicability. Condition D and Required Action D.2.2 and Condition F and Required Action F.2 are revised to remove requirements related to OPDRVs. Under the proposed change, the requirements on control room habitability are removed. See justification Section 3.4.3.
3.7.5, [Control Room Air Conditioning (AC)] System Applicability Action D Action E	3.7.4, [Control Room Air Conditioning (AC)] System Applicability Action D Action E	The specification is revised to remove OPDRVs from the Applicability. Condition D and Required Action D.2.2 and Condition E and Required Action E.2 are revised to remove requirements related to OPDRVs. Under the proposed change, the

NUREG-1433, BWR/4 ISTS	NUREG-1434, BWR/6 ISTS	Changes
		requirements on control room temperature control are removed. See justification Section 3.4.3.
3.8.2, AC Sources - Shutdown Applicable Safety Analysis Bases LCO Bases Applicability Bases Action A Action B SR 3.8.2.1 Bases	3.8.2, AC Sources - Shutdown Applicable Safety Analysis Bases LCO Bases Applicability Bases Action A Action B SR 3.8.2.1 Bases	TS 3.8.2, Required Actions A.2.3 and B.3 require immediate action to suspend OPDRVs. These requirements are replaced by proposed requirements in the definition Drain Time (which require automatic isolation valves and operator actions to be capable of being performed without offsite power), Action D (which requires the ECCS subsystem or alternate method of water injection to be capable of operating without offsite power), TS 3.3.5.2 and SR 3.5.2.7 (which require isolation valves credited in the Drain Time calculation to automatically actuate and isolate), SR 3.5.2.8 (which requires manual ECCS initiation), and Actions A, B, and F (which apply when the ECCS subsystems or automatic valves cannot perform their function, including the ability to perform without offsite power). See justification Sections 3.2.1.3, 3.2.3.4, and 3.2.4.5.

NUREG-1433, BWR/4 ISTS	NUREG-1434, BWR/6 ISTS	Changes
3.8.5, DC Sources - Shutdown Applicable Safety Analysis Bases LCO Bases Applicability Bases Action B	3.8.5, DC Sources - Shutdown Applicable Safety Analysis Bases LCO Bases Applicability Bases Action B	TS 3.8.5, Required Action B.2.3 requires immediate action to suspend OPDRVs. This requirement is replaced by proposed requirements in the definition Drain Time (which require automatic isolation valves and operator actions to be capable of being performed without offsite power), Action C and D (which requires isolation valves to be capable of operating without offsite power), and TS 3.3.5.2 (which requires necessary instrumentation). See justification Sections 3.2.1.3, 3.2.3.4, 3.2.4, and 3.4.4.
3.8.8, Inverters - Shutdown Applicable Safety Analysis Bases LCO Bases Applicability Bases Action A	3.8.8, Inverters - Shutdown Applicable Safety Analysis Bases LCO Bases Applicability Bases Action A	TS 3.8.8, Required Action A.2.3 requires immediate action to suspend OPDRVs. This requirement is replaced by proposed requirements in the definition Drain Time (which require automatic isolation valves and operator actions to be capable of being performed without offsite power), Action C and D (which requires isolation valves to be capable of operating without offsite power), and TS 3.3.5.2 (which requires necessary instrumentation). See justification Sections 3.2.1.3, 3.2.3.4, 3.2.4, and 3.4.4.
3.8.10, Distribution Systems - Shutdown Applicable Safety Analysis Bases LCO Bases	3.8.10, Distribution Systems - Shutdown Applicable Safety Analysis Bases LCO Bases	TS 3.8.10, Required Action A.2.3 requires immediate action to suspend OPDRVs. These requirements are

NUREG-1433, BWR/4 ISTS	NUREG-1434, BWR/6 ISTS	Changes
Applicability Bases Action A	Applicability Bases Action A	replaced by proposed requirements in the definition Drain Time (which require automatic isolation valves and operator actions to be capable of being performed without offsite power), Action C and D (which requires isolation valves to be capable of operating without offsite power), Action D (which requires the ECCS subsystem or alternate method of water injection to be capable of operating without offsite power), TS 3.3.5.2 and SR 3.5.2.7 (which require isolation valves credited in the Drain Time calculation to automatically actuate and isolate), SR 3.5.2.8 (which requires manual ECCS initiation), and Actions A, B, and F (which apply when the ECCS subsystem or automatic valves cannot perform their function, including the ability to perform without offsite power). See justification Sections 3.2.1.3, 3.2.3.4, 3.2.4, and 3.4.4.
3.10.1, Inservice Leak and Hydrostatic Testing Operation Applicable Safety Analysis Bases	3.10.1, Inservice Leak and Hydrostatic Testing Operation Applicable Safety Analysis Bases	The Applicable Safety Analysis Bases are revised to reflect renaming and changes to TS 3.5.2.
5.5.16, Setpoint Control Program	5.5.16, Setpoint Control Program	The reference to TS 3.3.5.2 is changed to TS 3.3.5.3. TS 3.3.5.2 is added.

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-542, "REACTOR PRESSURE VESSEL WATER INVENTORY CONTROL"

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

The proposed change replaces existing Technical Specifications (TS) requirements related to "operations with a potential for draining the reactor vessel" (OPDRVs) with new requirements on Reactor Pressure Vessel Water Inventory Control (RPV WIC) to protect Safety Limit 2.1.1.3. Safety Limit 2.1.1.3 requires reactor vessel water level to be greater than the top of active irradiated fuel.

Attachment 1 provides a description and assessment of the proposed changes. Attachment 2 provides the existing TS pages marked to show the proposed changes. Attachment 3 provides revised (clean) TS pages. Attachment 4 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. Description and Assessment
2. Proposed Technical Specification Changes (Mark-Up)
3. Revised Technical Specification Pages
4. Proposed Technical Specification Bases Changes (Mark-Up)

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

ATTACHMENT 1 - DESCRIPTION AND ASSESSMENT

1.0 DESCRIPTION

The proposed change replaces existing Technical Specifications (TS) requirements related to "operations which have the potential for draining the reactor vessel" (OPDRVs) with new requirements on Reactor Pressure Vessel Water Inventory Control (RPV WIC) to protect Safety Limit 2.1.1.3. Safety Limit 2.1.1.3 requires reactor vessel water level to be greater than the top of active irradiated fuel.

2.0 ASSESSMENT

2.1 Applicability of Published Safety Evaluation

[LICENSEE] has reviewed the safety evaluation provided to the Technical Specifications Task Force on [DATE], as well as the information provided in TSTF-542. [LICENSEE] has concluded that the justifications presented in TSTF-542 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 to the [PLANT] TS.

The following [PLANT] TS reference or are related to OPDRVs and are affected by the proposed change:

[NOTE TO LICENSEES: The following list should be revised to list the plant-specific TS that reference OPDRVs or are related to OPDRVs, as discussed in TSTF-542.]

- 3.3.5.1A & B, Emergency Core Cooling System (ECCS) Instrumentation
- 3.3.6.1A & B, Primary Containment Isolation Instrumentation
- 3.3.6.2A & B, Secondary Containment Isolation Instrumentation
- 3.3.7.1A & B, [Main Control Room Environmental Control (MCREC)] System Instrumentation
- 3.5.2, ECCS - Shutdown
- 3.6.1.3, Primary Containment Isolation Valves (PCIVs)
- 3.6.4.1, [Secondary] Containment
- 3.6.4.2, Secondary Containment Isolation Valves (SCIVs)
- 3.6.4.3, Standby Gas Treatment (SGT) System
- 3.7.4, [Main Control Room Environmental Control (MCREC)] System
- 3.7.5, [Control Room Air Conditioning (AC)] System
- 3.8.2, AC Sources - Shutdown
- 3.8.5, DC Sources - Shutdown
- 3.8.8, Inverters - Shutdown
- 3.8.10, Distribution Systems - Shutdown

2.2 Variations

[LICENSEE is not proposing any variations from the TS changes described in the TSTF-542 or the applicable parts of the NRC staff's safety evaluation.] [LICENSEE is proposing the following variations from the TS changes described in the TSTF-542 or the applicable parts of

the NRC staff's safety evaluation.] These variations do not affect the applicability of TSTF-542 or the NRC staff's safety evaluation to the proposed license amendment.]

[The [PLANT] TS utilize different [numbering][and][titles] than the Standard Technical Specifications on which TSTF-542 was based. Specifically, [describe differences between the plant-specific TS numbering and/or titles and the TSTF-542 numbering and titles.] These differences are administrative and do not affect the applicability of TSTF-542 to the [PLANT] TS.]

[The [PLANT] Technical Specifications do not contain a Note on LCO 3.5.2 regarding realignment to the Low Pressure Coolant Injection mode. This has no effect on the adoption of the TSTF-542 and is an acceptable deviation.

[The Traveler and Safety Evaluation discuss the applicable regulatory requirements and guidance, including the 10 CFR 50, Appendix A, General Design Criteria (GDC). [PLANT] was not licensed to the 10 CFR 50, Appendix A, GDC. The [PLANT] equivalents of the referenced GDC are [REFERENCE INCLUDING UFSAR LOCATION, IF APPLICABLE]. [DISCUSS THE EQUIVALENCE OF THE REFERENCED PLANT-SPECIFIC REQUIREMENTS TO THE APPENDIX A GDC AS RELATED TO THE PROPOSED CHANGE.] This difference does not alter the conclusion that the proposed change is applicable to [PLANT].]

[The [PLANT] Technical Specifications contain a Surveillance Frequency Control Program. Therefore, the Surveillance Requirement Frequencies for Specification 3.5.2 are "In accordance with the Surveillance Frequency Control Program."]

[[LICENSEE] has chosen to implement the Reactor Pressure Vessel Water Inventory Control (WIC) Instrumentation specification as TS 3.3.5.3 and to not renumber the existing TS 3.3.5.2.]

[The [PLANT] TS contain requirements that differ from the Standard Technical Specifications on which TSTF-542 was based, but are encompassed in the TSTF-542 justification:

[NOTE TO LICENSEES: The following bullets are to be used as guidance in developing plant-specific descriptions of differences between the plant TS and the STS used in TSTF-542. The following list is not intended to encompass all possible differences, and the plant-specific list should describe all differences.]

- [There are plant-specific TS requirements related to OPDRVs, the related concepts such as "RHR integrity maintained," and Required Actions to "suspend OPDRVs" that do not appear in the ISTS (e.g., NUREG-1433 and NUREG-1434). Changes to these TS controls are justified by the discussion in the TSTF-542 justification. [DESCRIBE PLANT-SPECIFIC TS AND WHY THE JUSTIFICATION IS APPLICABLE.]]

- [There are plant-specific instrumentation functions that provide automatic initiation of ECCS water injection on low RPV water level. Changes to these instrumentation functions is justified by the discussion in Section 3.4.1 of the TSTF-542 justification. [DESCRIBE PLANT-SPECIFIC FUNCTION AND WHY THE JUSTIFICATION IS APPLICABLE.]]

- [There are plant-specific instrumentation functions that provide Residual Heat Removal (RHR) System isolation on low water level and/or, for BWR/6 plants, isolate the primary containment and drywell ventilation exhaust. Changes to these instrumentation functions is justified by the discussion in Section 3.4.1 of the TSTF-542 justification. [DESCRIBE PLANT-SPECIFIC FUNCTION AND WHY THE JUSTIFICATION IS APPLICABLE.]]

- [There are plant-specific instrumentation functions that provide manual and automatic isolation of the [Secondary Containment] on low water level. Changes to these instrumentation functions is justified by the discussion in Section 3.4.1 of the TSTF-542 justification. [DESCRIBE PLANT-SPECIFIC FUNCTION AND WHY THE JUSTIFICATION IS APPLICABLE.]]

- [There are plant-specific instrumentation functions that provide automatic isolation of the control room on low water level. Changes to these instrumentation functions is justified by the discussion in Section 3.4.1 of the TSTF-542 justification. [DESCRIBE PLANT-SPECIFIC FUNCTION AND WHY THE JUSTIFICATION IS APPLICABLE.]]

- [There are plant-specific Functions to support manual initiation of an ECCS subsystem. Inclusion of these instrumentation Functions is justified by the discussion in Section 3.3 of the TSTF-542 justification. [DESCRIBE PLANT-SPECIFIC FUNCTION AND WHY THE JUSTIFICATION IS APPLICABLE.]]

- [There are plant-specific Functions that provide automatic isolation of penetration flow paths below the TAF on low RPV water level, which can be credited in a Drain Time calculation. Inclusion of these instrumentation Functions is justified by the discussion in Section 3.3 of the TSTF-542 justification. [DESCRIBE PLANT-SPECIFIC FUNCTION AND WHY THE JUSTIFICATION IS APPLICABLE.]]

- [There are plant-specific systems that provide Primary and Secondary Containment, PCIVs and SCIVs, and SGT system functions in the TS. Changes to the TS controls on these systems is justified by the discussion in Section 3.4.2 of the TSTF-542 justification. [DESCRIBE PLANT-SPECIFIC SYSTEM AND WHY THE JUSTIFICATION IS APPLICABLE.]]

- [There are plant-specific systems that provide control room habitability functions in the TS. Changes to the TS controls on these systems is justified by the discussion in Section 3.4.3 of the TSTF-542 justification. [DESCRIBE PLANT-SPECIFIC SYSTEM AND WHY THE JUSTIFICATION IS APPLICABLE.]]

- [There are plant-specific systems that provide the electrical power functions in the TS. Changes to the TS controls on these systems is justified by the discussion in Section 3.4.4 of the TSTF-542 justification. [DESCRIBE PLANT-SPECIFIC SYSTEM AND WHY THE JUSTIFICATION IS APPLICABLE.]]]

3.0 REGULATORY ANALYSIS

3.1 No Significant Hazards Consideration Analysis

[LICENSEE] requests adoption of TSTF-542 "Reactor Pressure Vessel Water Inventory Control," which is an approved change to the Standard Technical Specifications (STS), into the [PLANT NAME, UNIT NOS] Technical Specifications (TS). The proposed amendment replaces the existing requirements in the Technical Specifications (TS) related to "operations with a potential for draining the reactor vessel" (OPDRVs) with new requirements on Reactor Pressure Vessel Water Inventory Control (RPV WIC) to protect Safety Limit 2.1.1.3. Safety Limit 2.1.1.3 requires reactor vessel water level to be greater than the top of active irradiated fuel.

[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 change replaces existing TS requirements related to OPDRVs with new requirements on RPV WIC that will protect Safety Limit 2.1.1.3. Draining of RPV water inventory in Mode 4 (i.e., cold shutdown) and Mode 5 (i.e., refueling) is not an accident previously evaluated and, therefore, replacing the existing TS controls to prevent or mitigate such an event with a new set of controls has no effect on any accident previously evaluated. RPV water inventory control in Mode 4 or Mode 5 is not an initiator of any accident previously evaluated. The existing OPDRV controls or the proposed RPV WIC controls are not mitigating actions assumed in any accident previously evaluated.

   The proposed change reduces the probability of an unexpected draining event (which is not a previously evaluated accident) by imposing new requirements on the limiting time in which an unexpected draining event could result in the reactor vessel water level dropping to the top of the active fuel (TAF). These controls require cognizance of the plant configuration and control of configurations with unacceptably short drain times. These requirements reduce the probability of an unexpected draining event. The current TS requirements are only mitigating actions and impose no requirements that reduce the probability of an unexpected draining event.

   The proposed change reduces the consequences of an unexpected draining event (which is not a previously evaluated accident) by requiring an Emergency Core Cooling System (ECCS) subsystem to be operable at all times in Modes 4 and 5. The current TS requirements do not require any water injection systems, ECCS or otherwise, to be Operable in certain conditions in Mode 5. The change in requirement from two ECCS subsystems to one ECCS subsystem in Modes 4 and 5 does not significantly affect the consequences of an unexpected draining event because the proposed Actions ensure equipment is available within the limiting drain time that is as capable of mitigating the

event as the current requirements. The proposed controls provide escalating compensatory measures to be established as calculated drain times decrease, such as verification of a second method of water injection and additional confirmations that containment and/or filtration would be available if needed.

The proposed change reduces or eliminates some requirements that were determined to be unnecessary to manage the consequences of an unexpected draining event, such as automatic initiation of an ECCS subsystem and control room ventilation. These changes do not affect the consequences of any accident previously evaluated since a draining event in Modes 4 and 5 is not a previously evaluated accident and the requirements are not needed to adequately respond to a draining event.

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 previously evaluated?

Response: No

The proposed change replaces existing TS requirements related to OPDRVs with new requirements on RPV WIC that will protect Safety Limit 2.1.1.3. The proposed change will not alter the design function of the equipment involved. Under the proposed change, some systems that are currently required to be operable during OPDRVs would be required to be available within the limiting drain time or to be in service depending on the limiting drain time. Should those systems be unable to be placed into service, the consequences are no different than if those systems were unable to perform their function under the current TS requirements.

The event of concern under the current requirements and the proposed change is an unexpected draining event. The proposed change does not create new failure mechanisms, malfunctions, or accident initiators that would cause a draining event or a new or different kind of accident not previously evaluated or included 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 previously evaluated.

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

Response: No

The proposed change replaces existing TS requirements related to OPDRVs with new requirements on RPV WIC. The current requirements do not have a stated safety basis and no margin of safety is established in the licensing basis. The safety basis for the new requirements is to protect Safety Limit 2.1.1.3. New requirements are added to determine the limiting time in which the RPV water inventory could drain to the top of the fuel in the reactor vessel should an unexpected draining event occur. Plant configurations that

could result in lowering the RPV water level to the TAF within one hour are now prohibited. New escalating compensatory measures based on the limiting drain time replace the current controls. The proposed TS establish a safety margin by providing defense-in-depth to ensure that the Safety Limit is protected and to protect the public health and safety. While some less restrictive requirements are proposed for plant configurations with long calculated drain times, the overall effect of the change is to improve plant safety and to add safety margin.

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.

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.

{Note: Attachments 2, 3, and 4 are not included in the model application and will be provided by the licensee.}

Enclosure 2

Proposed BWR/4 and BWR/6 Definition of "Drain Time"

1.1 Definitions

CORE ALTERATION	CORE ALTERATION shall be the movement of any fuel, sources, or reactivity control components, within the reactor vessel with the vessel head removed and fuel in the vessel. The following exceptions are not considered to be CORE ALTERATIONS: a. Movement of source range monitors, local power range monitors, intermediate range monitors, traversing incore probes, or special movable detectors (including undervessel replacement), and b. Control rod movement, provided there are no fuel assemblies in the associated core cell. Suspension of CORE ALTERATIONS shall not preclude completion of movement of a component to a safe position.
CORE OPERATING LIMITS REPORT (COLR)	The COLR is the unit specific document that provides cycle specific parameter limits for the current reload cycle. These cycle specific limits shall be determined for each reload cycle in accordance with Specification 5.6.3. Plant operation within these limits is addressed in individual Specifications.
DOSE EQUIVALENT I-31	DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcuries/gram) that alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in [Table III of TID-14844, AEC, 1962, "Calculation of Distance Factors for Power and Test Reactor Sites" or those listed in Table E-7 of Regulatory Guide 1.109, Rev. 1, NRC, 1977, or ICRP 30, Supplement to Part 1, page 192-212, Table titled, "Committed Dose Equivalent in Target Organs or Tissues per Intake of Unit Activity"].
DRAIN TIME	The DRAIN TIME is the time it would take for the water inventory in and above the Reactor Pressure Vessel (RPV) to drain to the top of the active fuel (TAF) seated in the RPV assuming: a) The water inventory above the TAF is divided by the limiting drain rate; b) The limiting drain rate is the larger of the drain rate through a single penetration flow path with the highest flow rate, or the sum of the drain rates through multiple penetration flow paths susceptible to a common mode failure (e.g., seismic event, loss of normal power, single

human error), for all penetration flow paths below the TAF except:

1. Penetration flow paths connected to an intact closed system, or isolated by manual or automatic valves that are locked, sealed, or otherwise secured in the closed position, blank flanges, or other devices that prevent flow of reactor coolant through the penetration flow paths;

2. Penetration flow paths capable of being isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the TAF when actuated by RPV water level isolation instrumentation; or

3. Penetration flow paths with isolation devices that can be closed prior to the RPV water level being equal to the TAF by a dedicated operator trained in the task, who in continuous communication with the control room, is stationed at the controls, and is capable of closing the penetration flow path isolation device without offsite power.

c) The penetration flow paths required to be evaluated per paragraph b) are assumed to open instantaneously and are not subsequently isolated, and no water is assumed to be subsequently added to the RPV water inventory;

d) No additional draining events occur; and

e) Realistic cross-sectional areas and drain rates are used.

A bounding DRAIN TIME may be used in lieu of a calculated value.

EMERGENCY CORE COOLING SYSTEM (ECCS) RESPONSE TIME

The ECCS RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its ECCS initiation setpoint at the channel sensor until the ECCS 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.

1.1 Definitions

CORE ALTERATION	CORE ALTERATION shall be the movement of any fuel, sources, or reactivity control components, within the reactor vessel with the vessel head removed and fuel in the vessel. The following exceptions are not considered to be CORE ALTERATIONS: a. Movement of source range monitors, local power range monitors, intermediate range monitors, traversing incore probes, or special movable detectors (including undervessel replacement), and b. Control rod movement, provided there are no fuel assemblies in the associated core cell. Suspension of CORE ALTERATIONS shall not preclude completion of movement of a component to a safe position.
CORE OPERATING LIMITS REPORT (COLR)	The COLR is the unit specific document that provides cycle specific parameter limits for the current reload cycle. These cycle specific limits shall be determined for each reload cycle in accordance with Specification 5.6.3. Plant operation within these limits is addressed in individual Specifications.
DOSE EQUIVALENT I-131	DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcuries/gram) that alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in [Table III of TID-14844, AEC, 1962, "Calculation of Distance Factors for Power and Test Reactor Sites" or those listed in Table E-7 of Regulatory Guide 1.109, Rev. 1, NRC, 1977, or ICRP 30, Supplement to Part 1, page 192-212, Table titled, "Committed Dose Equivalent in Target Organs or Tissues per Intake of Unit Activity"].
DRAIN TIME	The DRAIN TIME is the time it would take for the water inventory in and above the Reactor Pressure Vessel (RPV) to drain to the top of the active fuel (TAF) seated in the RPV assuming: a) The water inventory above the TAF is divided by the limiting drain rate; b) The limiting drain rate is the larger of the drain rate through a single penetration flow path with the highest flow rate, or the sum of the drain rates through multiple penetration flow paths susceptible to a common mode failure (e.g., seismic event, loss of normal power, single

human error), for all penetration flow paths below the TAF except:

1. Penetration flow paths connected to an intact closed system, or isolated by manual or automatic valves that are locked, sealed, or otherwise secured in the closed position, blank flanges, or other devices that prevent flow of reactor coolant through the penetration flow paths;

2. Penetration flow paths capable of being isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the TAF when actuated by RPV water level isolation instrumentation; or

3. Penetration flow paths with isolation devices that can be closed prior to the RPV water level being equal to the TAF by a dedicated operator trained in the task, who is in continuous communication with the control room, is stationed at the controls, and is capable of closing the penetration flow path isolation devices without offsite power.

c) The penetration flow paths required to be evaluated per paragraph b) are assumed to open instantaneously and are not subsequently isolated, and no water is assumed to be subsequently added to the RPV water inventory;

d) No additional draining events occur; and

e) Realistic cross-sectional areas and drain rates are used.

A bounding DRAIN TIME may be used in lieu of a calculated value.

EMERGENCY CORE COOLING SYSTEM (ECCS) RESPONSE TIME	The ECCS RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its ECCS initiation setpoint at the channel sensor until the ECCS 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.

Enclosure 3

Proposed BWR/4 and BWR/6
TS 3.5.2, "RPV Water Inventory Control"

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS), RPV WATER INVENTORY CONTROL, AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

3.5.2 Reactor Pressure Vessel (RPV) Water Inventory Control

LCO 3.5.2 DRAIN TIME of RPV water inventory to the top of active fuel (TAF) shall be ≥ 36 hours.

AND

One low pressure ECCS injection/spray subsystem shall be OPERABLE.

--NOTE---
A Low Pressure Coolant Injection (LPCI) subsystem may be considered OPERABLE during alignment and operation for decay heat removal if capable of being manually realigned and not otherwise inoperable.

APPLICABILITY: MODES 4 and 5

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required ECCS injection/spray subsystem inoperable.	A.1 Restore required ECCS injection/spray subsystem to OPERABLE status.	4 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Initiate action to establish a method of water injection capable of operating without offsite electrical power.	Immediately

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. DRAIN TIME < 36 hours and ≥ 8 hours.	C.1	Verify [secondary] containment boundary is capable of being established in less than the DRAIN TIME.	4 hours
	<u>AND</u>		
	C.2	Verify each [secondary] containment penetration flow path is capable of being isolated in less than the DRAIN TIME.	4 hours
	<u>AND</u>		
	C.3	Verify one standby gas treatment subsystem is capable of being placed in operation in less than the DRAIN TIME.	4 hours
D. DRAIN TIME < 8 hours.	D.1	----------- NOTE --------------- Required ECCS injection/spray subsystem or additional method of water injection shall be capable of operating without offsite electrical power. ------------------------------------	
		Initiate action to establish an additional method of water injection with water sources capable of maintaining RPV water level > TAF for ≥ 36 hours.	Immediately
	<u>AND</u>		
	D.2	Initiate action to establish [secondary] containment boundary.	Immediately
	<u>AND</u>		

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	D.3 Initiate action to isolate each [secondary] containment penetration flow path or verify it can be manually isolated from the control room. <u>AND</u> D.4 Initiate action to verify one standby gas treatment subsystem is capable of being placed in operation.	Immediately Immediately
E. Required Action and associated Completion Time of Condition C or D not met. <u>OR</u> DRAIN TIME < 1 hour.	E.1 Initiate action to restore DRAIN TIME to ≥ 36 hours.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.2.1	Verify DRAIN TIME ≥ 36 hours.	[12 hours <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.2	Verify, for a required low pressure coolant injection (LPCI) subsystem, the suppression pool water level is ≥ [12 ft 2 inches].	[12 hours <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.3	Verify, for a required Core Spray (CS) subsystem, the: a. Suppression pool water level is ≥ [12 ft 2 inches] or b. Condensate storage tank water level is ≥ [12 ft].	[12 hours <u>OR</u> In accordance with the Surveillance Frequency Control Program]

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.2.4	Verify, for the required ECCS injection/spray subsystem, the piping is filled with water from the pump discharge valve to the injection valve.	[31 days OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.5	Verify, for the required ECCS injection/spray subsystem, each manual, power operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position.	[31 days OR In accordance with the Surveillance Frequency Control Program]

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.2.6	Operate the required ECCS injection/spray subsystem through the recirculation line for ≥ 10 minutes.	[92 days OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.7	Verify each valve credited for automatically isolating a penetration flow path actuates to the isolation position on an actual or simulated isolation signal.	[[18] months OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.8	-------------------------------NOTE------------------------------ Vessel injection/spray may be excluded. --- Verify the required ECCS injection/spray subsystem actuates on a manual initiation signal.	[[18] months OR In accordance with the Surveillance Frequency Control Program]

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS), RPV WATER INVENTORY CONTROL, AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

3.5.2 Reactor Pressure Vessel (RPV) Water Inventory Control

LCO 3.5.2 DRAIN TIME of RPV water inventory to the top of active fuel (TAF) shall be ≥ 36 hours.

AND

One ECCS injection/spray subsystem shall be OPERABLE.

--NOTE--
A Low Pressure Coolant Injection (LPCI) subsystem may be considered OPERABLE during alignment and operation for decay heat removal, if capable of being manually realigned and not otherwise inoperable.

APPLICABILITY: MODES 4 and 5

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required ECCS injection/spray subsystem inoperable.	A.1 Restore required ECCS injection/spray subsystem to OPERABLE status.	4 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Initiate action to establish a method of water injection capable of operating without offsite electrical power.	Immediately

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. DRAIN TIME < 36 hours and ≥ 8 hours.	C.1	Verify [secondary containment] boundary is capable of being established in less than the DRAIN TIME.	4 hours
	<u>AND</u>		
	C.2	Verify each [secondary containment] penetration flow path is capable of being isolated in less than the DRAIN TIME.	4 hours
	<u>AND</u>		
	C.3	[Verify one standby gas treatment subsystem is capable of being placed in operation in less than the DRAIN TIME.	4 hours]
D. DRAIN TIME < 8 hours.	D.1	----------- NOTE --------------- Required ECCS injection/spray subsystem or additional method of water injection shall be capable of operating without offsite electrical power. ------------------------------------	
		Initiate action to establish an additional method of water injection with water sources capable of maintaining RPV water level > TAF for ≥ 36 hours.	Immediately
	<u>AND</u>		
	D.2	Initiate action to establish [secondary containment] boundary.	Immediately
	<u>AND</u>		

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	D.3 Initiate action to isolate each [secondary containment] penetration flow path or verify it can be manually isolated from the control room. AND D.4 [Initiate action to verify one standby gas treatment subsystem is capable of being placed in operation.	Immediately Immediately]
E. Required Action and associated Completion Time of Condition C or D not met. OR DRAIN TIME < 1 hour.	E.1 Initiate action to restore DRAIN TIME to ≥ 36 hours.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.2.1	Verify DRAIN TIME ≥ 36 hours.	[12 hours OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.2	Verify, for a required low pressure ECCS injection/spray subsystem, the suppression pool water level is ≥ [12.67 ft].	[12 hours OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.3	Verify, for a required High Pressure Core Spray (HPCS) System, the: a. Suppression pool water level is ≥ [12.67 ft] or b. Condensate storage tank water level is ≥ [18 ft].	[12 hours OR In accordance with the Surveillance Frequency Control Program]

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.2.4	Verify, for the required ECCS injection/spray subsystem, the piping is filled with water from the pump discharge valve to the injection valve.	[31 days <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.5	Verify, for the required ECCS injection/spray subsystem, each manual, power operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position.	[31 days <u>OR</u> In accordance with the Surveillance Frequency Control Program]

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.2.6	Operate the required ECCS injection/spray subsystem through the recirculation line for ≥ 10 minutes.	[92 days <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.7	Verify each valve credited for automatically isolating a penetration flow path actuates to the isolation position on an actual or simulated isolation signal.	[[18] months OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.8	------------------------------NOTE------------------------------ Vessel injection/spray may be excluded. --- Verify the required ECCS injection/spray subsystem actuates on a manual initiation signal.	 [[18] months <u>OR</u> In accordance with the Surveillance Frequency Control Program]

Enclosure 4

Proposed BWR/4 and BWR/6 Bases for TS 3.5.2, "RPV Water Inventory Control"

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS), RPV WATER INVENTORY CONTROL, AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

B 3.5.2 Reactor Pressure Vessel (RPV) Water Inventory Control

BASES

BACKGROUND

The RPV contains penetrations below the top of the active fuel (TAF) that have the potential to drain the reactor coolant inventory to below the TAF. If the water level should drop below the TAF, the ability to remove decay heat is reduced, which could lead to elevated cladding temperatures and clad perforation. Safety Limit 2.1.1.3 requires the RPV water level to be above the top of the active irradiated fuel at all times to prevent such elevated cladding temperatures.

APPLICABLE SAFETY ANALYSES

With the unit in MODE 4 or 5, RPV water inventory control is not required to mitigate any events or accidents evaluated in the safety analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material to the environment should an unexpected draining event occur.

A double-ended guillotine break of the Reactor Coolant System (RCS) is not postulated in MODES 4 and 5 due to the reduced RCS pressure, reduced piping stresses, and ductile piping systems. Instead, an event is considered in which single operator error or initiating event allows draining of the RPV water inventory through a single penetration flow path with the highest flow rate, or the sum of the drain rates through multiple penetration flow paths susceptible to a common mode failure (e.g., seismic event, loss of normal power, single human error). It is assumed, based on engineering judgment, that while in MODES 4 and 5, one low pressure ECCS injection/spray subsystem can maintain adequate reactor vessel water level.

As discussed in References 1, 2, 3, 4, and 5, operating experience has shown RPV water inventory to be significant to public health and safety. Therefore, RPV Water Inventory Control satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).

LCO

The RPV water level must be controlled in MODES 4 and 5 to ensure that if an unexpected draining event should occur, the reactor coolant water level remains above the top of the active irradiated fuel as required by Safety Limit 2.1.1.3.

BASES

LCO (continued)

The Limiting Condition for Operation (LCO) requires the DRAIN TIME of RPV water inventory to the TAF to be ≥ 36 hours. A DRAIN TIME of 36 hours is considered reasonable to identify and initiate action to mitigate unexpected draining of reactor coolant. An event that could cause loss of RPV water inventory and result in the RPV water level reaching the TAF in greater than 36 hours does not represent a significant challenge to Safety Limit 2.1.1.3 and can be managed as part of normal plant operation.

One low pressure ECCS injection/spray subsystem is required to be OPERABLE and capable of being manually started to provide defense-in-depth should an unexpected draining event occur. A low pressure ECCS injection/spray subsystem consists of either one Core Spray (CS) subsystem or one Low Pressure Coolant Injection (LPCI) subsystem. Each CS subsystem consists of one motor driven pump, piping, and valves to transfer water from the suppression pool or condensate storage tank (CST) to the RPV. Each LPCI subsystem consists of one motor driven pump, piping, and valves to transfer water from the suppression pool to the RPV. In MODES 4 and 5, the RHR System cross tie valve is not required to be closed.

The LCO is modified by a Note which allows a required LPCI subsystem to be considered OPERABLE during alignment and operation for decay heat removal if capable of being manually realigned (remote or local) to the LPCI mode and is not otherwise inoperable. Alignment and operation for decay heat removal includes when the required RHR pump is not operating or when the system is realigned from or to the RHR shutdown cooling mode. This allowance is necessary since the RHR System may be required to operate in the shutdown cooling mode to remove decay heat and sensible heat from the reactor. Because of the restrictions on DRAIN TIME, sufficient time will be available following an unexpected draining event to manually align and initiate LPCI subsystem operation to maintain RPV water inventory prior to the RPV water level reaching the TAF.

APPLICABILITY

RPV water inventory control is required in MODES 4 and 5. Requirements on water inventory control in other MODES are contained in LCOs in Section 3.3, Instrumentation, and other LCOs in Section 3.5, ECCS, RCIC, and RPV Water Inventory Control. RPV water inventory control is required to protect Safety Limit 2.1.1.3 which is applicable whenever irradiated fuel is in the reactor vessel.

BASES

ACTIONS

A.1 and B.1

If the required low pressure ECCS injection/spray subsystem is inoperable, it must be restored to OPERABLE status within 4 hours. In this Condition, the LCO controls on DRAIN TIME minimize the possibility that an unexpected draining event could necessitate the use of the ECCS injection/spray subsystem, however the defense-in-depth provided by the ECCS injection/spray subsystem is lost. The 4 hour Completion Time for restoring the required low pressure ECCS injection/spray subsystem to OPERABLE status is based on engineering judgment that considers the LCO controls on DRAIN TIME and the low probability of an unexpected draining event that would result in loss of RPV water inventory.

If the inoperable ECCS injection/spray subsystem is not restored to OPERABLE status within the required Completion Time, action must be initiated immediately to establish a method of water injection capable of operating without offsite electrical power. The method of water injection includes the necessary instrumentation and controls, water sources, and pumps and valves needed to add water to the RPV or refueling cavity should an unexpected draining event occur. The method of water injection may be manually initiated and may consist of one or more systems or subsystems, and must be able to access water inventory capable of maintaining the RPV water level above the TAF for ≥ 36 hours. If recirculation of injected water would occur, it may be credited in determining the necessary water volume.

C.1, C.2, and C.3

With the DRAIN TIME less than 36 hours but greater than or equal to 8 hours, compensatory measures should be taken to ensure the ability to implement mitigating actions should an unexpected draining event occur. Should a draining event lower the reactor coolant level to below the TAF, there is potential for damage to the reactor fuel cladding and release of radioactive material. Additional actions are taken to ensure that radioactive material will be contained, diluted, and processed prior to being released to the environment.

The [secondary] containment provides a controlled volume in which fission products can be contained, diluted, and processed prior to release to the environment. Required Action C.1 requires verification of the capability to establish the [secondary] containment boundary in less than the DRAIN TIME. The required verification confirms actions to establish the [secondary] containment boundary are preplanned and necessary materials are available. The [secondary] containment boundary is considered established when one Standby Gas Treatment (SGT) subsystem is capable of maintaining a negative pressure in the [secondary] containment with respect to the environment.

BASES

ACTIONS (continued)

Verification that the [secondary] containment boundary can be established must be performed within 4 hours. The required verification is an administrative activity and does not require manipulation or testing of equipment. [Secondary] containment penetration flow paths form a part of the [secondary] containment boundary. Required Action C.2 requires verification of the capability to isolate each [secondary] containment penetration flow path in less than the DRAIN TIME. The required verification confirms actions to isolate the [secondary] containment penetration flow paths are preplanned and necessary materials are available. Power operated valves are not required to receive automatic isolation signals if they can be closed manually within the required time. Verification that the [secondary] containment penetration flow paths can be isolated must be performed within 4 hours. The required verification is an administrative activity and does not require manipulation or testing of equipment.

One SGT subsystem is capable of maintaining the [secondary] containment at a negative pressure with respect to the environment and filter gaseous releases. Required Action C.3 requires verification of the capability to place one SGT subsystem in operation in less than the DRAIN TIME. The required verification confirms actions to place a SGT subsystem in operation are preplanned and necessary materials are available. Verification that a SGT subsystem can be placed in operation must be performed within 4 hours. The required verification is an administrative activity and does not require manipulation or testing of equipment.

<u>D.1, D.2, D.3, and D.4</u>

With the DRAIN TIME less than 8 hours, mitigating actions are implemented in case an unexpected draining event should occur. Note that if the DRAIN TIME is less than 1 hour, Required Action E.1 is also applicable.

Required Action D.1 requires immediate action to establish an additional method of water injection augmenting the ECCS injection/spray subsystem required by the LCO. The additional method of water injection includes the necessary instrumentation and controls, water sources, and pumps and valves needed to add water to the RPV or refueling cavity should an unexpected draining event occur. The Note to Required Action D.1 states that either the ECCS injection/spray subsystem or the additional method of water injection must be capable of operating without offsite electrical power. The additional method of water injection may be manually initiated and may consist of one or more systems or subsystems. The additional method of water injection must be able to

BASES

ACTIONS (continued)

access water inventory capable of being injected to maintain the RPV water level above the TAF for ≥ 36 hours. The additional method of water injection and the ECCS injection/spray subsystem may share all or part of the same water sources. If recirculation of injected water would occur, it may be credited in determining the required water volume.

Should a draining event lower the reactor coolant level to below the TAF, there is potential for damage to the reactor fuel cladding and release of radioactive material. Additional actions are taken to ensure that radioactive material will be contained, diluted, and processed prior to being released to the environment.

The [secondary] containment provides a control volume in which fission products can be contained, diluted, and processed prior to release to the environment. Required Action D.2 requires that actions be immediately initiated to establish the [secondary] containment boundary. With the [secondary] containment boundary established, one SGT subsystem is capable of maintaining a negative pressure in the [secondary] containment with respect to the environment.

The [secondary] containment penetrations form a part of the [secondary] containment boundary. Required Action D.3 requires that actions be immediately initiated to verify that each [secondary] containment penetration flow path is isolated or to verify that it can be manually isolated from the control room.

One SGT subsystem is capable of maintaining the [secondary] containment at a negative pressure with respect to the environment and filter gaseous releases. Required Action D.4 requires that actions be immediately initiated to verify that at least one SGT subsystem is capable of being placed in operation. The required verification is an administrative activity and does not require manipulation or testing of equipment.

E.1

If the Required Actions and associated Completion times of Conditions C or D are not met or if the DRAIN TIME is less than 1 hour, actions must be initiated immediately to restore the DRAIN TIME to ≥ 36 hours. In this condition, there may be insufficient time to respond to an unexpected draining event to prevent the RPV water inventory from reaching the TAF. Note that Required Actions D.1, D.2, D.3, and D.4 are also applicable when DRAIN TIME is less than 1 hour.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.5.2.1

This Surveillance verifies that the DRAIN TIME of RPV water inventory to the TAF is ≥ 36 hours. The period of 36 hours is considered reasonable to identify and initiate action to mitigate draining of reactor coolant. Loss of RPV water inventory that would result in the RPV water level reaching the TAF in greater than 36 hours does not represent a significant challenge to Safety Limit 2.1.1.3 and can be managed as part of normal plant operation.

The definition of DRAIN TIME states that realistic cross-sectional areas and drain rates are used in the calculation. A realistic drain rate may be determined using a single, step-wise, or integrated calculation considering the changing RPV water level during a draining event. For a Control Rod RPV penetration flow path with the Control Rod Drive Mechanism removed and not replaced with a blank flange, the realistic cross-sectional area is based on the control rod blade seated in the control rod guide tube. If the control rod blade will be raised from the penetration to adjust or verify seating of the blade, the exposed cross-sectional area of the RPV penetration flow path is used.

The definition of DRAIN TIME excludes from the calculation those penetration flow paths connected to an intact closed system, or isolated by manual or automatic valves that are locked, sealed, or otherwise secured in the closed position, blank flanges, or other devices that prevent flow of reactor coolant through the penetration flow paths. A blank flange or other bolted device must be connected with a sufficient number of bolts to prevent draining in the event of an Operating Basis Earthquake. Normal or expected leakage from closed systems or past isolation devices is permitted. Determination that a system is intact and closed or isolated must consider the status of branch lines and ongoing plant maintenance and testing activities.

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Residual Heat Removal (RHR) Shutdown Cooling System is only considered an intact closed system when misalignment issues (Reference 6) have been precluded by functional valve interlocks or by isolation devices, such that redirection of RPV water out of an RHR subsystem is precluded. Further, RHR Shutdown Cooling System is only considered an intact closed system if its controls have not been transferred to Remote Shutdown, which disables the interlocks and isolation signals.

The exclusion of penetration flow paths from the determination of DRAIN TIME must consider the potential effects of a single operator error or initiating event on items supporting maintenance and testing (rigging, scaffolding, temporary shielding, piping plugs, snubber removal, freeze seals, etc.). If failure of such items could result and would cause a draining event from a closed system or between the RPV and the isolation device, the penetration flow path may not be excluded from the DRAIN TIME calculation.

Surveillance Requirement 3.0.1 requires SRs to be met between performances. Therefore, any changes in plant conditions that would change the DRAIN TIME requires that a new DRAIN TIME be determined.

[The Frequency of 12 hours is sufficient in view of indications of RPV water level available to the operator .

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

<u>SR 3.5.2.2 and SR 3.5.2.3</u>

The minimum water level of [12 ft 2 inches] required for the suppression pool is periodically verified to ensure that the suppression pool will provide adequate net positive suction head (NPSH) for the CS subsystem or LPCI subsystem pump, recirculation volume, and vortex prevention. With the suppression pool water level less than the required limit, the

SURVEILLANCE REQUIREMENTS (continued)

required ECCS injection/spray subsystem is inoperable unless aligned to an OPERABLE CST.

The required CS System is OPERABLE only if it can take suction from the CST, and the CST water level is sufficient to provide the required NPSH for the CS pump. Therefore, a verification that either the suppression pool water level is ≥ [12 ft 2 inches] or that a required CS subsystem is aligned to take suction from the CST and the CST contains ≥ [150,000] gallons of water, equivalent to [12] ft, ensures that the CS subsystem can supply at least [50,000] gallons of makeup water to the RPV. The CS suction is uncovered at the [100,000] gallon level.

[The 12 hour Frequency of these SRs was developed considering operating experience related to suppression pool and CST water level variations . Furthermore, the 12 hour Frequency is considered adequate in view of other indications available in the control room, including alarms, to alert the operator to an abnormal suppression pool or CST water level condition.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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<u>SR 3.5.2.4</u>

The flow path piping has the potential to develop voids and pockets of entrained air. Maintaining the pump discharge lines of the required ECCS injection/spray subsystems full of water ensures that the ECCS subsystem will perform properly. This may also prevent a water hammer following an ECCS initiation signal. One acceptable method of ensuring that the lines are full is to vent at the high points. [The 31 day Frequency is based on the gradual nature of void buildup in the ECCS piping, the procedural controls governing system operation, and operating experience.

OR

SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

SR 3.5.2.5

Verifying the correct alignment for manual, power operated, and automatic valves in the required ECCS subsystem flow path provides assurance that the proper flow paths will be available for ECCS operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these valves were verified to be in the correct position prior to locking, sealing, or securing. A valve that receives an initiation signal is allowed to be in a nonaccident position provided the valve will automatically reposition in the proper stroke time. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of potentially being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves. [The 31 day Frequency is appropriate because the valves are operated under procedural control and the probability of their being mispositioned during this time period is low.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.2.6

Verifying that the required ECCS injection/spray subsystem can be manually started and operate for at least 10 minutes demonstrates that the subsystem is available to mitigate a draining event. Testing the ECCS injection/spray subsystem through the recirculation line is necessary to avoid overfilling the refueling cavity. The minimum operating time of 10 minutes was based on engineering judgement. [The performance frequency of 92 days is consistent with similar at-power testing required by SR 3.5.1.7.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

SR 3.5.2.7

Verifying that each valve credited for automatically isolating a penetration flow path actuates to the isolation position on an actual or simulated RPV water level isolation signal is required to prevent RPV water inventory from dropping below the TAF should an unexpected draining event occur. [The [18] month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown these components usually pass the Surveillance when performed at the [18] month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SURVEILLANCE REQUIREMENTS (continued)

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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SR 3.5.2.8

The required ECCS subsystem is required to actuate on a manual initiation signal. This Surveillance verifies that a manual initiation signal will cause the required CS subsystems or LPCI subsystem to start and operate as designed, including pump startup and actuation of all automatic valves to their required positions.

[The [18] month Frequency is based on the need to perform the Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power.

Operating experience has shown that these components usually pass the SR when performed at the [18] month Frequency, which is based on the refueling cycle. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

This SR is modified by a Note that excludes vessel injection/spray during the Surveillance. Since all active components are testable and full flow can be demonstrated by recirculation through the test line, coolant injection into the RPV is not required during the Surveillance.

BASES

REFERENCES

1. Information Notice 84-81 "Inadvertent Reduction in Primary Coolant Inventory in Boiling Water Reactors During Shutdown and Startup," November 1984.

2. Information Notice 86-74, "Reduction of Reactor Coolant Inventory Because of Misalignment of RHR Valves," August 1986.

3. Generic Letter 92-04, "Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs Pursuant to 10 CFR 50.54(F), " August 1992.

4. NRC Bulletin 93-03, "Resolution of Issues Related to Reactor Vessel Water Level Instrumentation in BWRs," May 1993.

5. Information Notice 94-52, "Inadvertent Containment Spray and Reactor Vessel Draindown at Millstone 1," July 1994.

6. General Electric Service Information Letter No. 388, "RHR Valve Misalignment During Shutdown Cooling Operation for BWR 3/4/5/6," February 1983.

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS), RPV WATER INVENTORY CONTROL, AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

B 3.5.2 Reactor Pressure Vessel (RPV) Water Inventory Control

BASES

BACKGROUND

The RPV contains penetrations below the top of the active fuel (TAF) that have the potential to drain the reactor coolant inventory to below the TAF. If the water level should drop below the TAF, the ability to remove decay heat is reduced, which could lead to elevated cladding temperatures and clad perforation. Safety Limit 2.1.1.3 requires the RPV water level to be above the top of the active irradiated fuel at all times to prevent such elevated cladding temperatures.

APPLICABLE SAFETY ANALYSES

With the unit in MODE 4 or 5, RPV water inventory control is not required to mitigate any events or accidents evaluated in the safety analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material to the environment should an unexpected draining event occur.

A double-ended guillotine break of the Reactor Coolant System (RCS) is not postulated in MODES 4 and 5 due to the reduced RCS pressure, reduced piping stresses, and ductile piping systems. Instead, an event is considered in which single operator error or initiating event allows draining of the RPV water inventory through a single penetration flow path with the highest flow rate, or the sum of the drain rates through multiple penetration flow paths susceptible to a common mode failure (e.g., seismic event, loss of normal power, single human error). It is assumed, based on engineering judgment, that while in MODES 4 and 5, one low pressure ECCS injection/spray subsystem can maintain adequate reactor vessel water level.

As discussed in References 1, 2, 3, 4, and 5, operating experience has shown RPV water inventory to be significant to public health and safety. Therefore, RPV Water Inventory Control satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).

LCO

The RPV water level must be controlled in MODES 4 and 5 to ensure that if an unexpected draining event should occur, the reactor coolant water level remains above the top of the active irradiated fuel as required by Safety Limit 2.1.1.3.

BASES

LCO (continued)

The Limiting Condition for Operation (LCO) requires the DRAIN TIME of RPV water inventory to the TAF to be ≥ 36 hours. A DRAIN TIME of 36 hours is considered reasonable to identify and initiate action to mitigate unexpected draining of reactor coolant. An event that could cause loss of RPV water inventory and result in the RPV water level reaching the TAF in greater than 36 hours does not represent a significant challenge to Safety Limit 2.1.1.3 and can be managed as part of normal plant operation.

One ECCS injection/spray subsystem is required to be OPERABLE and capable of being manually started to provide defense-in- depth should an unexpected draining event occur. A ECCS injection/spray subsystem is defined as either one of the three Low Pressure Coolant Injection (LPCI) subsystems, one Low Pressure Core Spray (LPCS) System, or one High Pressure Core Spray (HPCS) System. The LPCI subsystems and the LPCS System consist of one motor driven pump, piping, and valves to transfer water from the suppression pool to the RPV. The HPCS System consists of one motor driven pump, piping, and valves to transfer water from the suppression pool or condensate storage tank (CST) to the RPV.

The LCO is modified by a Note which allows a required LPCI subsystem (A or B) to be considered OPERABLE during alignment and operation for decay heat removal, if capable of being manually realigned (remote or local) to the LPCI mode and is not otherwise inoperable. Alignment and operation for decay heat removal includes when the required RHR pump is not operating or when the system is realigned from or to the RHR shutdown cooling mode. This allowance is necessary since the RHR System may be required to operate in the shutdown cooling mode to remove decay heat and sensible heat from the reactor. Because of the restrictions on DRAIN TIME, sufficient time will be available following an unexpected draining event to manually align and initiate LPCI subsystem operation to maintain RPV water inventory prior to the RPV water level reaching the TAF.

APPLICABILITY

RPV water inventory control is required in MODES 4 and 5. Requirements on water inventory control in other MODES are contained in LCOs in Section 3.3, Instrumentation, and other LCOs in Section 3.5, ECCS, RCIC, and RPV Water Inventory Control. RPV water inventory control is required to protect Safety Limit 2.1.1.3 which is applicable whenever irradiated fuel is in the reactor vessel.

BASES

ACTIONS

A.1 and B.1

If the required ECCS injection/spray subsystem is inoperable, it must be restored to OPERABLE status within 4 hours. In this Condition, the LCO controls on DRAIN TIME minimize the possibility that an unexpected draining event could necessitate the use of the ECCS injection/spray subsystem, however the defense-in-depth provided by the ECCS injection/spray subsystem is lost. The 4 hour Completion Time for restoring the required ECCS injection/spray subsystem to OPERABLE status is based on engineering judgment that considers the LCO controls on DRAIN TIME and the low probability of an unexpected draining event that would result in loss of RPV water inventory.

If the inoperable ECCS injection/spray subsystem is not restored to OPERABLE status within the required Completion Time, action must be initiated immediately to establish a method of water injection capable of operating without offsite electrical power. The method of water injection includes the necessary instrumentation and controls, water sources, and pumps and valves needed to add water to the RPV or refueling cavity should an unexpected draining event occur. The method of water injection may be manually initiated and may consist of one or more systems or subsystems, and must be able to access water inventory capable of maintaining the RPV water level above the TAF for ≥ 36 hours. If recirculation of injected water would occur, it may be credited in determining the necessary water volume.

C.1, C.2, and C.3

With the DRAIN TIME less than 36 hours but greater than or equal to 8 hours, compensatory measures should be taken to ensure the ability to implement mitigating actions should an unexpected draining event occur. Should a draining event lower the reactor coolant level to below the TAF, there is potential for damage to the reactor fuel cladding and release of radioactive material. Additional actions are taken to ensure that radioactive material will be contained, diluted[, and processed] prior to being released to the environment.

The [secondary containment] provides a controlled volume in which fission products can be contained, diluted[, and processed] prior to release to the environment. Required Action C.1 requires verification of the capability to establish the [secondary containment] boundary in less than the DRAIN TIME. The required verification confirms actions to establish the [secondary containment] boundary are preplanned and necessary materials are available. [The [secondary containment] boundary is considered established when one Standby Gas Treatment (SGT) subsystem is capable of maintaining a negative pressure in the [secondary containment] with respect to the environment.]

ACTIONS (continued)

Verification that the [secondary containment] boundary can be established must be performed within 4 hours. The required verification is an administrative activity and does not require manipulation or testing of equipment. [Secondary containment] penetration flow paths form a part of the [secondary containment] boundary. Required Action C.2 requires verification of the capability to isolate each [secondary containment] penetration flow path in less than the DRAIN TIME. The required verification confirms actions to isolate the [secondary containment] penetration flow paths are preplanned and necessary materials are available. Power operated valves are not required to receive automatic isolation signals if they can be closed manually within the required time. Verification that the [secondary containment] penetration flow paths can be isolated must be performed within 4 hours. The required verification is an administrative activity and does not require manipulation or testing of equipment.

[One SGT subsystem is capable of maintaining the [secondary containment] at a negative pressure with respect to the environment and filter gaseous releases. Required Action C.3 requires verification of the capability to place one SGT subsystem in operation in less than the DRAIN TIME. The required verification confirms actions to place a SGT subsystem in operation are preplanned and necessary materials are available. Verification that a SGT subsystem can be placed in operation must be performed within 4 hours. The required verification is an administrative activity and does not require manipulation or testing of equipment.]

<u>D.1, D.2, D.3, and D.4</u>

With the DRAIN TIME less than 8 hours, mitigating actions are implemented in case an unexpected draining event should occur. Note that if the DRAIN TIME is less than 1 hour, Required Action E.1 is also applicable.

Required Action D.1 requires immediate action to establish an additional method of water injection augmenting the ECCS injection/spray subsystem required by the LCO. The additional method of water injection includes the necessary instrumentation and controls, water sources, and pumps and valves needed to add water to the RPV or refueling cavity should an unexpected draining event occur. The Note to Required Action D.1 states that either the ECCS injection/spray subsystem or the additional method of water injection must be capable of operating without offsite electrical power. The additional method of water injection may be manually initiated and may consist of one or more systems or

ACTIONS (continued)

subsystems. The additional method of water injection must be able to access water inventory capable of being injected to maintain the RPV water level above the TAF for ≥ 36 hours. The additional method of water injection and the ECCS injection/spray subsystem may share all or part of the same water sources. If recirculation of injected water would occur, it may be credited in determining the required water volume.

Should a draining event lower the reactor coolant level to below the TAF, there is potential for damage to the reactor fuel cladding and release of radioactive material. Additional actions are taken to ensure that radioactive material will be contained, diluted, and processed prior to being released to the environment.
The [secondary containment] provides a control volume in which fission products can be contained, diluted[, and processed] prior to release to the environment. Required Action D.2 requires that actions be immediately initiated to establish the [secondary containment] boundary. [With the [secondary containment] boundary established, one SGT subsystem is capable of maintaining a negative pressure in the [secondary containment] with respect to the environment].

The [secondary containment] penetrations form a part of the [secondary containment] boundary. Required Action D.3 requires that actions be immediately initiated to verify that each [secondary containment] penetration flow path is isolated or to verify that it can be manually isolated from the control room.

[One SGT subsystem is capable of maintaining the [secondary containment] at a negative pressure with respect to the environment and filter gaseous releases. Required Action D.4 requires that actions be immediately initiated to verify that at least one SGT subsystem is capable of being placed in operation. The required verification is an administrative activity and does not require manipulation or testing of equipment.]

<u>E.1</u>

If the Required Actions and associated Completion times of Conditions C or D are not met or if the DRAIN TIME is less than 1 hour, actions must be initiated immediately to restore the DRAIN TIME to ≥ 36 hours. In this condition, there may be insufficient time to respond to an unexpected draining event to prevent the RPV water inventory from reaching the TAF. Note that Required Actions D.1, D.2, D.3, and D.4 are also applicable when DRAIN TIME is less than 1 hour.

SURVEILLANCE REQUIREMENTS

SR 3.5.2.1

This Surveillance verifies that the DRAIN TIME of RPV water inventory to the TAF is ≥ 36 hours. The period of 36 hours is considered reasonable to identify and initiate action to mitigate draining of reactor coolant. Loss of RPV water inventory that would result in the RPV water level reaching the TAF in greater than 36 hours does not represent a significant challenge to Safety Limit 2.1.1.3 and can be managed as part of normal plant operation.

The definition of DRAIN TIME states that realistic cross-sectional areas and drain rates are used in the calculation. A realistic drain rate may be determined using a single, step-wise, or integrated calculation considering the changing RPV water level during a draining event. For a Control Rod RPV penetration flow path with the Control Rod Drive Mechanism removed and not replaced with a blank flange, the realistic cross-sectional area is based on the control rod blade seated in the control rod guide tube. If the control rod blade will be raised from the penetration to adjust or verify seating of the blade, the exposed cross-sectional area of the RPV penetration flow path is used.

The definition of DRAIN TIME excludes from the calculation those penetration flow paths connected to an intact closed system, or isolated by manual or automatic valves that are locked, sealed, or otherwise secured in the closed position, blank flanges, or other devices that prevent flow of reactor coolant through the penetration flow paths. A blank flange or other bolted device must be connected with a sufficient number of bolts to prevent draining in the event of an Operating Basis Earthquake. Normal or expected leakage from closed systems or past isolation devices is permitted. Determination that a system is intact and closed or isolated must consider the status of branch lines and ongoing plant maintenance and testing activities.

SURVEILLANCE REQUIREMENTS (continued)

The Residual Heat Removal (RHR) Shutdown Cooling System is only considered an intact closed system when misalignment issues (Reference 6) have been precluded by functional valve interlocks or by isolation devices, such that redirection of RPV water out of an RHR subsystem is precluded. Further, RHR Shutdown Cooling System is only considered an intact closed system if its controls have not been transferred to Remote Shutdown, which disables the interlocks and isolation signals.

The exclusion of penetration flow paths from the determination of DRAIN TIME must consider the potential effects of a single operator error or initiating event on items supporting maintenance and testing (rigging, scaffolding, temporary shielding, piping plugs, snubber removal, freeze seals, etc.). If failure of such items could result and would cause a draining event from a closed system or between the RPV and the isolation device, the penetration flow path may not be excluded from the DRAIN TIME calculation.

Surveillance Requirement 3.0.1 requires SRs to be met between performances. Therefore, any changes in plant conditions that would change the DRAIN TIME requires that a new DRAIN TIME be determined.

[The Frequency of 12 hours is sufficient in view of indications of RPV water level available to the operator .

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

<u>SR 3.5.2.2 and SR 3.5.2.3</u>

The minimum water level of [12.67 ft] required for the suppression pool is periodically verified to ensure that the suppression pool will provide adequate net positive suction head (NPSH) for the ECCS pump, recirculation volume, and vortex prevention. With the suppression pool

BASES

SURVEILLANCE REQUIREMENTS (continued)

water level less than the required limit, the required ECCS injection/spray subsystem is inoperable unless aligned to an OPERABLE CST.

When the suppression pool level is < [12.67 ft], the HPCS System is considered OPERABLE only if it can take suction from the CST and the CST water level is sufficient to provide the required NPSH for the HPCS pump. Therefore, a verification that either the suppression pool water level is ≥ [12.67 ft] or the HPCS System is aligned to take suction from the CST and the CST contains ≥ [170,000] gallons of water, equivalent to [18] ft, ensures that the HPCS System can supply makeup water to the RPV.

[The 12 hour Frequency of these SRs was developed considering operating experience related to suppression pool and CST water level variations. Furthermore, the 12 hour Frequency is considered adequate in view of other indications available in the control room, including alarms, to alert the operator to an abnormal suppression pool or CST water level condition.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

<u>SR 3.5.2.4</u>

The flow path piping has the potential to develop voids and pockets of entrained air. Maintaining the pump discharge lines of the required ECCS injection/spray subsystems full of water ensures that the ECCS subsystem will perform properly. This may also prevent a water hammer following an ECCS initiation signal. One acceptable method of ensuring that the lines are full is to vent at the high points. [The 31 day Frequency is based on the gradual nature of void buildup in the ECCS piping, the procedural controls governing system operation, and operating experience.

OR

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]

SR 3.5.2.5

Verifying the correct alignment for manual, power operated, and automatic valves in the required ECCS subsystem flow path provides assurance that the proper flow paths will be available for ECCS operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position since these valves were verified to be in the correct position prior to locking, sealing, or securing. A valve that receives an initiation signal is allowed to be in a nonaccident position provided the valve will automatically reposition in the proper stroke time. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of potentially being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves. [The 31 day Frequency is appropriate because the valves are operated under procedural control and the probability of their being mispositioned during this time period is low.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.2.6

Verifying that the required ECCS injection/spray subsystem can be manually started and operate for at least 10 minutes demonstrates that the subsystem is available to mitigate a draining event. Testing the ECCS injection/spray subsystem through the recirculation line is necessary to avoid overfilling the refueling cavity. The minimum operating time of 10 minutes was based on engineering judgement. [The performance frequency of 92 days is consistent with similar at-power testing required by SR 3.5.1.7.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]

SR 3.5.2.7

Verifying that each valve credited for automatically isolating a penetration flow path actuates to the isolation position on an actual or simulated RPV water level isolation signal is required to prevent RPV water inventory from dropping below the TAF should an unexpected draining event occur. [The [18] month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown these components usually pass the Surveillance when performed at the [18] month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SURVEILLANCE REQUIREMENTS (continued)

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

SR 3.5.2.8

The required ECCS subsystem is required to actuate on a manual initiation signal. This Surveillance verifies that a manual initiation signal will cause the required LCPI subsystem, LCPS System, or HPCS System to start and operate as designed, including pump startup and actuation of all automatic valves to their required positions.

[The [18] month Frequency is based on the need to perform the Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power.

Operating experience has shown that these components usually pass the SR when performed at the [18] month Frequency, which is based on the refueling cycle. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

This SR is modified by a Note that excludes vessel injection/spray during the Surveillance. Since all active components are testable and full flow can be demonstrated by recirculation through the test line, coolant injection into the RPV is not required during the Surveillance.

BASES

REFERENCES

1. Information Notice 84-81 "Inadvertent Reduction in Primary Coolant Inventory in Boiling Water Reactors During Shutdown and Startup," November 1984.

2. Information Notice 86-74, "Reduction of Reactor Coolant Inventory Because of Misalignment of RHR Valves," August 1986.

3. Generic Letter 92-04, "Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs Pursuant to 10 CFR 50.54(F), " August 1992.

4. NRC Bulletin 93-03, "Resolution of Issues Related to Reactor Vessel Water Level Instrumentation in BWRs," May 1993.

5. Information Notice 94-52, "Inadvertent Containment Spray and Reactor Vessel Draindown at Millstone 1," July 1994.

6. General Electric Service Information Letter No. 388, "RHR Valve Misalignment During Shutdown Cooling Operation for BWR 3/4/5/6," February 1983.

Enclosure 5

Proposed BWR/4 and BWR/6
TS 3.3.5.2, "RPV Water Inventory Control Instrumentation"

3.3 INSTRUMENTATION

3.3.5.2A Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation (Without Setpoint Control Program)

LCO 3.3.5.2A The RPV Water Inventory Control instrumentation for each Function in Table 3.3.5.2-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.5.2-1.

ACTIONS

---NOTE---

Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more channels inoperable.	A.1 Enter the Condition referenced in Table 3.3.5.2-1 for the channel.	Immediately
B. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	B.1 Declare associated penetration flow path(s) incapable of automatic isolation. <u>AND</u> B.2 Calculate DRAIN TIME.	Immediately Immediately
C. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	C.1 Place channel in trip.	1 hour
D. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	D.1 Restore channel to OPERABLE status.	24 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. Required Action and associated Completion Time of Condition C or D not met.	E.1 Declare associated low pressure ECCS injection/spray subsystem inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

---NOTE---

Refer to Table 3.3.5.2-1 to determine which SRs apply for each ECCS Function.

SURVEILLANCE		FREQUENCY
SR 3.3.5.2.1	Perform CHANNEL CHECK.	[12 hours <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.2.2	Perform CHANNEL FUNCTIONAL TEST.	[[92] days <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.2.3	Perform LOGIC SYSTEM FUNCTIONAL TEST.	[[18] months <u>OR</u> In accordance with the Surveillance Frequency Control Program]

Table 3.3.5.2-1 (page 1 of 1)
RPV Water Inventory Control Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Core Spray System					
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[4]	C	SR 3.3.5.2.1 SR 3.3.5.2.2	≤ [500] psig
b. Core Spray Pump Discharge Flow - Low (Bypass)	4, 5	[1 per pump(a)]	D	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [ ] gpm and ≤ [ ] gpm]
c. Manual Initiation	4, 5	[1 per subsystem (a)]	D	SR 3.3.5.2.3	NA
2. Low Pressure Coolant Injection (LPCI) System					
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[4]	C	SR 3.3.5.2.1 SR 3.3.5.2.2	≤ [500] psig
b. Low Pressure Coolant Injection Pump Discharge Flow - Low Bypass)	4, 5	[1 per pump(a)]	D	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [ ] gpm and ≤ [ ] gpm]
c. Manual Initiation	4, 5	[1](a)	D	SR 3.3.5.2.3	NA
3. RHR System Isolation					
a. Reactor Vessel Water Level - Low, Level 3	(b)	[2 in one trip system]	B	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [10] inches
4. Reactor Water Cleanup (RWCU) System Isolation					
a. Reactor Vessel Water Level - Low Low, Level 2	(b)	[2 in one trip system]	B	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [-47] inches

(a) Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, "Reactor Pressure Vessel Water Inventory Control."
(b) When automatic isolation of the associated penetration flow path(s) is credited in calculating DRAIN TIME.

3.3 INSTRUMENTATION

3.3.5.2B Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation (With Setpoint Control Program)

LCO 3.3.5.2B The RPV Water Inventory Control instrumentation for each Function in Table 3.3.5.2-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.5.2-1.

ACTIONS

--NOTE--
Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more channels inoperable.	A.1 Enter the Condition referenced in Table 3.3.5.2-1 for the channel.	Immediately
B. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	B.1 Declare associated penetration flow path(s) incapable of automatic isolation. <u>AND</u> B.2 Calculate DRAIN TIME.	Immediately Immediately
C. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	C.1 Place channel in trip.	1 hour
D. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	D.1 Restore channel to OPERABLE status.	24 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
E. Required Action and associated Completion Time of Condition C or D not met.	E.1	Declare associated low pressure ECCS injection/spray subsystem inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

--NOTE--
Refer to Table 3.3.5.2-1 to determine which SRs apply for each ECCS Function.

SURVEILLANCE		FREQUENCY
SR 3.3.5.2.1	Perform CHANNEL CHECK.	[12 hours <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.2.2	Perform CHANNEL FUNCTIONAL TEST.	[[92] days <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.2.3	Perform LOGIC SYSTEM FUNCTIONAL TEST.	[[18] months <u>OR</u> In accordance with the Surveillance Frequency Control Program]

Table 3.3.5.2-1 (page 1 of 1)
RPV Water Inventory Control Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
1. Core Spray System				
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[4]	C	SR 3.3.5.2.1 SR 3.3.5.2.2
b. Core Spray Pump Discharge Flow - Low (Bypass)	4, 5	[1 per pump(a)]	D	SR 3.3.5.2.1 SR 3.3.5.2.2
c. Manual Initiation	4, 5	[1 per subsystem s(a)]	D	SR 3.3.5.2.3
2. Low Pressure Coolant Injection (LPCI) System				
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[4]	C	SR 3.3.5.2.1 SR 3.3.5.2.2
b. Low Pressure Coolant Injection Pump Discharge Flow - Low Bypass)	4, 5	[1 per pump(a)]	D	SR 3.3.5.2.1 SR 3.3.5.2.2
c. Manual Initiation	4, 5	[1](a)	D	SR 3.3.5.2.3
3. RHR System Isolation				
a. Reactor Vessel Water Level - Low, Level 3	(b)	[2 in one trip system]	B	SR 3.3.5.2.1 SR 3.3.5.2.2
4. Reactor Water Cleanup (RWCU) System Isolation				
a. Reactor Vessel Water Level - Low Low, Level 2	(b)	[2 in one trip system]	B	SR 3.3.5.2.1 SR 3.3.5.2.2

(a) Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, "Reactor Pressure Vessel Water Inventory Control."
(b) When automatic isolation of the associated penetration flow path(s) is credited in calculating DRAIN TIME.

3.3 INSTRUMENTATION

3.3.5.2A Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation (Without Setpoint Control Program)

LCO 3.3.5.2A The RPV Water Inventory Control instrumentation for each Function in Table 3.3.5.2-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.5.2-1.

ACTIONS

---NOTE---
Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more channels inoperable.	A.1 Enter the Condition referenced in Table 3.3.5.2-1 for the channel.	Immediately
B. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	B.1 Declare associated penetration flow path(s) incapable of automatic isolation.	Immediately
	<u>AND</u>	
	B.2 Calculate DRAIN TIME.	Immediately
C. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	C.1 Place channel in trip.	1 hour

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	D.1	Declare HPCS system inoperable.	1 hour
	<u>OR</u>		
	D.2	Align the HPCS pump suction to the suppression pool.	1 hour
E. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	E.1	Declare HPCS system inoperable.	1 hour
	<u>AND</u>		
	E.2	Restore channel to OPERABLE status.	24 hours
F. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	F.1	Restore channel to OPERABLE status.	24 hours
G. Required Action and associated Completion Time of Condition C, D, E, or F not met.	G.1	Declare associated ECCS injection/spray subsystem inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

---NOTE---

Refer to Table 3.3.5.2-1 to determine which SRs apply for each ECCS Function.

SURVEILLANCE		FREQUENCY
SR 3.3.5.2.1	Perform CHANNEL CHECK.	[12 hours OR In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.2.2	Perform CHANNEL FUNCTIONAL TEST.	[[92] days OR In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.2.3	Perform LOGIC SYSTEM FUNCTIONAL TEST.	[[18] months OR In accordance with the Surveillance Frequency Control Program]

Table 3.3.5.2-1 (page 1 of 2)
RPV Water Inventory Control Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core Spray (LPCS) Subsystems					
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[3(a)]	C	SR 3.3.5.2.1 SR 3.3.5.2.2	≤ [534] psig
b. [LPCS Pump Discharge Flow - Low (Bypass)]	4, 5	[1 per pump(a)]	F	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [ ] gpm and ≤ [ ] gpm
c. [LPCI Pump A Discharge Flow - Low (Bypass)]	4, 5	[1 per pump(a)]	F	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [ ] gpm and ≤ [ ] gpm
d. Manual Initiation	4, 5	[1 per subsystem (a)]	F	SR 3.3.5.2.3	NA
2. LPCI B and LPCI C Subsystems					
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[3(a)]	C	SR 3.3.5.2.1 SR 3.3.5.2.2	≤ [534] psig
b. [LPCI Pump B and LPCI Pump C Discharge Flow - Low (Bypass)]	4, 5	[1 per pump(a)]	F	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [ ] gpm and ≤ [ ] gpm
c. Manual Initiation	4, 5	[1 per subsystem (a)]	F	SR 3.3.5.2.3	NA

(a) Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, "Reactor Pressure Vessel Water Inventory Control."

Table 3.3.5.2-1 (page 2 of 2)
RPV Water Inventory Control Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
3. High Pressure Core Spray (HPCS) System					
a. Reactor Vessel Water Level - High, Level 8	4, 5	[1(a)]	E	SR 3.3.5.2.1 SR 3.3.5.2.2	≤ [55.7] inches
b. Condensate Storage Tank Level - Low	4(b), 5(b)	[1(a)]	D	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [-3] inches
c. [HPCS Pump Discharge Pressure - High (Bypass)]	4, 5	[1 per pump (a)]	F	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [ ] psig
d. [HPCS System Flow Rate - Low (Bypass)]	4, 5	[1 per pump (a)]	F	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [ ] gpm and ≤ [ ] gpm
e. Manual Initiation	4, 5	[1 per subsystem (a)]	F	SR 3.3.5.2.3	[NA]
4. RHR System Isolation					
a. Reactor Vessel Water Level - Low, Level 3	(c)	[2 in one trip system]	B	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [10.8] inches
5. Reactor Water Cleanup (RWCU) System Isolation					
a. Reactor Vessel Water Level - Low Low, Level 2	(c)	[2 in one trip system]	B	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [-43.8] inches

(a) Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, "Reactor Pressure Vessel Water Inventory Control."

(b) When HPCS is OPERABLE for compliance with LCO 3.5.2, "RPV Water Inventory Control," and aligned to the condensate storage tank.

(c) When automatic isolation of the associated penetration flow path(s) is credited in calculating DRAIN TIME.

3.3 INSTRUMENTATION

3.3.5.2B Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation (With Setpoint Control Program)

LCO 3.3.5.2B The RPV Water Inventory Control instrumentation for each Function in Table 3.3.5.2-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.5.2-1.

ACTIONS

---NOTE---
Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more channels inoperable.	A.1 Enter the Condition referenced in Table 3.3.5.2-1 for the channel.	Immediately
B. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	B.1 Declare associated penetration flow path(s) incapable of automatic isolation.	Immediately
	<u>AND</u>	
	B.2 Calculate DRAIN TIME.	Immediately
C. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	C.1 Place channel in trip.	1 hour

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	D.1	Declare HPCS system inoperable.	1 hour
	<u>OR</u>		
	D.2	Align the HPCS pump suction to the suppression pool.	1 hour
E. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	E.1	Declare HPCS system inoperable.	1 hour
	<u>AND</u>		
	E.2	Restore channel to OPERABLE status.	24 hours
F. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	F.1	Restore channel to OPERABLE status.	24 hours
G. Required Action and associated Completion Time of Condition C, D, E, or F not met.	G.1	Declare associated ECCS injection/spray subsystem inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

--NOTE--
Refer to Table 3.3.5.2-1 to determine which SRs apply for each ECCS Function.

SURVEILLANCE		FREQUENCY
SR 3.3.5.2.1	Perform CHANNEL CHECK.	[12 hours <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.2.2	Perform CHANNEL FUNCTIONAL TEST.	[[92] days <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.1.3	Perform LOGIC SYSTEM FUNCTIONAL TEST.	[[18] months <u>OR</u> In accordance with the Surveillance Frequency Control Program]

Table 3.3.5.2-1 (page 1 of 2)
RPV Water Inventory Control Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
1. Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core Spray (LPCS) Subsystems				
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[3(a)]	C	SR 3.3.5.2.1 SR 3.3.5.2.2
b. [LPCS Pump Discharge Flow - Low (Bypass)]	4, 5	[1 per pump(a)]	F	SR 3.3.5.2.1 SR 3.3.5.2.2
c. [LPCI Pump A Discharge Flow - Low (Bypass)]	4, 5	[1 per pump(a)]	F	SR 3.3.5.2.1 SR 3.3.5.2.2
d. Manual Initiation	4, 5	[1 per subsystem (a)]	F	SR 3.3.5.2.3
2. LPCI B and LPCI C Subsystems				
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[3(a)]	C	SR 3.3.5.2.1 SR 3.3.5.2.2
b. [LPCI Pump B and LPCI Pump C Discharge Flow - Low (Bypass)]	4, 5	[1 per pump(a)]	F	SR 3.3.5.2.1 SR 3.3.5.21.2
c. Manual Initiation	4, 5	[11 per subsystem (a)]	F	SR 3.3.5.2.3

(a) Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, "Reactor Pressure Vessel Water Inventory Control."

Table 3.3.5.2-1 (page 2 of 2)
RPV Water Inventory Control Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
3. High Pressure Core Spray (HPCS) System				
a. Reactor Vessel Water Level - High, Level 8	4, 5	[1(a)]	E	SR 3.3.5.2.1 SR 3.3.5.2.2
b. Condensate Storage Tank Level - Low	4(b), 5(b)	[1(a)]	D	SR 3.3.5.2.1 SR 3.3.5.2.2
c. [HPCS Pump Discharge Pressure - High (Bypass)]	4, 5	[1 per pump (a)]	F	SR 3.3.5.2.1 SR 3.3.5.2.2
d. [HPCS System Flow Rate - Low (Bypass)]	4, 5	[1 per pump (a)]	F	SR 3.3.5.2.1 SR 3.3.5.2.2
e. Manual Initiation	4, 5	[1 per subsystem (a)]	F	SR 3.3.5.2.3
4. RHR System Isolation				
a. Reactor Vessel Water Level - Low, Level 3	(c)	[2 in one trip system]	B	SR 3.3.5.2.1 SR 3.3.5.2.2
5. Reactor Water Cleanup (RWCU) System Isolation				
a. Reactor Vessel Water Level - Low Low, Level 2	(c)	[2 in one trip system]	B	SR 3.3.5.2.1 SR 3.3.5.2.2

(a) Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, "Reactor Pressure Vessel Water Inventory Control."

(b) When HPCS is OPERABLE for compliance with LCO 3.5.2, "RPV Water Inventory Control," and aligned to the condensate storage tank.

(c) When automatic isolation of the associated penetration flow path(s) is credited in calculating DRAIN TIME.

Enclosure 6

Proposed BWR/4 and BWR/6 Bases for TS 3.3.5.2, "RPV Water Inventory Control Instrumentation"

B 3.3 INSTRUMENTATION

B 3.3.5.2A Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation (Without Setpoint Control Program)

BASES

BACKGROUND

The RPV contains penetrations below the top of the active fuel (TAF) that have the potential to drain the reactor coolant inventory to below the TAF. If the water level should drop below the TAF, the ability to remove decay heat is reduced, which could lead to elevated cladding temperatures and clad perforation. Safety Limit 2.1.1.3 requires the RPV water level to be above the top of the active irradiated fuel at all times to prevent such elevated cladding temperatures.

Technical Specifications are required by 10 CFR 50.36 to include limiting safety system settings (LSSS) for variables that have significant safety functions. LSSS are defined by the regulation as "Where a LSSS is specified for a variable on which a safety limit has been placed, the setting must be chosen so that automatic protective actions will correct the abnormal situation before a Safety Limit (SL) is exceeded." The Analytical Limit is the limit of the process variable at which a safety action is initiated to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur. The actual settings for the automatic isolation channels are the same as those established for the same functions in MODES 1, 2, and 3 in LCO 3.3.5.1, "Emergency Core Cooling System (ECCS) Instrumentation," or LCO 3.3.6.1, "Primary Containment Isolation instrumentation".

With the unit in MODE 4 or 5, RPV water inventory control is not required to mitigate any events or accidents evaluated in the safety analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material should a draining event occur. Under the definition of DRAIN TIME, some penetration flow paths may be excluded from the DRAIN TIME calculation if they will be isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the TAF when actuated by RPV water level isolation instrumentation.

BASES

BACKGROUND (continued)

The purpose of the RPV Water Inventory Control Instrumentation is to support the requirements of LCO 3.5.2, “Reactor Pressure Vessel (RPV) Water Inventory Control,” and the definition of DRAIN TIME. There are functions that are required for manual initiation or operation of the ECCS injection/spray subsystem required to be OPERABLE by LCO 3.5.2 and other functions that support automatic isolation of Residual Heat Removal subsystem and Reactor Water Cleanup system penetration flow path(s) on low RPV water level.

The RPV Water Inventory Control Instrumentation supports operation of core spray (CS) and low pressure coolant injection (LPCI). The equipment involved with each of these systems is described in the Bases for LCO 3.5.2.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

With the unit in MODE 4 or 5, RPV water inventory control is not required to mitigate any events or accidents evaluated in the safety analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material should a draining event occur.

A double-ended guillotine break of the Reactor Coolant System (RCS) is not postulated in MODES 4 and 5 due to the reduced RCS pressure, reduced piping stresses, and ductile piping systems. Instead, an event is postulated in which a single operator error or initiating event allows draining of the RPV water inventory through a single penetration flow path with the highest flow rate, or the sum of the drain rates through multiple penetration flow paths susceptible to a common mode failure (e.g., seismic event, loss of normal power, single human error). It is assumed, based on engineering judgment, that while in MODES 4 and 5, one low pressure ECCS injection/spray subsystem can be manually initiated to maintain adequate reactor vessel water level.

As discussed in References 1, 2, 3, 4, and 5, operating experience has shown RPV water inventory to be significant to public health and safety. Therefore, RPV Water Inventory Control satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).

Permissive and interlock setpoints are generally considered as nominal values without regard to measurement accuracy.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

Core Spray and Low Pressure Coolant Injection Systems

1.a, 2.a. Reactor Steam Dome Pressure - Low (Injection Permissive)

Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS injection/spray subsystem manual injection functions. This function ensures that, prior to opening the injection valves of the low pressure ECCS subsystems, the reactor pressure has fallen to a value below these subsystems' maximum design pressure. While it is assured during MODES 4 and 5 that the reactor steam dome pressure will be below the ECCS maximum design pressure, the Reactor Steam Dome Pressure - Low signals are assumed to be OPERABLE and capable of permitting initiation of the ECCS.

The Reactor Steam Dome Pressure - Low signals are initiated from four pressure transmitters that sense the reactor dome pressure. The transmitters are connected to four trip units. The outputs of the trip units are connected to relays whose contacts are arranged in a one-out-of-two taken twice logic.

The Allowable Value is low enough to prevent overpressuring the equipment in the low pressure ECCS.

The four channels of Reactor Steam Dome Pressure - Low Function are required to be OPERABLE in MODES 4 and 5 when ECCS manual initiation is required to be OPERABLE by LCO 3.5.2.

1.b, 2.b. Core Spray and Low Pressure Coolant Injection Pump Discharge Flow - Low (Bypass)

The minimum flow instruments are provided to protect the associated low pressure ECCS pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow is sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump.

One flow transmitter per ECCS pump is used to detect the associated subsystems' flow rates. The logic is arranged such that each transmitter causes its associated minimum flow valve to open. The logic will close the minimum flow valve once the closure setpoint is exceeded. The LPCI minimum flow valves are time delayed such that the valves will not open for 10 seconds after the switches detect low flow. The time delay is

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

provided to limit reactor vessel inventory loss during the startup of the Residual Heat Removal (RHR) shutdown cooling mode.

The Pump Discharge Flow - Low Allowable Values are high enough to ensure that the pump flow rate is sufficient to protect the pump, yet low enough to ensure that the closure of the minimum flow valve is initiated to allow full flow into the core.

One channel of the Pump Discharge Flow - Low Function is required to be OPERABLE in MODES 4 and 5 when the associated Core Spray or LPCI pump is required to be OPERABLE by LCO 3.5.2 to ensure the pumps are capable of injecting into the Reactor Pressure Vessel when manually initiated.

1.c, 2.c. Manual Initiation

The Manual Initiation push button channels introduce signals into the appropriate ECCS logic to provide manual initiation capability. There is one push button for each of the CS and LPCI subsystems (i.e., two for CS and two for LPCI).

There is no Allowable Value for this Function since the channels are mechanically actuated based solely on the position of the push buttons. A channel of the Manual Initiation Function (one channel per subsystem) is required to be OPERABLE in MODES 4 and 5 when the associated ECCS subsystems are required to be OPERABLE per LCO 3.5.2.

RHR System Isolation

3.a - Reactor Vessel Water Level - Low, Level 3

The definition of Drain Time allows crediting the closing of penetration flow paths that are capable of being isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the TAF when actuated by RPV water level isolation instrumentation. The Reactor Vessel Water Level - Low, Level 3 Function associated with RHR System isolation may be credited for automatic isolation of penetration flow paths associated with the RHR System.

Reactor Vessel Water Level - Low, Level 3 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. While four channels (two channels per trip system) of the Reactor Vessel Water Level - Low, Level 3 Function are available, only two channels (all in the same trip system) are required to be OPERABLE.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The Reactor Vessel Water Level - Low, Level 3 Allowable Value was chosen to be the same as the Primary Containment Isolation Instrumentation Reactor Vessel Water Level - Low, Level 3 Allowable Value (LCO 3.3.6.1), since the capability to cool the fuel may be threatened.

The Reactor Vessel Water Level - Low, Level 3 Function is only required to be OPERABLE when automatic isolation of the associated penetration flow path is credited in calculating DRAIN TIME.

This Function isolates the Group 11 valves.

Reactor Water Cleanup (RWCU) System Isolation

4.a - Reactor Vessel Water level - Low Low, Level 2

The definition of Drain Time allows crediting the closing of penetration flow paths that are capable of being isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the TAF when actuated by RPV water level isolation instrumentation. The Reactor Vessel Water Level - Low Low, Level 2 Function associated with RWCU System isolation may be credited for automatic isolation of penetration flow paths associated with the RWCU System.

Reactor Vessel Water Level - Low Low, Level 2 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. While four channels (two channels per trip system) of the Reactor Vessel Water Level - Low, Level 2 Function are available, only two channels (all in the same trip system) are required to be OPERABLE.

The Reactor Vessel Water Level - Low Low, Level 2 Allowable Value was chosen to be the same as the ECCS Reactor Vessel Water Level - Low Low, Level 2 Allowable Value (LCO 3.3.5.1), since the capability to cool the fuel may be threatened.

The Reactor Vessel Water Level - Low Low, Level 2 Function is only required to be OPERABLE when automatic isolation of the associated penetration flow path is credited in calculating DRAIN TIME.

This Function isolates the Group 5 valves.

BASES

ACTIONS

A Note has been provided to modify the ACTIONS related to RPV Water Inventory Control instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition discovered to be inoperable or not within limits will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable RPV Water Inventory Control instrumentation channels provide appropriate compensatory measures for separate inoperable Condition entry for each inoperable RPV Water Inventory Control instrumentation channel.

A.1

Required Action A.1 directs entry into the appropriate Condition referenced in Table 3.3.5.2-1. The applicable Condition referenced in the Table is Function dependent. Each time a channel is discovered inoperable, Condition A is entered for that channel and provides for transfer to the appropriate subsequent Condition.

B.1 and B.2

RHR System Isolation, Reactor Vessel Water Level - Low Level 3, and Reactor Water Cleanup System, Reactor Vessel Water Level - Low Low, Level 2 functions are applicable when automatic isolation of the associated penetration flow path is credited in calculating Drain Time. If the instrumentation is inoperable, Required Action B.1 directs an immediate declaration that the associated penetration flow path(s) are incapable of automatic isolation. Required Action B.2 directs calculation of DRAIN TIME. The calculation cannot credit automatic isolation of the affected penetration flow paths.

BASES

ACTIONS (continued)

C.1

Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS injection/spray subsystem manual injection functions. If the permissive is inoperable, manual initiation of ECCS is prohibited. Therefore, the permissive must be placed in the trip condition within 1 hour. With the permissive in the trip condition, manual initiation may be performed. Prior to placing the permissive in the tripped condition, the operator can take manual control of the pump and the injection valve to inject water into the RPV.

The Completion Time of 1 hour is intended to allow the operator time to evaluate any discovered inoperabilities and to place the channel in trip.

D.1

If a Core Spray or Low Pressure Coolant Injection Pump Discharge Flow - Low bypass function is inoperable, there is a risk that the associated low pressure ECCS pump could overheat when the pump is operating and the associated injection valve is not fully open. In this condition, the operator can take manual control of the pump and the injection valve to ensure the pump does not overheat. If a manual initiation function is inoperable, the ECCS subsystem pumps can be started manually and the valves can be opened manually, but this is not the preferred condition.

The 24 hour Completion Time was chosen to allow time for the operator to evaluate and repair any discovered inoperabilities. The Completion Time is appropriate given the ability to manually start the ECCS pumps and open the injection valves and to manually ensure the pump does not overheat.

E.1

With the Required Action and associated Completion Time of Condition C or D not met, the associated low pressure ECCS injection/spray subsystem may be incapable of performing the intended function, and must be declared inoperable immediately.

BASES

SURVEILLANCE REQUIREMENTS

As noted in the beginning of the SRs, the SRs for each RPV Water Inventory Control instrument Function are found in the SRs column of Table 3.3.5.2-1.

SR 3.3.5.2.1

Performance of the CHANNEL CHECK ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A CHANNEL CHECK guarantees that undetected outright channel failure is limited; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL FUNCTIONAL TEST.

Agreement criteria are determined by the plant staff, based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

[The Frequency of 12 hours is based upon operating experience that demonstrates channel failure is rare.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]

The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.5.2.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests.

Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

[The Frequency of 92 days is based upon operating experience that demonstrates channel failure is rare.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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SR 3.3.5.2.3

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required initiation logic for a specific channel. The system functional testing performed in LCO 3.5.2 overlaps this Surveillance to complete testing of the assumed safety function.

[The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency.

OR

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

REFERENCES

1. Information Notice 84-81 "Inadvertent Reduction in Primary Coolant Inventory in Boiling Water Reactors During Shutdown and Startup," November 1984.

2. Information Notice 86-74, "Reduction of Reactor Coolant Inventory Because of Misalignment of RHR Valves," August 1986.

3. Generic Letter 92-04, "Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs Pursuant to 10 CFR 50.54(F), " August 1992.

4. NRC Bulletin 93-03, "Resolution of Issues Related to Reactor Vessel Water Level Instrumentation in BWRs," May 1993.

5. Information Notice 94-52, "Inadvertent Containment Spray and Reactor Vessel Draindown at Millstone 1," July 1994.

B 3.3 INSTRUMENTATION

B 3.3.5.2B Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation (With Setpoint Control Program)

BASES

BACKGROUND

The RPV contains penetrations below the top of the active fuel (TAF) that have the potential to drain the reactor coolant inventory to below the TAF. If the water level should drop below the TAF, the ability to remove decay heat is reduced, which could lead to elevated cladding temperatures and clad perforation. Safety Limit 2.1.1.3 requires the RPV water level to be above the top of the active irradiated fuel at all times to prevent such elevated cladding temperatures.

Technical Specifications are required by 10 CFR 50.36 to include limiting safety system settings (LSSS) for variables that have significant safety functions. LSSS are defined by the regulation as "Where a LSSS is specified for a variable on which a safety limit has been placed, the setting must be chosen so that automatic protective actions will correct the abnormal situation before a Safety Limit (SL) is exceeded." The Analytical Limit is the limit of the process variable at which a safety action is initiated to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur. The actual settings are identified and maintained in the Setpoint Control Program (SCP) controlled by 10 CFR 50.59.

With the unit in MODE 4 or 5, RPV water inventory control is not required to mitigate any events or accidents evaluated in the safety analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material should a draining event occur. Under the definition of DRAIN TIME, some penetration flow paths may be excluded from the DRAIN TIME calculation if they will be isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the TAF when actuated by RPV water level isolation instrumentation.

The purpose of the RPV Water Inventory Control Instrumentation is to support the requirements of LCO 3.5.2, “Reactor Pressure Vessel (RPV) Water Inventory Control,” and the definition of DRAIN TIME. There are functions that are required for manual initiation or operation of the ECCS

BASES

BACKGROUND (continued)

injection/spray subsystem required to be OPERABLE by LCO 3.5.2 and other functions that support automatic isolation of Residual Heat Removal subsystem and Reactor Water Cleanup system penetration flow path(s) on low RPV water level.

The RPV Water Inventory Control Instrumentation supports operation of core spray (CS) and low pressure coolant injection (LPCI). The equipment involved with each of these systems is described in the Bases for LCO 3.5.2.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

With the unit in MODE 4 or 5, RPV water inventory control is not required to mitigate any events or accidents evaluated in the safety analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material should a draining event occur.

A double-ended guillotine break of the Reactor Coolant System (RCS) is not postulated in MODES 4 and 5 due to the reduced RCS pressure, reduced piping stresses, and ductile piping systems. Instead, an event is postulated in which a single operator error or initiating event allows draining of the RPV water inventory through a single penetration flow path with the highest flow rate, or the sum of the drain rates through multiple penetration flow paths susceptible to a common mode failure (e.g., seismic event, loss of normal power, single human error). It is assumed, based on engineering judgment, that while in MODES 4 and 5, one low pressure ECCS injection/spray subsystem can be manually initiated to maintain adequate reactor vessel water level.

As discussed in References 1, 2, 3, 4, and 5, operating experience has shown RPV water inventory to be significant to public health and safety. Therefore, RPV Water Inventory Control satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).

Permissive and interlock setpoints are generally considered as nominal values without regard to measurement accuracy.

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Core Spray and Low Pressure Coolant Injection Systems

1.a, 2.a. Reactor Steam Dome Pressure - Low (Injection Permissive)

Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS injection/spray subsystem manual injection functions. This function ensures that, prior to opening the injection valves of the low pressure ECCS subsystems, the reactor pressure has fallen to a value below these subsystems' maximum design pressure. While it is assured during MODES 4 and 5 that the reactor steam dome pressure will be below the ECCS maximum design pressure, the Reactor Steam Dome Pressure - Low signals are assumed to be OPERABLE and capable of permitting initiation of the ECCS.

The Reactor Steam Dome Pressure - Low signals are initiated from four pressure transmitters that sense the reactor dome pressure. The transmitters are connected to four trip units. The outputs of the trip units are connected to relays whose contacts are arranged in a one-out-of-two taken twice logic.

The four channels of Reactor Steam Dome Pressure - Low Function are required to be OPERABLE in MODES 4 and 5 when ECCS manual initiation is required to be OPERABLE by LCO 3.5.2.

1.b, 2.b. Core Spray and Low Pressure Coolant Injection Pump Discharge Flow - Low (Bypass)

The minimum flow instruments are provided to protect the associated low pressure ECCS pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow is sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump.

One flow transmitter per ECCS pump is used to detect the associated subsystems' flow rates. The logic is arranged such that each transmitter causes its associated minimum flow valve to open. The logic will close the minimum flow valve once the closure setpoint is exceeded. The LPCI minimum flow valves are time delayed such that the valves will not open for 10 seconds after the switches detect low flow. The time delay is provided to limit reactor vessel inventory loss during the startup of the Residual Heat Removal (RHR) shutdown cooling mode.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

One channel of the Pump Discharge Flow - Low Function is required to be OPERABLE in MODES 4 and 5 when the associated Core Spray or LPCI pump is required to be OPERABLE by LCO 3.5.2 to ensure the pumps are capable of injecting into the Reactor Pressure Vessel when manually initiated.

<u>1.c, 2.c. Manual Initiation</u>

The Manual Initiation push button channels introduce signals into the appropriate ECCS logic to provide manual initiation capability. There is one push button for each of the CS and LPCI subsystems (i.e., two for CS and two for LPCI).

A channel of the Manual Initiation Function (one channel per subsystem) is required to be OPERABLE in MODES 4 and 5 when the associated ECCS subsystems are required to be OPERABLE per LCO 3.5.2.

<u>RHR System Isolation</u>

<u>3.a - Reactor Vessel Water Level - Low, Level 3</u>

The definition of DRAIN TIME allows crediting the closing of penetration flow paths that are capable of being automatically isolated by RPV water level isolation instrumentation prior to the RPV water level being equal to the TAF. The Reactor Vessel Water Level - Low, Level 3 Function associated with RHR System isolation may be credited for automatic isolation of penetration flow paths associated with the RHR System.

Reactor Vessel Water Level - Low, Level 3 signals are initiated from two channels per trip system that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. While four channels (two channels per trip system) of the Reactor Vessel Water Level - Low, Level 3 Function are available, only two channels (all in the same trip system) are required to be OPERABLE.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The Reactor Vessel Water Level - Low, Level 3 Function is only required to be OPERABLE when automatic isolation of the associated penetration flow path is credited in calculating DRAIN TIME.

This Function isolates the Group 11 valves.

<u>Reactor Water Cleanup (RWCU) System Isolation</u>

<u>4.a - Reactor Vessel Water level - Low Low, Level 2</u>

The definition of DRAIN TIME allows crediting the closing of penetration flow paths that are capable of being automatically isolated by RPV water level isolation instrumentation prior to the RPV water level being equal to the TAF. The Reactor Vessel Water Level - Low Low, Level 2 Function associated with RWCU System isolation may be credited for automatic isolation of penetration flow paths associated with the RWCU System.

Reactor Vessel Water Level - Low Low, Level 2 is initiated from two channels per trip system that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. While four channels (two channels per trip system) of the Reactor Vessel Water Level - Low, Level 2 Function are available, only two channels (all in the same trip system) are required to be OPERABLE.

The Reactor Vessel Water Level - Low Low, Level 2 Function is only required to be OPERABLE when automatic isolation of the associated penetration flow path is credited in calculating DRAIN TIME.

This Function isolates the Group 5 valves.

BASES

ACTIONS

A Note has been provided to modify the ACTIONS related to RPV Water Inventory Control instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition discovered to be inoperable or not within limits will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable RPV Water Inventory Control instrumentation channels provide appropriate compensatory measures for separate inoperable Condition entry for each inoperable RPV Water Inventory Control instrumentation channel.

A.1

Required Action A.1 directs entry into the appropriate Condition referenced in Table 3.3.5.2-1. The applicable Condition referenced in the Table is Function dependent. Each time a channel is discovered inoperable, Condition A is entered for that channel and provides for transfer to the appropriate subsequent Condition.

B.1 and B.2

RHR System Isolation, Reactor Vessel Water Level - Low Level 3, and Reactor Water Cleanup System, Reactor Vessel Water Level - Low Low, Level 2 functions are applicable when automatic isolation of the associated penetration flow path is credited in calculating Drain Time. If the instrumentation is inoperable, Required Action B.1 directs an immediate declaration that the associated penetration flow path(s) are incapable of automatic isolation. Required Action B.2 directs calculation of DRAIN TIME. The calculation cannot credit automatic isolation of the affected penetration flow paths.

BASES

ACTIONS (continued)

C.1

Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS injection/spray subsystem manual injection functions. If the permissive is inoperable, manual initiation of ECCS is prohibited. Therefore, the permissive must be placed in the trip condition within 1 hour. With the permissive in the trip condition, manual initiation may be performed. Prior to placing the permissive in the tripped condition, the operator can take manual control of the pump and the injection valve to inject water into the RPV.

The Completion Time of 1 hour is intended to allow the operator time to evaluate any discovered inoperabilities and to place the channel in trip.

D.1

If a Core Spray or Low Pressure Coolant Injection Pump Discharge Flow - Low bypass function is inoperable, there is a risk that the associated low pressure ECCS pump could overheat when the pump is operating and the associated injection valve is not fully open. In this condition, the operator can take manual control of the pump and the injection valve to ensure the pump does not overheat. If a manual initiation function is inoperable, the ECCS subsystem pumps can be started manually and the valves can be opened manually, but this is not the preferred condition.

The 24 hour Completion Time was chosen to allow time for the operator to evaluate and repair any discovered inoperabilities. The Completion Time is appropriate given the ability to manually start the ECCS pumps and open the injection valves and to manually ensure the pump does not overheat.

E.1

With the Required Action and associated Completion Time of Condition C or D not met, the associated low pressure ECCS injection/spray subsystem may be incapable of performing the intended function, and must be declared inoperable immediately.

BASES

SURVEILLANCE REQUIREMENTS

As noted in the beginning of the SRs, the SRs for each RPV Water Inventory Control instrument Function are found in the SRs column of Table 3.3.5.2-1.

SR 3.3.5.2.1

Performance of the CHANNEL CHECK ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A CHANNEL CHECK guarantees that undetected outright channel failure is limited; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL FUNCTIONAL TEST.

Agreement criteria are determined by the plant staff, based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

[The Frequency of 12 hours is based upon operating experience that demonstrates channel failure is rare.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]

The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.5.2.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests.

Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

[The Frequency of 92 days is based upon operating experience that demonstrates channel failure is rare.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]

SR 3.3.5.2.3

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required initiation logic for a specific channel. The system functional testing performed in LCO 3.5.2 overlaps this Surveillance to complete testing of the assumed safety function.

[The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency.

OR

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]

REFERENCES

1. Information Notice 84-81 "Inadvertent Reduction in Primary Coolant Inventory in Boiling Water Reactors During Shutdown and Startup," November 1984.

2. Information Notice 86-74, "Reduction of Reactor Coolant Inventory Because of Misalignment of RHR Valves," August 1986.

3. Generic Letter 92-04, "Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs Pursuant to 10 CFR 50.54(F), " August 1992.

4. NRC Bulletin 93-03, "Resolution of Issues Related to Reactor Vessel Water Level Instrumentation in BWRs," May 1993.

5. Information Notice 94-52, "Inadvertent Containment Spray and Reactor Vessel Draindown at Millstone 1," July 1994.

B 3.3 INSTRUMENTATION

B 3.3.5.2A Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation (Without Setpoint Control Program)

BASES

BACKGROUND

The RPV contains penetrations below the top of the active fuel (TAF) that have the potential to drain the reactor coolant inventory to below the TAF. If the water level should drop below the TAF, the ability to remove decay heat is reduced, which could lead to elevated cladding temperatures and clad perforation. Safety Limit 2.1.1.3 requires the RPV water level to be above the top of the active irradiated fuel at all times to prevent such elevated cladding temperatures.

Technical Specifications are required by 10 CFR 50.36 to include limiting safety system settings (LSSS) for variables that have significant safety functions. LSSS are defined by the regulation as "Where a LSSS is specified for a variable on which a safety limit has been placed, the setting must be chosen so that automatic protective actions will correct the abnormal situation before a Safety Limit (SL) is exceeded." The Analytical Limit is the limit of the process variable at which a safety action is initiated to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur. The actual settings for the automatic isolation channels are the same as those established for the same functions in MODES 1, 2, and 3 in LCO 3.3.5.1, "Emergency Core Cooling System (ECCS) Instrumentation," or LCO 3.3.6.1, "Primary Containment Isolation instrumentation".

With the unit in MODE 4 or 5, RPV water inventory control is not required to mitigate any events or accidents evaluated in the safety analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material should a draining event occur. Under the definition of DRAIN TIME, some penetration flow paths may be excluded from the DRAIN TIME calculation if they will be isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the TAF when actuated by RPV water level isolation instrumentation.

BASES

BACKGROUND (continued)

The purpose of the RPV Water Inventory Control Instrumentation is to support the requirements of LCO 3.5.2, “Reactor Pressure Vessel (RPV) Water Inventory Control,” and the definition of DRAIN TIME. There are functions that are required for manual initiation or operation of the ECCS injection/spray subsystem required to be OPERABLE by LCO 3.5.2 and other functions that support automatic isolation of Residual Heat Removal subsystem and Reactor Water Cleanup system penetration flow path(s) on low RPV water level.

The RPV Water Inventory Control Instrumentation supports operation of low pressure core spray (LPCS), low pressure coolant injection (LPCI), and high pressure core spray (HPCS). The equipment involved with each of these systems is described in the Bases for LCO 3.5.2.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

With the unit in MODE 4 or 5, RPV water inventory control is not required to mitigate any events or accidents evaluated in the safety analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material should a draining event occur.

A double-ended guillotine break of the Reactor Coolant System (RCS) is not postulated in MODES 4 and 5 due to the reduced RCS pressure, reduced piping stresses, and ductile piping systems. Instead, an event is postulated in which a single operator error or initiating event allows draining of the RPV water inventory through a single penetration flow path with the highest flow rate, or the sum of the drain rates through multiple penetration flow paths susceptible to a common mode failure (e.g., seismic event, loss of normal power, single human error). It is assumed, based on engineering judgment, that while in MODES 4 and 5, one ECCS injection/spray subsystem can be manually initiated to maintain adequate reactor vessel water level.

As discussed in References 1, 2, 3, 4, and 5, operating experience has shown RPV water inventory to be significant to public health and safety. Therefore, RPV Water Inventory Control satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).

Permissive and interlock setpoints are generally considered as nominal values without regard to measurement accuracy.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

Low Pressure Core Spray and Low Pressure Coolant Injection Systems

1.a, 2.a. Reactor Steam Dome Pressure - Low (Injection Permissive)

Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS subsystems. This ensures that, prior to opening the injection valves of the low pressure ECCS subsystems, the reactor pressure has fallen to a value below these subsystems' maximum design pressure. While it is assured during Modes 4 and 5 that the reactor steam dome pressure will be below the ECCS maximum design pressure, the Reactor Steam Dome Pressure - Low signals are assumed to be operable and capable of permitting initiation of the ECCS.

The Reactor Steam Dome Pressure - Low signals are initiated from four pressure transmitters that sense the reactor dome pressure. The four pressure transmitters each drive a master and slave trip unit. The outputs of the trip units are connected to relays whose contacts are arranged in a one-out-of-two taken twice logic for each Division.

The Allowable Value is low enough to prevent overpressuring the equipment in the low pressure ECCS.

Three channels of Reactor Steam Dome Pressure - Low Function per associated ECCS Division are only required to be OPERABLE in MODES 4 and 5 when ECCS Manual Initiation is required to be OPERABLE, since these channels support the manual initiation Function. In addition, the channels are only required when the associated ECCS subsystem is required to be OPERABLE by LCO 3.5.2.

1.b, 1.c, 2.b. Low Pressure Coolant Injection and Low Pressure Core Spray Pump Discharge Flow - Low (Bypass)

The minimum flow instruments are provided to protect the associated low pressure ECCS pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow is sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump.

One flow transmitter per ECCS pump is used to detect the associated subsystems' flow rates. The logic is arranged such that each transmitter causes its associated minimum flow valve to open. The logic will close

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

the minimum flow valve once the closure setpoint is exceeded. The LPCI minimum flow valves are time delayed such that the valves will not open for 10 seconds after the switches detect low flow. The time delay is provided to limit reactor vessel inventory loss during the startup of the Residual Heat Removal (RHR) shutdown cooling mode (for RHR A and RHR B).

The Pump Discharge Flow - Low Allowable Values are high enough to ensure that the pump flow rate is sufficient to protect the pump, yet low enough to ensure that the closure of the minimum flow valve is initiated to allow full flow into the core.

One channel of the Pump Discharge Flow - Low Function is required to be OPERABLE in MODES 4 and 5 when the associated LPCS or LPCI pump is required to be OPERABLE by LCO 3.5.2 to ensure the pumps are capable of injecting into the Reactor Pressure Vessel when manually initiated.

<u>1.d, 2.c. Manual Initiation</u>

The Manual Initiation push button channels introduce signals into the appropriate ECCS logic to provide manual initiation capability. There is one push button for each of the two Divisions of low pressure ECCS (i.e., Division 1 ECCS, LPCS and LPCI A; Division 2 ECCS, LPCI B and LPCI C). The only the manual initiation function required to be OPERABLE is that associated with the ECCS subsystem required to be OPERABLE by LCO 3.5.2.

There is no Allowable Value for this Function since the channels are mechanically actuated based solely on the position of the push buttons.

<u>High Pressure Core Spray System</u>

<u>3.a. Reactor Vessel Water Level - High, Level 8</u>

The high RPV water level Level 8 signal is used to close the HPCS injection valve to prevent overflow into the main steam lines (MSLs). Reactor Vessel Water Level - High, Level 8 signals for HPCS are initiated from two level transmitters from the narrow range water level measurement instrumentation. One channel associated with the HPCS System required to be OPERABLE by LCO 3.5.2 is required to be OPERABLE.

The Reactor Vessel Water Level - High, Level 8 Allowable Value is chosen to isolate flow from the HPCS System prior to water overflowing into the MSLs.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

One channel of Reactor Vessel Water Level - High, Level 8 Function is required to be OPERABLE in MODES 4 and 5 when the associated HPCS is required to be OPERABLE by LCO 3.5.2 to ensure to the HPCS is capable of injecting into the Reactor Pressure Vessel when manually initiated.

3.b. Condensate Storage Tank Level – Low

Low level in the CST indicates the unavailability of an adequate supply of makeup water from this normal source. Normally the suction valves between HPCS and the CST are open and water for HPCS injection would be taken from the CST. However, if the water level in the CST falls below a preselected level, first the suppression pool suction valve automatically opens, and then the CST suction valve automatically closes. This ensures that an adequate supply of makeup water is available to the HPCS pump. To prevent losing suction to the pump, the suction valves are interlocked so that the suppression pool suction valve must be open before the CST suction valve automatically closes.

Condensate Storage Tank Level - Low signals are initiated from two level transmitters. The logic is arranged such that either transmitter and associated trip unit can cause the suppression pool suction valve to open and the CST suction valve to close.

The Condensate Storage Tank Level - Low Function Allowable Value is high enough to ensure adequate pump suction head while water is being taken from the CST.

One channel of the Condensate Storage Tank Level - Low Function is only required to be OPERABLE when HPCS is required to be OPERABLE to fulfill the requirements of LCO 3.5.2 and HPCS is aligned to the CST.

3.c, 3.d. HPCS Pump Discharge Pressure - High (Bypass) and HPCS System Flow Rate - Low (Bypass)

The minimum flow instruments are provided to protect the HPCS pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow and high pump discharge pressure are sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump or the discharge pressure is low (indicating the HPCS pump is not operating).

One flow transmitter is used to detect the HPCS System's flow rate. The logic is arranged such that the transmitter causes the minimum flow valve

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

to open, provided the HPCS pump discharge pressure, sensed by another transmitter, is high enough (indicating the pump is operating). The logic will close the minimum flow valve once the closure setpoint is exceeded. (The valve will also close upon HPCS pump discharge pressure decreasing below the setpoint.)

The HPCS System Flow Rate - Low and HPCS Pump Discharge Pressure - High Allowable Value is high enough to ensure that pump flow rate is sufficient to protect the pump, yet low enough to ensure that the closure of the minimum flow valve is initiated to allow full flow into the core.

The HPCS Pump Discharge Pressure - High Allowable Value is set high enough to ensure that the valve will not be open when the pump is not operating.

One channel of each Function associated with one pump is required to be OPERABLE when HPCS is required to be OPERABLE by LCO 3.5.2 in MODES 4 and 5.

3.e. Manual Initiation

The Manual Initiation push button channel introduces a signal into the HPCS logic to provide manual initiation capability. There is one push button for the HPCS System. One channel of the Manual Initiation Function is only required to be OPERABLE in MODES 4 and 5 when the associated ECCS subsystem is required to be OPERABLE per LCO 3.5.2.

There is no Allowable Value for this Function since the channel is mechanically actuated based solely on the position of the push button.

RHR System Isolation

4.a - Reactor Vessel Water Level - Low. Level 3

The definition of DRAIN TIME allows crediting the closing of penetration flow paths that are capable of being automatically isolated by RPV water level isolation instrumentation prior to the RPV water level being equal to the TAF. The Reactor Vessel Water Level - Low, Level 3 Function is only required to be OPERABLE when automatic isolation of the associated RHR penetration flow path is credited in calculating DRAIN TIME.

Reactor Vessel Water Level - Low, Level 3 signals are initiated from four level transmitters (two per trip system) that sense the difference between the pressure due to a constant column of water (reference leg) and the

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

pressure due to the actual water level (variable leg) in the vessel. While four channels (two channels per trip system) of the Reactor Vessel Water Level - Low, Level 3 Function are available, only two channels (all in the same trip system) are required to be OPERABLE.

The Reactor Vessel Water Level - Low, Level 3 Allowable Value was chosen to be the same as the RPS Reactor Vessel Water Level - Low, Level 3 Allowable Value (LCO 3.3.1.1), since the capability to cool the fuel may be threatened.

This Function isolates the Group 11 valves.

<u>Reactor Water Cleanup (RWCU) System Isolation</u>

<u>5.a - Reactor Vessel Water level - Low Low, Level 2</u>

The definition of DRAIN TIME allows crediting the closing of penetration flow paths that are capable of being automatically isolated by RPV water level isolation instrumentation prior to the RPV water level being equal to the TAF. The Reactor Vessel Water Level - Low Low, Level 2 Function associated with RWCU System isolation may be credited for automatic isolation of penetration flow paths associated with the RWCU System.

Reactor Vessel Water Level - Low Low, Level 2 is initiated from two channels per trip system that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. While four channels (two channels per trip system) of the Reactor Vessel Water Level - Low, Level 2 Function are available, only two channels (all in the same trip system) are required to be OPERABLE.

The Reactor Vessel Water Level - Low Low, Level 2 Allowable Value was chosen to be the same as the ECCS Reactor Vessel Water Level - Low Low, Level 2 Allowable Value (LCO 3.3.5.1), since the capability to cool the fuel may be threatened.

The Reactor Vessel Water Level - Low Low, Level 2 Function is only required to be OPERABLE when automatic isolation of the associated penetration flow path is credited in calculating DRAIN TIME.

This Function isolates the Group 8 valves.

ACTIONS

A Note has been provided to modify the ACTIONS related to RPV Water Inventory Control instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition discovered to be inoperable or not within limits will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable RPV Water Inventory Control instrumentation channels provide appropriate compensatory measures for separate inoperable Condition entry for each inoperable RPV Water Inventory Control instrumentation channel.

A.1

Required Action A.1 directs entry into the appropriate Condition referenced in Table 3.3.5.2-1. The applicable Condition referenced in the Table is Function dependent. Each time a channel is discovered inoperable, Condition A is entered for that channel and provides for transfer to the appropriate subsequent Condition.

B.1 and B.2

RHR System Isolation, Reactor Vessel Water Level - Low Level 3, and Reactor Water Cleanup System, Reactor Vessel Water Level - Low Low, Level 2 functions are applicable when automatic isolation of the associated penetration flow path is credited in calculating Drain Time. If the instrumentation is inoperable, Required Action B.1 directs an immediate declaration that the associated penetration flow path(s) are incapable of automatic isolation. Required Action B.2 directs calculation of DRAIN TIME. The calculation cannot credit automatic isolation of the affected penetration flow paths.

BASES

ACTIONS (continued)

C.1

Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS injection/spray subsystem manual initiation functions. If this permissive is inoperable, manual initiation of ECCS is prohibited. Therefore, the permissive must be placed in the trip condition within 1 hour. With the permissive in the trip condition, manual initiation may be performed. Prior to placing the permissive in the tripped condition, the operator can take manual control of the pump and the injection valve to inject water into the RPV.

The Completion Time of 1 hour is intended to allow the operator time to evaluate any discovered inoperabilities and to place the channel in trip.

D.1 and D.2

Required Actions D.1 and D.2 are intended to ensure that appropriate actions are taken if multiple, inoperable channels within the same Function result in a loss of automatic suction swap for the HPCS system from the condensate storage tank to the suppression pool. The HPCS system must be declared inoperable within 1 hour or the HPCS pump suction must be aligned to the suppression pool, since, if aligned, the function is already performed.

The 1 hour Completion Time is acceptable because it minimizes the risk of HPCS being needed without an adequate water source while allowing time for restoration or alignment of HPCS pump suction to the suppression pool.

E.1 and E.2

Required Actions E.1 and E.2 apply when the HPCS Reactor Vessel Water Level - High, Level 8 function is inoperable. If the function is inoperable and the channel is tripped, the HPCS pump discharge valve will not open and HPCS injection is prevented. The HPCS system must be declared inoperable within 1 hour and the function must be restored to Operable status within 24 hours.

The Completion Time of 1 hour is provided to declare the HPCS System inoperable. The 24 hour Completion Time was chosen to allow time for the operator to evaluate and repair any discovered inoperabilities. The Completion Time is appropriate given the ability to manually start the HPCS and to locally open the discharge valve.

BASES

ACTIONS (continued)

F.1

If an LPCI or LPCS Discharge Flow - Low bypass function or HPCS System Discharge Pressure - High or Flow Rate - Low bypass function is inoperable, there is a risk that the associated ECCS pump could overheat when the pump is operating and the associated injection valve is not fully open. In this condition, the operator can take manual control of the pump and the injection valve to ensure the pump does not overheat. If a manual initiation function is inoperable, the ECCS subsystem pumps can be started manually and the valves can be opened manually, but this is not the preferred condition.

The 24 hour Completion Time was chosen to allow time for the operator to evaluate and repair any discovered inoperabilities. The Completion Time is appropriate given the ability to manually start the ECCS pumps and open the injection valves and to manually ensure the pump does not overheat.

G.1

With the Required Action and associated Completion Time of Conditions C, D, E, or f not met, the associated ECCS injection/spray subsystem may be incapable of performing the intended function, and must be declared inoperable immediately.

SURVEILLANCE REQUIREMENTS

As noted in the beginning of the SRs, the SRs for each RPV Water Inventory Control instrument Function are found in the SRs column of Table 3.3.5.2-1.

SR 3.3.5.2.1

Performance of the CHANNEL CHECK ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A CHANNEL CHECK guarantees that undetected outright channel failure is limited; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL FUNCTIONAL TEST.

BASES

SURVEILLANCE REQUIREMENTS (continued)

Agreement criteria are determined by the plant staff, based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

[The Frequency of 12 hours is based upon operating experience that demonstrates channel failure is rare.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]

The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.5.2.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests.

Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

[The Frequency of 92 days is based upon operating experience that demonstrates channel failure is rare.

OR

SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]

SR 3.3.5.2.3

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required initiation logic for a specific channel. The system functional testing performed in LCO 3.5.2 overlaps this Surveillance to complete testing of the assumed safety function.

[The 18 month Frequency is based on operating experience that has shown that these components usually pass the Surveillance when performed at the 18 month Frequency.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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BASES

REFERENCES

1. Information Notice 84-81 "Inadvertent Reduction in Primary Coolant Inventory in Boiling Water Reactors During Shutdown and Startup," November 1984.

2. Information Notice 86-74, "Reduction of Reactor Coolant Inventory Because of Misalignment of RHR Valves," August 1986.

3. Generic Letter 92-04, "Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs Pursuant to 10 CFR 50.54(F), " August 1992.

4. NRC Bulletin 93-03, "Resolution of Issues Related to Reactor Vessel Water Level Instrumentation in BWRs," May 1993.

5. Information Notice 94-52, "Inadvertent Containment Spray and Reactor Vessel Draindown at Millstone 1," July 1994.

B 3.3 INSTRUMENTATION

B 3.3.5.2B Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation (Without Setpoint Control Program)

BASES

BACKGROUND

The RPV contains penetrations below the top of the active fuel (TAF) that have the potential to drain the reactor coolant inventory to below the TAF. If the water level should drop below the TAF, the ability to remove decay heat is reduced, which could lead to elevated cladding temperatures and clad perforation. Safety Limit 2.1.1.3 requires the RPV water level to be above the top of the active irradiated fuel at all times to prevent such elevated cladding temperatures.

Technical Specifications are required by 10 CFR 50.36 to include limiting safety system settings (LSSS) for variables that have significant safety functions. LSSS are defined by the regulation as "Where a LSSS is specified for a variable on which a safety limit has been placed, the setting must be chosen so that automatic protective actions will correct the abnormal situation before a Safety Limit (SL) is exceeded." The Analytical Limit is the limit of the process variable at which a safety action is initiated to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur. The actual settings are identified and maintained in the Setpoint Control Program (SCP) controlled by 10 CFR 50.59.

With the unit in MODE 4 or 5, RPV water inventory control is not required to mitigate any events or accidents evaluated in the safety analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material should a draining event occur. Under the definition of DRAIN TIME, some penetration flow paths may be excluded from the DRAIN TIME calculation if they will be isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the TAF when actuated by RPV water level isolation instrumentation.

The purpose of the RPV Water Inventory Control Instrumentation is to support the requirements of LCO 3.5.2, “Reactor Pressure Vessel (RPV) Water Inventory Control,” and the definition of DRAIN TIME. There are

BASES

BACKGROUND (continued)

functions that are required for manual initiation or operation of the ECCS injection/spray subsystem required to be OPERABLE by LCO 3.5.2 and other functions that support automatic isolation of Residual Heat Removal subsystem and Reactor Water Cleanup system penetration flow path(s) on low RPV water level.

The RPV Water Inventory Control Instrumentation supports operation of low pressure core spray (LPCS), low pressure coolant injection (LPCI), and high pressure core spray (HPCS). The equipment involved with each of these systems is described in the Bases for LCO 3.5.2.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

With the unit in MODE 4 or 5, RPV water inventory control is not required to mitigate any events or accidents evaluated in the safety analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material should a draining event occur.

A double-ended guillotine break of the Reactor Coolant System (RCS) is not postulated in MODES 4 and 5 due to the reduced RCS pressure, reduced piping stresses, and ductile piping systems. Instead, an event is postulated in which a single operator error or initiating event allows draining of the RPV water inventory through a single penetration flow path with the highest flow rate, or the sum of the drain rates through multiple penetration flow paths susceptible to a common mode failure (e.g., seismic event, loss of normal power, single human error). It is assumed, based on engineering judgment, that while in MODES 4 and 5, one ECCS injection/spray subsystem can be manually initiated to maintain adequate reactor vessel water level.

As discussed in References 1, 2, 3, 4, and 5, operating experience has shown RPV water inventory to be significant to public health and safety. Therefore, RPV Water Inventory Control satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Low Pressure Core Spray and Low Pressure Coolant Injection Systems

1.a, 2.a. Reactor Steam Dome Pressure - Low (Injection Permissive)
Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS subsystems. This ensures that, prior to opening the injection valves of the low pressure ECCS subsystems, the reactor pressure has fallen to a value below these subsystems' maximum design pressure. While it is assured during Modes 4 and 5 that the reactor steam dome pressure will be below the ECCS maximum design pressure, the Reactor Steam Dome Pressure - Low signals are assumed to be operable and capable of permitting initiation of the ECCS.

The Reactor Steam Dome Pressure - Low signals are initiated from four pressure transmitters that sense the reactor dome pressure. The four pressure transmitters each drive a master and slave trip unit. The outputs of the trip units are connected to relays whose contacts are arranged in a one-out-of-two taken twice logic for each Division.

Three channels of Reactor Steam Dome Pressure - Low Function per associated ECCS Division are only required to be OPERABLE in MODES 4 and 5 when ECCS Manual Initiation is required to be OPERABLE, since these channels support the manual initiation Function. In addition, the channels are only required when the associated ECCS subsystem is required to be OPERABLE by LCO 3.5.2.

1.b, 1.c, 2.b. Low Pressure Coolant Injection and Low Pressure Core Spray Pump Discharge Flow - Low (Bypass)

The minimum flow instruments are provided to protect the associated low pressure ECCS pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow is sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump.

One flow transmitter per ECCS pump is used to detect the associated subsystems' flow rates. The logic is arranged such that each transmitter causes its associated minimum flow valve to open. The logic will close the minimum flow valve once the closure setpoint is exceeded. The LPCI minimum flow valves are time delayed such that the valves will not open for 10 seconds after the switches detect low flow. The time delay is provided to limit reactor vessel inventory loss during the startup of the Residual Heat Removal (RHR) shutdown cooling mode (for RHR A and RHR B).

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

One channel of the Pump Discharge Flow - Low Function is required to be OPERABLE in MODES 4 and 5 when the associated LPCS or LPCI pump is required to be OPERABLE by LCO 3.5.2 to ensure the pumps are capable of injecting into the Reactor Pressure Vessel when manually initiated.

1.d, 2.c. Manual Initiation

The Manual Initiation push button channels introduce signals into the appropriate ECCS logic to provide manual initiation capability. There is one push button for each of the two Divisions of low pressure ECCS (i.e., Division 1 ECCS, LPCS and LPCI A; Division 2 ECCS, LPCI B and LPCI C). The only the manual initiation function required to be OPERABLE is that associated with the ECCS subsystem required to be OPERABLE by LCO 3.5.2.

High Pressure Core Spray System

3.a. Reactor Vessel Water Level - High, Level 8

The high RPV water level Level 8 signal is used to close the HPCS injection valve to prevent overflow into the main steam lines (MSLs). Reactor Vessel Water Level - High, Level 8 signals for HPCS are initiated from two level transmitters from the narrow range water level measurement instrumentation. One channel associated with the HPCS System required to be OPERABLE by LCO 3.5.2 is required to be OPERABLE.

One channel of Reactor Vessel Water Level - High, Level 8 Function is required to be OPERABLE in MODES 4 and 5 when the associated HPCS is required to be OPERABLE by LCO 3.5.2 to ensure to the HPCS is capable of injecting into the Reactor Pressure Vessel when manually initiated.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

3.b. Condensate Storage Tank Level – Low

Low level in the CST indicates the unavailability of an adequate supply of makeup water from this normal source. Normally the suction valves between HPCS and the CST are open and water for HPCS injection would be taken from the CST. However, if the water level in the CST falls below a preselected level, first the suppression pool suction valve automatically opens, and then the CST suction valve automatically closes. This ensures that an adequate supply of makeup water is available to the HPCS pump. To prevent losing suction to the pump, the suction valves are interlocked so that the suppression pool suction valve must be open before the CST suction valve automatically closes.

Condensate Storage Tank Level - Low signals are initiated from two level transmitters. The logic is arranged such that either transmitter and associated trip unit can cause the suppression pool suction valve to open and the CST suction valve to close.

One channel of the Condensate Storage Tank Level - Low Function is only required to be OPERABLE when HPCS is required to be OPERABLE to fulfill the requirements of LCO 3.5.2 and HPCS is aligned to the CST.

3.c, 3.d. HPCS Pump Discharge Pressure - High (Bypass) and HPCS System Flow Rate - Low (Bypass)

The minimum flow instruments are provided to protect the HPCS pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow and high pump discharge pressure are sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump or the discharge pressure is low (indicating the HPCS pump is not operating).

One flow transmitter is used to detect the HPCS System's flow rate. The logic is arranged such that the transmitter causes the minimum flow valve to open, provided the HPCS pump discharge pressure, sensed by another transmitter, is high enough (indicating the pump is operating). The logic will close the minimum flow valve once the closure setpoint is exceeded. (The valve will also close upon HPCS pump discharge pressure decreasing below the setpoint.)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

One channel of each Function associated with one pump is required to be OPERABLE when HPCS is required to be OPERABLE by LCO 3.5.2 in MODES 4 and 5.

3.e. Manual Initiation

The Manual Initiation push button channel introduces a signal into the HPCS logic to provide manual initiation capability. There is one push button for the HPCS System. One channel of the Manual Initiation Function is only required to be OPERABLE in MODES 4 and 5 when the associated ECCS subsystem is required to be OPERABLE per LCO 3.5.2.

RHR Cooling System Isolation

4.a - Reactor Vessel Water Level - Low, Level 3

The definition of DRAIN TIME allows crediting the closing of penetration flow paths that are capable of being automatically isolated by RPV water level isolation instrumentation prior to the RPV water level being equal to the TAF. The Reactor Vessel Water Level - Low, Level 3 Function is only required to be OPERABLE when automatic isolation of the associated RHR penetration flow path is credited in calculating DRAIN TIME.

Reactor Vessel Water Level - Low, Level 3 signals are initiated from four level transmitters (two per trip system) that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. While four channels (two channels per trip system) of the Reactor Vessel Water Level - Low, Level 3 Function are available, only two channels (all in the same trip system) are required to be OPERABLE.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

This Function isolates the Group 11 valves.

Reactor Water Cleanup (RWCU) System Isolation

5.a - Reactor Vessel Water level - Low Low, Level 2

The definition of DRAIN TIME allows crediting the closing of penetration flow paths that are capable of being automatically isolated by RPV water level isolation instrumentation prior to the RPV water level being equal to the TAF. The Reactor Vessel Water Level - Low Low, Level 2 Function associated with RWCU System isolation may be credited for automatic isolation of penetration flow paths associated with the RWCU System.

Reactor Vessel Water Level - Low Low, Level 2 is initiated from two channels per trip system that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. While four channels (two channels per trip system) of the Reactor Vessel Water Level - Low, Level 2 Function are available, only two channels (all in the same trip system) are required to be OPERABLE.

The Reactor Vessel Water Level - Low Low, Level 2 Function is only required to be OPERABLE when automatic isolation of the associated penetration flow path is credited in calculating DRAIN TIME.

This Function isolates the Group 8 valves.

ACTIONS

A Note has been provided to modify the ACTIONS related to RPV Water Inventory Control instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition discovered to be inoperable or not within limits will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable RPV Water Inventory Control instrumentation channels provide appropriate compensatory measures for separate inoperable Condition entry for each inoperable RPV Water Inventory Control instrumentation channel.

ACTIONS (continued)

A.1

Required Action A.1 directs entry into the appropriate Condition referenced in Table 3.3.5.2-1. The applicable Condition referenced in the Table is Function dependent. Each time a channel is discovered inoperable, Condition A is entered for that channel and provides for transfer to the appropriate subsequent Condition.

B.1 and B.2

RHR System Isolation, Reactor Vessel Water Level - Low Level 3, and Reactor Water Cleanup System, Reactor Vessel Water Level - Low Low, Level 2 functions are applicable when automatic isolation of the associated penetration flow path is credited in calculating Drain Time. If the instrumentation is inoperable, Required Action B.1 directs an immediate declaration that the associated penetration flow path(s) are incapable of automatic isolation. Required Action B.2 directs calculation of DRAIN TIME. The calculation cannot credit automatic isolation of the affected penetration flow paths.

C.1

Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS injection/spray subsystem manual initiation functions. If this permissive is inoperable, manual initiation of ECCS is prohibited. Therefore, the permissive must be placed in the trip condition within 1 hour. With the permissive in the trip condition, manual initiation may be performed. Prior to placing the permissive in the tripped condition, the operator can take manual control of the pump and the injection valve to inject water into the RPV.

ACTIONS (continued)

The Completion Time of 1 hour is intended to allow the operator time to evaluate any discovered inoperabilities and to place the channel in trip.

D.1 and D.2

Required Actions D.1 and D.2 are intended to ensure that appropriate actions are taken if multiple, inoperable channels within the same Function result in a loss of automatic suction swap for the HPCS system from the condensate storage tank to the suppression pool. The HPCS system must be declared inoperable within 1 hour or the HPCS pump suction must be aligned to the suppression pool, since, if aligned, the function is already performed.

The 1 hour Completion Time is acceptable because it minimizes the risk of HPCS being needed without an adequate water source while allowing time for restoration or alignment of HPCS pump suction to the suppression pool.

E.1 and E.2

Required Actions E.1 and E.2 apply when the HPCS Reactor Vessel Water Level - High, Level 8 function is inoperable. If the function is inoperable and the channel is tripped, the HPCS pump discharge valve will not open and HPCS injection is prevented. The HPCS system must be declared inoperable within 1 hour and the function must be restored to Operable status within 24 hours.

The Completion Time of 1 hour is provided to declare the HPCS System inoperable. The 24 hour Completion Time was chosen to allow time for the operator to evaluate and repair any discovered inoperabilities. The Completion Time is appropriate given the ability to manually start the HPCS and to locally open the discharge valve.

BASES

ACTIONS (continued)

F.1

If an LPCI or LPCS Discharge Flow - Low bypass function or HPCS System Discharge Pressure - High or Flow Rate - Low bypass function is inoperable, there is a risk that the associated ECCS pump could overheat when the pump is operating and the associated injection valve is not fully open. In this condition, the operator can take manual control of the pump and the injection valve to ensure the pump does not overheat. If a manual initiation function is inoperable, the ECCS subsystem pumps can be started manually and the valves can be opened manually, but this is not the preferred condition.

The 24 hour Completion Time was chosen to allow time for the operator to evaluate and repair any discovered inoperabilities. The Completion Time is appropriate given the ability to manually start the ECCS pumps and open the injection valves and to manually ensure the pump does not overheat.

G.1

With the Required Action and associated Completion Time of Conditions C, D, E, or F not met, the associated ECCS injection/spray subsystem may be incapable of performing the intended function, and must be declared inoperable immediately.

SURVEILLANCE REQUIREMENTS

As noted in the beginning of the SRs, the SRs for each RPV Water Inventory Control instrument Function are found in the SRs column of Table 3.3.5.2-1.

SR 3.3.5.2.1

Performance of the CHANNEL CHECK ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A CHANNEL CHECK guarantees that undetected outright channel failure is limited; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL FUNCTIONAL TEST.

BASES

SURVEILLANCE REQUIREMENTS (continued)

Agreement criteria are determined by the plant staff, based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

[The Frequency of 12 hours is based upon operating experience that demonstrates channel failure is rare.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.5.2.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests.

Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

[The Frequency of 92 days is based upon operating experience that demonstrates channel failure is rare.

OR

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]

SR 3.3.5.2.3

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required initiation logic for a specific channel. The system functional testing performed in LCO 3.5.2 overlaps this Surveillance to complete testing of the assumed safety function.

[The 18 month Frequency is based on operating experience that has shown that these components usually pass the Surveillance when performed at the 18 month Frequency.
OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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REFERENCES

1. Information Notice 84-81 "Inadvertent Reduction in Primary Coolant Inventory in Boiling Water Reactors During Shutdown and Startup," November 1984.

2. Information Notice 86-74, "Reduction of Reactor Coolant Inventory Because of Misalignment of RHR Valves," August 1986.

3. Generic Letter 92-04, "Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs Pursuant to 10 CFR 50.54(F), " August 1992.

4. NRC Bulletin 93-03, "Resolution of Issues Related to Reactor Vessel Water Level Instrumentation in BWRs," May 1993.

5. Information Notice 94-52, "Inadvertent Containment Spray and Reactor Vessel Draindown at Millstone 1," July 1994.

Enclosure 7

BWR/4 Technical Specifications and Bases Markup

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1.1 Definitions

CORE ALTERATION	CORE ALTERATION shall be the movement of any fuel, sources, or reactivity control components, within the reactor vessel with the vessel head removed and fuel in the vessel. The following exceptions are not considered to be CORE ALTERATIONS: a. Movement of source range monitors, local power range monitors, intermediate range monitors, traversing incore probes, or special movable detectors (including undervessel replacement), and b. Control rod movement, provided there are no fuel assemblies in the associated core cell. Suspension of CORE ALTERATIONS shall not preclude completion of movement of a component to a safe position.
CORE OPERATING LIMITS REPORT (COLR)	The COLR is the unit specific document that provides cycle specific parameter limits for the current reload cycle. These cycle specific limits shall be determined for each reload cycle in accordance with Specification 5.6.3. Plant operation within these limits is addressed in individual Specifications.
DOSE EQUIVALENT I-31	DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcuries/gram) that alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in [Table III of TID-14844, AEC, 1962, "Calculation of Distance Factors for Power and Test Reactor Sites" or those listed in Table E-7 of Regulatory Guide 1.109, Rev. 1, NRC, 1977, or ICRP 30, Supplement to Part 1, page 192-212, Table titled, "Committed Dose Equivalent in Target Organs or Tissues per Intake of Unit Activity"].
DRAIN TIME	*The DRAIN TIME is the time it would take for the water inventory in and above the Reactor Pressure Vessel (RPV) to drain to the top of the active fuel (TAF) seated in the RPV assuming:* *a) The water inventory above the TAF is divided by the limiting drain rate;* *b) The limiting drain rate is the larger of the drain rate through a single penetration flow path with the highest flow rate, or the sum of the drain rates through multiple penetration flow paths susceptible to a common mode failure (e.g., seismic event, loss of normal power, single*

human error), for all penetration flow paths below the TAF except:

1. Penetration flow paths connected to an intact closed system, or isolated by manual or automatic valves that are locked, sealed, or otherwise secured in the closed position, blank flanges, or other devices that prevent flow of reactor coolant through the penetration flow paths;

2. Penetration flow paths capable of being isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the TAF when actuated by RPV water level isolation instrumentation; or

3. Penetration flow paths with isolation devices that can be closed prior to the RPV water level being equal to the TAF by a dedicated operator trained in the task, who in continuous communication with the control room, is stationed at the controls, and is capable of closing the penetration flow path isolation device without offsite power.

c) The penetration flow paths required to be evaluated per paragraph b) are assumed to open instantaneously and are not subsequently isolated, and no water is assumed to be subsequently added to the RPV water inventory;

d) No additional draining events occur; and

e) Realistic cross-sectional areas and drain rates are used.

A bounding DRAIN TIME may be used in lieu of a calculated value.

EMERGENCY CORE COOLING SYSTEM (ECCS) RESPONSE TIME

The ECCS RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its ECCS initiation setpoint at the channel sensor until the ECCS 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.

3.3 INSTRUMENTATION

3.3.5.1A Emergency Core Cooling System (ECCS) Instrumentation (Without Setpoint Control Program)

LCO 3.3.5.1A The ECCS instrumentation for each Function in Table 3.3.5.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.5.1-1.

ACTIONS

---NOTE---
Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or more channels inoperable.	A.1	Enter the Condition referenced in Table 3.3.5.1-1 for the channel.	Immediately
B. As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	B.1	--------------NOTE~~S~~------------- 1~~. Only applicable in MODES 1, 2, and 3.~~ ~~2.~~ Only applicable for Functions 1.a, 1.b, 2.a, and 2.b. ------------------------------------- Declare supported feature(s) inoperable when its redundant feature ECCS initiation capability is inoperable.	 1 hour from discovery of loss of initiation capability for feature(s) in both divisions
	AND		

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	B.2 ---------------NOTE-------------- Only applicable for Functions 3.a and 3.b. -------------------------------------	
	Declare High Pressure Coolant Injection (HPCI) System inoperable.	1 hour from discovery of loss of HPCI initiation capability
	AND	
	B.3 Place channel in trip.	24 hours
C. As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	C.1 --------------NOTE~~S~~------------- ~~1. Only applicable in MODES 1, 2, and 3.~~ ~~2.~~ Only applicable for Functions 1.c, 2.c, 2.d, and 2.f. -------------------------------------	
	Declare supported feature(s) inoperable when its redundant feature ECCS initiation capability is inoperable.	1 hour from discovery of loss of initiation capability for feature(s) in both divisions
	AND	
	C.2 Restore channel to OPERABLE status.	24 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	D.1	---------------NOTE-------------- Only applicable if HPCI pump suction is not aligned to the suppression pool. ------------------------------------- Declare HPCI System inoperable.	1 hour from discovery of loss of HPCI initiation capability
	<u>AND</u>		
	D.2.1	Place channel in trip.	24 hours
	<u>OR</u>		
	D.2.2	Align the HPCI pump suction to the suppression pool.	24 hours
E. As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	E.1	--------------NOTE~~S~~------------- ~~1. Only applicable in MODES 1, 2, and 3.~~ ~~2.~~ Only applicable for Functions 1.d and 2.g. ------------------------------------- Declare supported feature(s) inoperable when its redundant feature ECCS initiation capability is inoperable.	1 hour from discovery of loss of initiation capability for subsystems in both divisions
	<u>AND</u>		
	E.2	Restore channel to OPERABLE status.	7 days

Table 3.3.5.1-1 (page 1 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Core Spray System					
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2, 3~~,~~ ~~4(a), 5(a)~~	[4](a~~b~~)	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3](b~~c~~)(c~~d~~) SR 3.3.5.1.5(b~~c~~)(c~~d~~) SR 3.3.5.1.6 SR 3.3.5.1.7	≥ [-113] inches
b. Drywell Pressure - High	1, 2, 3	[4](a~~b~~)	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3](b~~c~~)(c~~d~~) SR 3.3.5.1.5(b~~c~~)(c~~d~~) SR 3.3.5.1.6 SR 3.3.5.1.7	≤ [1.92] psig
c. Reactor Steam Dome Pressure - Low (Injection Permissive)	1, 2, 3	[4]	C	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7	≥ [390] psig and ≤ [500] psig
	~~4(a), 5(a)~~	~~[4]~~	~~B~~	~~SR 3.3.5.1.1~~ ~~SR 3.3.5.1.2~~ ~~[SR 3.3.5.1.3]~~ ~~SR 3.3.5.1.5~~ ~~SR 3.3.5.1.6~~ ~~SR 3.3.5.1.7~~	~~≥ [390] psig and ≤ [500] psig~~

~~(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2, "ECCS - Shutdown."~~

(a~~b~~) Also required to initiate the associated [diesel generator (DG) and isolate the associated plant service water (PSW) turbine building (T/B) isolation valves].

(b~~c~~) If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

(c~~d~~) The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Limiting Trip Setpoint (LTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and as-left tolerances are specified in [insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference].

Table 3.3.5.1-1 (page 2 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Core Spray System					
[d. Core Spray Pump Discharge Flow - Low (Bypass)	1, 2, 3~~,~~ 4~~(a)~~~~, 5(a)~~	[2] [1 per pump]	E	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.5[(b~~c~~)(c~~d~~)] SR 3.3.5.1.6	≥ [ ] gpm and ≤ [ ] gpm]
[e. Manual Initiation	1, 2, 3~~,~~ 4~~(a)~~~~, 5(a)~~	[2] [1 per subsystem]	C	SR 3.3.5.1.6	NA]
2. Low Pressure Coolant Injection (LPCI) System					
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2, 3~~,~~ 4~~(a)~~~~, 5(a)~~	[4][(a~~b~~)]	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3][(b~~c~~)(c~~d~~)] SR 3.3.5.1.5[(b~~c~~)(c~~d~~)] SR 3.3.5.1.6 SR 3.3.5.1.7	≥ [-113] inches
b. Drywell Pressure - High	1, 2, 3	[4][(a~~b~~)]	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3][(b~~c~~)(c~~d~~)] SR 3.3.5.1.5[(b~~c~~)(c~~d~~)] SR 3.3.5.1.6 SR 3.3.5.1.7	≤ [1.92] psig

~~(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2, "ECCS - Shutdown."~~

(a~~b~~) Also required to initiate the associated [DG and isolate the associated PSW T/B isolation valves].

(b~~c~~) If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

(c~~d~~) The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Limiting Trip Setpoint (LTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and as-left tolerances are specified in [insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference].

Table 3.3.5.1-1 (page 3 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2. LPCI System					
c. Reactor Steam Dome Pressure - Low (Injection Permissive)	1, 2, 3	[4]	C	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7	≥ [390] psig and ≤ [500] psig
	~~4(a), 5(a)~~	~~[4]~~	~~B~~	~~SR 3.3.5.1.1~~ ~~SR 3.3.5.1.2~~ ~~[SR 3.3.5.1.3]~~ ~~SR 3.3.5.1.5~~ ~~SR 3.3.5.1.6~~ ~~SR 3.3.5.1.7~~	~~≥ [390] psig and ≤ [500] psig~~
d. Reactor Steam Dome Pressure - Low (Recirculation Discharge Valve Permissive)	1(d~~e~~), 2(d~~e~~), 3(d~~e~~)	[4]	C	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [335] psig
e. Reactor Vessel Shroud Level - Level 0	1, 2, 3	[2]	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [-202] inches
[f. Low Pressure Coolant Injection Pump Start - Time Delay Relay	1, 2, 3~~,~~ ~~4(a), 5(a)~~	[4] [1 per pump]	C	SR 3.3.5.1.5 SR 3.3.5.1.6	
Pumps A,B,D					≥ 9 seconds and ≤ 11 seconds
Pump C					≤ 1 second]

~~(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2, "ECCS - Shutdown."~~

(d~~e~~) With associated recirculation pump discharge valve open.

Table 3.3.5.1-1 (page 4 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2. LPCI System					
[g. Low Pressure Coolant Injection Pump Discharge Flow - Low Bypass)	1, 2, 3~~, 4(a), 5(a)~~	[4] [1 per pump]	E	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.5(b~~c~~)(c~~d~~) SR 3.3.5.1.6	≥ [ ] gpm and ≤ [ ] gpm]
[h. Manual Initiation	1, 2, 3~~, 4(a), 5(a)~~	[2] [1 per subsystem]	C	SR 3.3.5.1.6	NA]
3. High Pressure Coolant Injection (HPCI) System					
a. Reactor Vessel Water Level - Low Low, Level 2	1, 2(e~~f~~), 3(e~~f~~)	[4]	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3](b~~c~~)(c~~d~~) SR 3.3.5.1.5(b~~c~~)(c~~d~~) SR 3.3.5.1.6 SR 3.3.5.1.7	≥ [-47] inches
b. Drywell Pressure – High	1, 2(e~~f~~), 3(e~~f~~)	[4]	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3](b~~c~~)(c~~d~~) SR 3.3.5.1.5(b~~c~~)(c~~d~~) SR 3.3.5.1.6 SR 3.3.5.1.7	≤ [1.92] psig
c. Reactor Vessel Water Level - High, Level 8	1, 2(e~~f~~), 3(e~~f~~)	[2]	C	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3](b~~c~~)(c~~d~~) SR 3.3.5.1.5(b~~c~~)(c~~d~~) SR 3.3.5.1.6 SR 3.3.5.1.7	≤ [56.5] inches

~~(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2, "ECCS - Shutdown."~~

(b~~c~~) If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

(c~~d~~) The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Limiting Trip Setpoint (LTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and as-left tolerances are specified in [insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference].

(e~~f~~) With reactor steam dome pressure > [150] psig.

Table 3.3.5.1-1 (page 5 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
3. HPCI System					
d. Condensate Storage Tank Level - Low	1, $2^{(e\cancel{f})}$, $3^{(e\cancel{f})}$	[2]	D	[SR 3.3.5.1.1] SR 3.3.5.1.2 [SR 3.3.5.1.4]$^{(b\cancel{c})(c\cancel{d})}$ SR 3.3.5.1.6	≥ [0] inches
e. Suppression Pool Water Level - High	1, $2^{(e\cancel{f})}$, $3^{(e\cancel{f})}$	[2]	D	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3]$^{(b\cancel{c})(c\cancel{d})}$ SR 3.3.5.1.5$^{(b\cancel{c})(c\cancel{d})}$ SR 3.3.5.1.6	≤ [154] inches
[f. High Pressure Coolant Injection Pump Discharge Flow - Low (Bypass)	1, $2^{(e\cancel{f})}$, $3^{(e\cancel{f})}$	[1]	E	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.5$^{(b\cancel{c})(c\cancel{d})}$ SR 3.3.5.1.6	≥ [ ] gpm and ≤ [ ] gpm]
[g. Manual Initiation	1, $2^{(e\cancel{f})}$, $3^{(e\cancel{f})}$	[1]	C	SR 3.3.5.1.6	NA]
4. Automatic Depressurization System (ADS) Trip System A					
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, $2^{(e\cancel{f})}$, $3^{(e\cancel{f})}$	[2]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3]$^{(b\cancel{c})(c\cancel{d})}$ SR 3.3.5.1.5$^{(b\cancel{c})(c\cancel{d})}$ SR 3.3.5.1.6	≥ [-113] inches
b. Drywell Pressure - High	1, $2^{(e\cancel{f})}$, $3^{(e\cancel{f})}$	[2]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3]$^{(b\cancel{c})(c\cancel{d})}$ SR 3.3.5.1.5$^{(b\cancel{c})(c\cancel{d})}$ SR 3.3.5.1.6	≤ [1.92] psig

(*b*~~c~~) If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

(*c*~~d~~) The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Limiting Trip Setpoint (LTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and as-left tolerances

are specified in [insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference].

(e~~f~~) With reactor steam dome pressure > [150] psig.

Table 3.3.5.1-1 (page 5 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
4. ADS Trip System A					
c. Automatic Depressurization System Initiation Timer	1, 2(e~~f~~), 3(e~~f~~)	[1]	G	[SR 3.3.5.1.5] SR 3.3.5.1.6	≤ [120] seconds
d. Reactor Vessel Water Level - Low, Level 3 (Confirmatory)	1, 2(e~~f~~), 3(e~~f~~)	[1]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3](b~~c~~)(c~~d~~) SR 3.3.5.1.5(b~~c~~)(c~~d~~) SR 3.3.5.1.6	≥ [10] inches
e. Core Spray Pump Discharge Pressure - High	1, 2(e~~f~~), 3(e~~f~~)	[2]	G	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [137] psig and ≤ [ ] psig
f. Low Pressure Coolant Injection Pump Discharge Pressure - High	1, 2(e~~f~~), 3(e~~f~~)	[4]	G	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [112] psig and ≤ [ ] psig
g. Automatic Depressurization System Low Water Level Actuation Timer	1, 2(e~~f~~), 3(e~~f~~)	[2]	G	[SR 3.3.5.1.5] SR 3.3.5.1.6	≤ [13] minutes
[h. Manual Initiation	1, 2(e~~f~~), 3(e~~f~~)	[2]	G	SR 3.3.5.1.6	N/A]

(b~~c~~) If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

(c~~d~~) The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Limiting Trip Setpoint (LTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and as-left tolerances are specified in [insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference].

(e~~f~~) With reactor steam dome pressure > [150] psig.

Table 3.3.5.1-1 (page 5 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
5. ADS Trip System B					
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2(e~~f~~), 3(e~~f~~)	[2]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3](b~~c~~)(c~~d~~) SR 3.3.5.1.5(b~~c~~)(c~~d~~) SR 3.3.5.1.6	≥ [-113] inches
b. Drywell Pressure - High	1, 2(e~~f~~), 3(e~~f~~)	[2]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3](b~~c~~)(c~~d~~) SR 3.3.5.1.5(b~~c~~)(c~~d~~) SR 3.3.5.1.6	≤ [1.92] psig
c. Automatic Depressurization System Initiation Timer	1, 2(e~~f~~), 3(e~~f~~)	[1]	G	[SR 3.3.5.1.5] SR 3.3.5.1.6	≤ [120] seconds
d. Reactor Vessel Water Level - Low, Level 3 (Confirmatory)	1, 2(e~~f~~), 3(e~~f~~)	[1]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3](b~~c~~)(c~~d~~) SR 3.3.5.1.5(b~~c~~)(c~~d~~) SR 3.3.5.1.6	≥ [10] inches
e. Core Spray Pump Discharge Pressure - High	1, 2(e~~f~~), 3(e~~f~~)	[2]	G	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [137] psig and ≤ [ ] psig

(b~~c~~) If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

(c~~d~~) The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Limiting Trip Setpoint (LTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and as-left tolerances are specified in [insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference].

(e~~f~~) With reactor steam dome pressure > [150] psig.

Table 3.3.5.1-1 (page 6 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
5. ADS Trip System B					
f. Low Pressure Coolant Injection Pump Discharge Pressure - High	1, $2^{(e\cancel{f})}$, $3^{(e\cancel{f})}$	[4]	G	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [112] psig and ≤ [ ] psig
g. Automatic Depressurization System Low Water Level Actuation Timer	1, $2^{(e\cancel{f})}$, $3^{(e\cancel{f})}$	[2]	G	[SR 3.3.5.1.5] SR 3.3.5.1.6	≥ [13] minutes
[h. Manual Initiation	1, $2^{(e\cancel{f})}$, $3^{(e\cancel{f})}$	[2]	G	SR 3.3.5.1.6	NA]

(e~~f~~) With reactor steam dome pressure > [150] psig.

3.3 INSTRUMENTATION

3.3.5.1B Emergency Core Cooling System (ECCS) Instrumentation (With Setpoint Control Program)

LCO 3.3.5.1B The ECCS instrumentation for each Function in Table 3.3.5.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.5.1-1.

ACTIONS

---NOTE---

Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more channels inoperable.	A.1 Enter the Condition referenced in Table 3.3.5.1-1 for the channel.	Immediately
B. As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	B.1 --------------NOTE~~S~~------------- ~~1. Only applicable in MODES 1, 2, and 3.~~ ~~2.~~ Only applicable for Functions 1.a, 1.b, 2.a, and 2.b. ------------------------------------- Declare supported feature(s) inoperable when its redundant feature ECCS initiation capability is inoperable. <u>AND</u>	 1 hour from discovery of loss of initiation capability for feature(s) in both divisions

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	B.2 ---------------NOTE-------------- Only applicable for Functions 3.a and 3.b. -------------------------------------	
	Declare High Pressure Coolant Injection (HPCI) System inoperable.	1 hour from discovery of loss of HPCI initiation capability
	AND	
	B.3 Place channel in trip.	24 hours
C. As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	C.1 --------------NOTE~~S~~------------- ~~1. Only applicable in MODES 1, 2, and 3.~~ ~~2.~~ Only applicable for Functions 1.c, 2.c, 2.d, and 2.f. -------------------------------------	
	Declare supported feature(s) inoperable when its redundant feature ECCS initiation capability is inoperable.	1 hour from discovery of loss of initiation capability for feature(s) in both divisions
	AND	
	C.2 Restore channel to OPERABLE status.	24 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	D.1	---------------NOTE-------------- Only applicable if HPCI pump suction is not aligned to the suppression pool. ------------------------------------- Declare HPCI System inoperable.	1 hour from discovery of loss of HPCI initiation capability
	AND		
	D.2.1	Place channel in trip.	24 hours
	OR		
	D.2.2	Align the HPCI pump suction to the suppression pool.	24 hours
E. As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	E.1	--------------NOTE~~S~~------------- ~~1. Only applicable in MODES 1, 2, and 3.~~ ~~2.~~ Only applicable for Functions 1.d and 2.g. ------------------------------------- Declare supported feature(s) inoperable when its redundant feature ECCS initiation capability is inoperable.	1 hour from discovery of loss of initiation capability for subsystems in both divisions
	AND		
	E.2	Restore channel to OPERABLE status.	7 days

Table 3.3.5.1-1 (page 1 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
1. Core Spray System				
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2, 3~~,~~ ~~4(a), 5(a)~~	[4](a~~b~~)	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7
b. Drywell Pressure - High	1, 2, 3	[4](a~~b~~)	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7
c. Reactor Steam Dome Pressure - Low (Injection Permissive)	1, 2, 3	[4]	C	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7
	~~4(a), 5(a)~~	~~[4]~~	~~B~~	~~SR 3.3.5.1.1~~ ~~SR 3.3.5.1.2~~ ~~[SR 3.3.5.1.3]~~ ~~SR 3.3.5.1.5~~ ~~SR 3.3.5.1.6~~ ~~SR 3.3.5.1.7~~
[d. Core Spray Pump Discharge Flow - Low (Bypass)	1, 2, 3~~,~~ ~~4(a), 5(a)~~	[2] [1 per pump]	E	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.5 SR 3.3.5.1.6]
[e. Manual Initiation	1, 2, 3~~,~~ ~~4(a), 5(a)~~	[2] [1 per subsystem]	C	SR 3.3.5.1.6]

~~(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2, "ECCS - Shutdown."~~

(a~~b~~) Also required to initiate the associated [diesel generator (DG) and isolate the associated plant service water (PSW) turbine building (T/B) isolation valves].

Table 3.3.5.1-1 (page 2 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
2. Low Pressure Coolant Injection (LPCI) System				
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2, 3~~,~~ ~~4(a), 5(a)~~	[4](a~~b~~)	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7
b. Drywell Pressure - High	1, 2, 3	[4](a~~b~~)	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7
c. Reactor Steam Dome Pressure - Low (Injection Permissive)	1, 2, 3	[4]	C	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7
	~~4(a), 5(a)~~	~~[4]~~	~~B~~	~~SR 3.3.5.1.1~~ ~~SR 3.3.5.1.2~~ ~~[SR 3.3.5.1.3]~~ ~~SR 3.3.5.1.5~~ ~~SR 3.3.5.1.6~~ ~~SR 3.3.5.1.7~~
d. Reactor Steam Dome Pressure - Low (Recirculation Discharge Valve Permissive)	1(b~~c~~),2(b~~c~~),3(b~~c~~)	[4]	C	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
e. Reactor Vessel Shroud Level - Level 0	1, 2, 3	[2]	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6

~~(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2, "ECCS - Shutdown."~~

(a~~b~~) Also required to initiate the associated [DG and isolate the associated PSW T/B isolation valves].

(b~~c~~) With associated recirculation pump discharge valve open.

Table 3.3.5.1-1 (page 3 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
2. LPCI System				
[f. Low Pressure Coolant Injection Pump Start - Time Delay Relay	1, 2, 3~~, 4(a), 5(a)~~	[4] [1 per pump]	C	SR 3.3.5.1.5 SR 3.3.5.1.6]
Pumps A,B,D				
Pump C				
[g. Low Pressure Coolant Injection Pump Discharge Flow - Low Bypass)	1, 2, 3~~, 4(a), 5(a)~~	[4] [1 per pump]	E	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.5 SR 3.3.5.1.6]
[h. Manual Initiation	1, 2, 3~~, 4(a), 5(a)~~	[2] [1 per subsystem]	C	SR 3.3.5.1.6]
3. High Pressure Coolant Injection (HPCI) System				
a. Reactor Vessel Water Level - Low Low, Level 2	1, 2(c~~d~~), 3(c~~d~~)	[4]	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7
b. Drywell Pressure – High	1, 2(c~~d~~), 3(c~~d~~)	[4]	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7
c. Reactor Vessel Water Level - High, Level 8	1, 2(c~~d~~), 3(c~~d~~)	[2]	C	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7

~~(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2, "ECCS - Shutdown."~~

(c~~d~~) With reactor steam dome pressure > [150] psig.

Table 3.3.5.1-1 (page 4 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
3. HPCI System				
d. Condensate Storage Tank Level - Low	1, 2(c~~d~~), 3(c~~d~~)	[2]	D	[SR 3.3.5.1.1] SR 3.3.5.1.2 [SR 3.3.5.1.4] SR 3.3.5.1.6
e. Suppression Pool Water Level - High	1, 2(c~~d~~), 3(c~~d~~)	[2]	D	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
[f. High Pressure Coolant Injection Pump Discharge Flow - Low (Bypass)	1, 2(c~~d~~), 3(c~~d~~)	[1]	E	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.5 SR 3.3.5.1.6]
[g. Manual Initiation	1, 2(c~~d~~), 3(c~~d~~)	[1]	C	SR 3.3.5.1.6]
4. Automatic Depressurization System (ADS) Trip System A				
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2(c~~d~~), 3(c~~d~~)	[2]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
b. Drywell Pressure - High	1, 2(c~~d~~), 3(c~~d~~)	[2]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
c. Automatic Depressurization System Initiation Timer	1, 2(c~~d~~), 3(c~~d~~)	[1]	G	[SR 3.3.5.1.5] SR 3.3.5.1.6
d. Reactor Vessel Water Level - Low, Level 3 (Confirmatory)	1, 2(c~~d~~), 3(c~~d~~)	[1]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6

(~~d~~c) With reactor steam dome pressure > [150] psig.

Table 3.3.5.1-1 (page 5 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
4. ADS Trip System A				
e. Core Spray Pump Discharge Pressure - High	1, 2(c~~d~~), 3(c~~d~~)	[2]	G	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
f. Low Pressure Coolant Injection Pump Discharge Pressure - High	1, 2(c~~d~~), 3(c~~d~~)	[4]	G	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
g. Automatic Depressurization System Low Water Level Actuation Timer	1, 2(c~~d~~), 3(c~~d~~)	[2]	G	[SR 3.3.5.1.5] SR 3.3.5.1.6
[h. Manual Initiation	1, 2(c~~d~~), 3(c~~d~~)	[2]	G	SR 3.3.5.1.6]
5. ADS Trip System B				
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2(c~~d~~), 3(c~~d~~)	[2]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
b. Drywell Pressure - High	1, 2(c~~d~~), 3(c~~d~~)	[2]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
c. Automatic Depressurization System Initiation Timer	1, 2(c~~d~~), 3(c~~d~~)	[1]	G	[SR 3.3.5.1.5] SR 3.3.5.1.6
d. Reactor Vessel Water Level - Low, Level 3 (Confirmatory)	1, 2(c~~d~~), 3(c~~d~~)	[1]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6

(c~~d~~) With reactor steam dome pressure > [150] psig.

Table 3.3.5.1-1 (page 6 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
5. ADS Trip System B				
e. Core Spray Pump Discharge Pressure - High	1, 2(c~~d~~), 3(c~~d~~)	[2]	G	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
f. Low Pressure Coolant Injection Pump Discharge Pressure - High	1, 2(c~~d~~), 3(c~~d~~)	[4]	G	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
g. Automatic Depressurization System Low Water Level Actuation Timer	1, 2(c~~d~~), 3(c~~d~~)	[2]	G	[SR 3.3.5.1.5] SR 3.3.5.1.6
[h. Manual Initiation	1, 2(c~~d~~), 3(c~~d~~)	[2]	G	SR 3.3.5.1.6]

(c~~d~~) With reactor steam dome pressure > [150] psig.

3.3 INSTRUMENTATION

3.3.5.2A Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation (Without Setpoint Control Program)

LCO 3.3.5.2A The RPV Water Inventory Control instrumentation for each Function in Table 3.3.5.2-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.5.2-1.

ACTIONS

--NOTE--
Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more channels inoperable.	A.1 Enter the Condition referenced in Table 3.3.5.2-1 for the channel.	Immediately
B. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	B.1 Declare associated penetration flow path(s) incapable of automatic isolation. <u>AND</u> B.2 Calculate DRAIN TIME.	Immediately Immediately
C. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	C.1 Place channel in trip.	1 hour
D. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	D.1 Restore channel to OPERABLE status.	24 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. Required Action and associated Completion Time of Condition C or D not met.	E.1 Declare associated low pressure ECCS injection/spray subsystem inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

---NOTE---
Refer to Table 3.3.5.2-1 to determine which SRs apply for each ECCS Function.

SURVEILLANCE		FREQUENCY
SR 3.3.5.2.1	Perform CHANNEL CHECK.	[12 hours <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.2.2	Perform CHANNEL FUNCTIONAL TEST.	[[92] days <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.2.3	Perform LOGIC SYSTEM FUNCTIONAL TEST.	[[18] months <u>OR</u> In accordance with the Surveillance Frequency Control Program]

Table 3.3.5.2-1 (page 1 of 1)
RPV Water Inventory Control Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Core Spray System					
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[4]	C	SR 3.3.5.2.1 SR 3.3.5.2.2	≤ [500] psig
b. Core Spray Pump Discharge Flow - Low (Bypass)	4, 5	[1 per pump(a)]	D	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [ ] gpm and ≤ [ ] gpm]
c. Manual Initiation	4, 5	[1 per subsystem (a)]	D	SR 3.3.5.2.3	NA
2. Low Pressure Coolant Injection (LPCI) System					
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[4]	C	SR 3.3.5.2.1 SR 3.3.5.2.2	≤ [500] psig
b. Low Pressure Coolant Injection Pump Discharge Flow - Low Bypass)	4, 5	[1 per pump(a)]	D	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [ ] gpm and ≤ [ ] gpm]
c. Manual Initiation	4, 5	[1](a)	D	SR 3.3.5.2.3	NA
3. RHR System Isolation					
a. Reactor Vessel Water Level - Low, Level 3	(b)	[2 in one trip system]	B	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [10] inches
4. Reactor Water Cleanup (RWCU) System Isolation					
a. Reactor Vessel Water Level - Low Low, Level 2	(b)	[2 in one trip system]	B	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [-47] inches

(a) Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, "Reactor Pressure Vessel Water Inventory Control."
(b) When automatic isolation of the associated penetration flow path(s) is credited in calculating DRAIN TIME.

3.3 INSTRUMENTATION

3.3.5.2B Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation (With Setpoint Control Program)

LCO 3.3.5.2B The RPV Water Inventory Control instrumentation for each Function in Table 3.3.5.2-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.5.2-1.

ACTIONS

---NOTE---

Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more channels inoperable.	A.1 Enter the Condition referenced in Table 3.3.5.2-1 for the channel.	Immediately
B. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	B.1 Declare associated penetration flow path(s) incapable of automatic isolation.	Immediately
	<u>AND</u>	
	B.2 Calculate DRAIN TIME.	Immediately
C. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	C.1 Place channel in trip.	1 hour
D. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	D.1 Restore channel to OPERABLE status.	24 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
E. Required Action and associated Completion Time of Condition C or D not met.	E.1	Declare associated low pressure ECCS injection/spray subsystem inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

---NOTE---
Refer to Table 3.3.5.2-1 to determine which SRs apply for each ECCS Function.

SURVEILLANCE		FREQUENCY
SR 3.3.5.2.1	Perform CHANNEL CHECK.	[12 hours OR In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.2.2	Perform CHANNEL FUNCTIONAL TEST.	[[92] days OR In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.2.3	Perform LOGIC SYSTEM FUNCTIONAL TEST.	[[18] months OR In accordance with the Surveillance Frequency Control Program]

Table 3.3.5.2-1 (page 1 of 1)
RPV Water Inventory Control Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
1. Core Spray System				
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[4]	C	SR 3.3.5.2.1 SR 3.3.5.2.2
b. Core Spray Pump Discharge Flow - Low (Bypass)	4, 5	[1 per pump(a)]	D	SR 3.3.5.2.1 SR 3.3.5.2.2
c. Manual Initiation	4, 5	[1 per subsystem s(a)]	D	SR 3.3.5.2.3
2. Low Pressure Coolant Injection (LPCI) System				
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[4]	C	SR 3.3.5.2.1 SR 3.3.5.2.2
b. Low Pressure Coolant Injection Pump Discharge Flow - Low Bypass)	4, 5	[1 per pump(a)]	D	SR 3.3.5.2.1 SR 3.3.5.2.2
c. Manual Initiation	4, 5	[1](a)	D	SR 3.3.5.2.3
3. RHR System Isolation				
a. Reactor Vessel Water Level - Low, Level 3	(b)	[2 in one trip system]	B	SR 3.3.5.2.1 SR 3.3.5.2.2
4. Reactor Water Cleanup (RWCU) System Isolation				
a. Reactor Vessel Water Level - Low Low, Level 2	(b)	[2 in one trip system]	B	SR 3.3.5.2.1 SR 3.3.5.2.2

(a) Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, "Reactor Pressure Vessel Water Inventory Control."

(b) When automatic isolation of the associated penetration flow path(s) is credited in calculating DRAIN TIME.

3.3 INSTRUMENTATION

3.3.5.*3*~~2~~A Reactor Core Isolation Cooling (RCIC) System Instrumentation (Without Setpoint Control Program)

LCO 3.3.5.*3*~~2~~A The RCIC System instrumentation for each Function in Table 3.3.5.*3.*~~2~~-1 shall be OPERABLE.

APPLICABILITY: MODE 1,
MODES 2 and 3 with reactor steam dome pressure > [150] psig.

ACTIONS

---NOTE---
Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more channels inoperable.	A.1 Enter the Condition referenced in Table 3.3.5.*3*~~2~~-1 for the channel.	Immediately
B. As required by Required Action A.1 and referenced in Table 3.3.5.*3*~~2~~-1.	B.1 Declare RCIC System inoperable.	1 hour from discovery of loss of RCIC initiation capability
	AND	
	B.2 Place channel in trip.	24 hours
C. As required by Required Action A.1 and referenced in Table 3.3.5.*3*~~2~~-1.	C.1 Restore channel to OPERABLE status.	24 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. As required by Required Action A.1 and referenced in Table 3.3.5.*3*~~2~~-1.	D.1 ---------------NOTE-------------- Only applicable if RCIC pump suction is not aligned to the suppression pool. ------------------------------------- Declare RCIC System inoperable.	1 hour from discovery of loss of RCIC initiation capability
	<u>AND</u>	
	D.2.1 Place channel in trip.	24 hours
	<u>OR</u>	
	D.2.2 Align RCIC pump suction to the suppression pool.	24 hours
E. Required Action and associated Completion Time of Condition B, C, or D not met.	E.1 Declare RCIC System inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

---NOTES---

1. Refer to Table 3.3.5.*3*~~2~~-1 to determine which SRs apply for each RCIC Function.

2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours for Functions 2 and 5; and (b) for up to 6 hours for Functions 1, 3, and 4 provided the associated Function maintains RCIC initiation capability.

SURVEILLANCE		FREQUENCY
SR 3.3.5.*3*~~2~~.1	Perform CHANNEL CHECK.	[12 hours <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.*3*~~2~~.2	Perform CHANNEL FUNCTIONAL TEST.	[[92] days <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.*3*~~2~~.3	[Calibrate the trip units.	[[92] days <u>OR</u> In accordance with the Surveillance Frequency Control Program]]

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.5.*3*~~2~~.4	[Perform CHANNEL CALIBRATION.	[92 days <u>OR</u> In accordance with the Surveillance Frequency Control Program]]
SR 3.3.5.*3*~~2~~.5	Perform CHANNEL CALIBRATION.	[[18] months <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.*3*~~2~~.6	Perform LOGIC SYSTEM FUNCTIONAL TEST.	[[18] months <u>OR</u> In accordance with the Surveillance Frequency Control Program]

Table 3.3.5.*3*~~2~~-1 (page 1 of 1)
Reactor Core Isolation Cooling System Instrumentation

FUNCTION	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Reactor Vessel Water Level - Low Low, Level 2	[4]	B	SR 3.3.5.*3*~~2~~.1 SR 3.3.5.*3*~~2~~.2 [SR 3.3.5.*3*~~2~~.3]$^{(a)(b)}$ SR 3.3.5.*3*~~2~~.5$^{(a)(b)}$ SR 3.3.5.*3*~~2~~.6	≥ [-47] inches
2. Reactor Vessel Water Level - High, Level 8	[2]	C	SR 3.3.5.*3*~~2~~.1 SR 3.3.5.*3*~~2~~.2 [SR 3.3.5.*3*~~2~~.3]$^{(a)(b)}$ SR 3.3.5.*3*~~2~~.5$^{(a)(b)}$ SR 3.3.5.*3*~~2~~.6	≤ [56.5] inches
3. Condensate Storage Tank Level - Low	[2]	D	[SR 3.3.5.*3*~~2~~.1] SR 3.3.5.*3*~~2~~.2 [SR 3.3.5.*3*~~2~~.3]$^{(a)(b)}$ [SR 3.3.5.*3*~~2~~.4]$^{(a)(b)}$ SR 3.3.5.*3*~~2~~.6	≥ [0] inches
[4. Suppression Pool Water Level - High	[2]	D	[SR 3.3.5.*3*~~2~~.1] SR 3.3.5.*3*~~2~~.2 [SR 3.3.5.*3*~~2~~.3]$^{(a)(b)}$ SR 3.3.5.*3*~~2~~.5$^{(a)(b)}$ SR 3.3.5.*3*~~2~~.6	≤ [151] inches]
[5. Manual Initiation	[1]	C	SR 3.3.5.*3*~~2~~.6	NA]

(a) If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

(b) The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Limiting Trip Setpoint (LTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures (Nominal Trip Setpoint) to confirm channel performance. The LTSP and the methodologies used to determine the as-found and as-left tolerances are specified in [insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference].

3.3 INSTRUMENTATION

3.3.5.*3*~~2~~B Reactor Core Isolation Cooling (RCIC) System Instrumentation (With Setpoint Control Program)

LCO 3.3.5.*3*~~2~~B The RCIC System instrumentation for each Function in Table 3.3.5.*3*~~2~~-1 shall be OPERABLE.

APPLICABILITY: MODE 1,
MODES 2 and 3 with reactor steam dome pressure > [150] psig.

ACTIONS

---NOTE---
Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more channels inoperable.	A.1 Enter the Condition referenced in Table 3.3.5.*3*~~2~~-1 for the channel.	Immediately
B. As required by Required Action A.1 and referenced in Table 3.3.5.*3*~~2~~-1.	B.1 Declare RCIC System inoperable.	1 hour from discovery of loss of RCIC initiation capability
	AND	
	B.2 Place channel in trip.	24 hours
C. As required by Required Action A.1 and referenced in Table 3.3.5.*3*~~2~~-1.	C.1 Restore channel to OPERABLE status.	24 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. As required by Required Action A.1 and referenced in Table 3.3.5.3~~2~~-1.	D.1 ---------------NOTE-------------- Only applicable if RCIC pump suction is not aligned to the suppression pool. ------------------------------------- Declare RCIC System inoperable.	 1 hour from discovery of loss of RCIC initiation capability
	<u>AND</u>	
	D.2.1 Place channel in trip.	24 hours
	<u>OR</u>	
	D.2.2 Align RCIC pump suction to the suppression pool.	24 hours
E. Required Action and associated Completion Time of Condition B, C, or D not met.	E.1 Declare RCIC System inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

---NOTES---

1. Refer to Table 3.3.5.3~~2~~-1 to determine which SRs apply for each RCIC Function.

2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours for Functions 2 and 5; and (b) for up to 6 hours for Functions 1, 3, and 4 provided the associated Function maintains RCIC initiation capability.

SURVEILLANCE		FREQUENCY
SR 3.3.5.3~~2~~.1	Perform CHANNEL CHECK.	[12 hours OR In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.3~~2~~.2	Perform CHANNEL FUNCTIONAL TEST.	[[92] days OR In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.3~~2~~.3	[Calibrate the trip units in accordance with the Setpoint Control Program.	[[92] days OR In accordance with the Surveillance Frequency Control Program]]

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.5.3~~2~~.4	[Perform CHANNEL CALIBRATION in accordance with the Setpoint Control Program.	[92 days <u>OR</u> In accordance with the Surveillance Frequency Control Program]]
SR 3.3.5.3~~2~~.5	Perform CHANNEL CALIBRATION in accordance with the Setpoint Control Program.	[[18] months <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.3~~2~~.6	Perform LOGIC SYSTEM FUNCTIONAL TEST.	[[18] months <u>OR</u> In accordance with the Surveillance Frequency Control Program]

Table 3.3.5.*3*~~2~~-1 (page 1 of 1)
Reactor Core Isolation Cooling System Instrumentation

FUNCTION	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
1. Reactor Vessel Water Level - Low Low, Level 2	[4]	B	SR 3.3.5.*3*~~2~~.1 SR 3.3.5.*3*~~2~~.2 [SR 3.3.5.*3*~~2~~.3] SR 3.3.5.*3*~~2~~.5 SR 3.3.5.*3*~~2~~.6
2. Reactor Vessel Water Level - High, Level 8	[2]	C	SR 3.3.5.*3*~~2~~.1 SR 3.3.5.*3*~~2~~.2 [SR 3.3.5.*3*~~2~~.3] SR 3.3.5.*3*~~2~~.5 SR 3.3.5.*3*~~2~~.6
3. Condensate Storage Tank Level - Low	[2]	D	[SR 3.3.5.*3*~~2~~.1] SR 3.3.5.*3*~~2~~.2 [SR 3.3.5.*3*~~2~~.3] [SR 3.3.5.*3*~~2~~.4] SR 3.3.5.*3*~~2~~.6
[4. Suppression Pool Water Level - High	[2]	D	[SR 3.3.5.*3*~~2~~.1] SR 3.3.5.*3*~~2~~.2 [SR 3.3.5.*3*~~2~~.3] SR 3.3.5.*3*~~2~~.5 SR 3.3.5.*3*~~2~~.6]
[5. Manual Initiation	[1]	C	SR 3.3.5.*3*~~2~~.6]

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
I. As required by Required Action C.1 and referenced in Table 3.3.6.1-1.	I.1 Declare associated standby liquid control subsystem (SLC) inoperable. OR I.2 Isolate the Reactor Water Cleanup System.	1 hour 1 hour
J. As required by Required Action C.1 and referenced in Table 3.3.6.1-1.	J.1 Initiate action to restore channel to OPERABLE status. ~~OR~~ ~~J.2 Initiate action to isolate the Residual Heat Removal (RHR) Shutdown Cooling System.~~	Immediately ~~Immediately~~

Table 3.3.6.1-1 (page 6 of 7)
Primary Containment Isolation Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
5. RWCU System Isolation					
b. Area Temperature - High	1, 2, 3	[3] [1 per room]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 [SR 3.3.6.1.3] SR 3.3.6.1.6 SR 3.3.6.1.7 [SR 3.3.6.1.8]	≤ [150]°F
c. Area Ventilation Differential Temperature - High	1, 2, 3	[3] [1 per room]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 [SR 3.3.6.1.3] SR 3.3.6.1.6 SR 3.3.6.1.7 [SR 3.3.6.1.8]	≤ [67]°F
d. SLC System Initiation	1, 2	[2](b)	I	SR 3.3.6.1.7	NA
e. Reactor Vessel Water Level - Low Low, Level 2	1, 2, 3	[2]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 [SR 3.3.6.1.3] SR 3.3.6.1.6 SR 3.3.6.1.7 SR 3.3.6.1.8	≥ [-47] inches
[f. Manual Initiation	1, 2, 3	[1 per group]	G	SR 3.3.6.1.7	NA]
6. Shutdown Cooling System Isolation					
a. Reactor Steam Dome Pressure - High	1, 2, 3	[1]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 [SR 3.3.6.1.3] SR 3.3.6.1.6 SR 3.3.6.1.7	≤ [145] psig
b. Reactor Vessel Water Level - Low, Level 3	3~~, 4, 5~~	[2]~~(c)~~	J	SR 3.3.6.1.1 SR 3.3.6.1.2 [SR 3.3.6.1.3] SR 3.3.6.1.6 SR 3.3.6.1.7	≥ [10] inches

(b) SLC System Initiation only inputs into one of the two trip systems.

~~(c) Only one trip system required in MODES 4 and 5 with RHR Shutdown Cooling integrity maintained.~~

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
I. As required by Required Action C.1 and referenced in Table 3.3.6.1-1.	I.1 Declare associated standby liquid control subsystem (SLC) inoperable. OR I.2 Isolate the Reactor Water Cleanup System.	1 hour 1 hour
J. As required by Required Action C.1 and referenced in Table 3.3.6.1-1.	J.1 Initiate action to restore channel to OPERABLE status. ~~OR~~ ~~J.2 Initiate action to isolate the Residual Heat Removal (RHR) Shutdown Cooling System.~~	Immediately ~~Immediately~~

Table 3.3.6.1-1 (page 6 of 7)
Primary Containment Isolation Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS
5. RWCU System Isolation				
b. Area Temperature - High	1, 2, 3	[3] [1 per room]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 [SR 3.3.6.1.3] SR 3.3.6.1.6 SR 3.3.6.1.7 [SR 3.3.6.1.8]
c. Area Ventilation Differential Temperature - High	1, 2, 3	[3] [1 per room]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 [SR 3.3.6.1.3] SR 3.3.6.1.6 SR 3.3.6.1.7 [SR 3.3.6.1.8]
d. SLC System Initiation	1, 2	[2](b)	I	SR 3.3.6.1.7
e. Reactor Vessel Water Level - Low Low, Level 2	1, 2, 3	[2]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 [SR 3.3.6.1.3] SR 3.3.6.1.6 SR 3.3.6.1.7 SR 3.3.6.1.8
[f. Manual Initiation	1, 2, 3	[1 per group]	G	SR 3.3.6.1.7
6. Shutdown Cooling System Isolation				
a. Reactor Steam Dome Pressure - High	1, 2, 3	[1]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 [SR 3.3.6.1.3] SR 3.3.6.1.6 SR 3.3.6.1.7
b. Reactor Vessel Water Level - Low, Level 3	3~~, 4, 5~~	[2]~~(c)~~	J	SR 3.3.6.1.1 SR 3.3.6.1.2 [SR 3.3.6.1.3] SR 3.3.6.1.6 SR 3.3.6.1.7

(b) SLC System Initiation only inputs into one of the two trip systems.

~~(c) Only one trip system required in MODES 4 and 5 with RHR Shutdown Cooling integrity maintained.~~

Table 3.3.6.2-1 (page 1 of 1)
Secondary Containment Isolation Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Reactor Vessel Water Level - Low Low, Level 2	1, 2, 3~~, [(a)]~~	[2]	SR 3.3.6.2.1 SR 3.3.6.2.2 [SR 3.3.6.2.3] SR 3.3.6.2.5 SR 3.3.6.2.6 SR 3.3.6.2.7	≥ [-47] inches
2. Drywell Pressure - High	1, 2, 3	[2]	SR 3.3.6.2.1 SR 3.3.6.2.2 [SR 3.3.6.2.3] SR 3.3.6.2.5 SR 3.3.6.2.6 SR 3.3.6.2.7	≤ [1.92] psig
3. Reactor Building Exhaust Radiation - High	1, 2, 3, [(a)~~, (b)~~]	[2]	SR 3.3.6.2.1 SR 3.3.6.2.2 SR 3.3.6.2.5 SR 3.3.6.2.6 SR 3.3.6.2.7	≤ [60] mR/hr
[4. Refueling Floor Exhaust Radiation - High	1, 2, 3, [(a)~~, (b)~~]	[2]	SR 3.3.6.2.1 SR 3.3.6.2.2 [SR 3.3.6.2.4] SR 3.3.6.2.6 SR 3.3.6.2.7	≤ [20] mR/hr]
[5. Manual Initiation	1, 2, 3, [(a)~~, (b)~~]	[1 per group]	SR 3.3.6.2.6	NA]

~~(a) During operations with a potential for draining the reactor vessel~~.

(a~~b~~) During movement of [recently] irradiated fuel assemblies in [secondary] containment.

Table 3.3.6.2-1 (page 1 of 1)
Secondary Containment Isolation Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	SURVEILLANCE REQUIREMENTS
1. Reactor Vessel Water Level - Low Low, Level 2	1, 2, 3~~, [(a)]~~	[2]	SR 3.3.6.2.1 SR 3.3.6.2.2 [SR 3.3.6.2.3] SR 3.3.6.2.5 SR 3.3.6.2.6 SR 3.3.6.2.7
2. Drywell Pressure - High	1, 2, 3	[2]	SR 3.3.6.2.1 SR 3.3.6.2.2 [SR 3.3.6.2.3] SR 3.3.6.2.5 SR 3.3.6.2.6 SR 3.3.6.2.7
3. Reactor Building Exhaust Radiation - High	1, 2, 3, [(a)~~, (b)~~]	[2]	SR 3.3.6.2.1 SR 3.3.6.2.2 SR 3.3.6.2.5 SR 3.3.6.2.6 SR 3.3.6.2.7
[4. Refueling Floor Exhaust Radiation - High	1, 2, 3, [(a)~~, (b)~~]	[2]	SR 3.3.6.2.1 SR 3.3.6.2.2 [SR 3.3.6.2.4] SR 3.3.6.2.6 SR 3.3.6.2.7]
[5. Manual Initiation	1, 2, 3, [(a)~~, (b)~~]	[1 per group]	SR 3.3.6.2.6]

~~(a) During operations with a potential for draining the reactor vessel.~~

(a~~b~~) During movement of [recently] irradiated fuel assemblies in [secondary] containment.

Table 3.3.7.1-1 (page 1 of 1)
[Main Control Room Environmental Control] System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
[1. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2, 3~~, [a]~~	[2]	B	SR 3.3.7.1.1 SR 3.3.7.1.2 [SR 3.3.7.1.3] SR 3.3.7.1.4 SR 3.3.7.1.5	≥ [-113] inches]
[2. Drywell Pressure - High	1, 2, 3	[2]	B	SR 3.3.7.1.1 SR 3.3.7.1.2 [SR 3.3.7.1.3] SR 3.3.7.1.4 SR 3.3.7.1.5	≤ [1.92] psig]
[3. Main Steam Line Flow - High	1, 2, 3	[2 per MSL]	B	SR 3.3.7.1.1 SR 3.3.7.1.2 [SR 3.3.7.1.3] SR 3.3.7.1.4 SR 3.3.7.1.5	[138]% rated steam flow]
[4. Refueling Floor Area Radiation - High	1, 2, 3, [~~(a),~~ (a~~b~~)]	[1]	C	SR 3.3.7.1.1 SR 3.3.7.1.2 SR 3.3.7.1.4 SR 3.3.7.1.5	≤ [20] mR/hr]
5. Control Room Air Inlet Radiation - High	1, 2, 3, ~~(a),~~ (a~~b~~)	[1]	C	SR 3.3.7.1.1 SR 3.3.7.1.2 SR 3.3.7.1.4 SR 3.3.7.1.5	≤ [1] mR/hr

~~(a) During operations with a potential for draining the reactor vessel.~~

(a~~b~~) During movement of [recently] irradiated fuel assemblies in the [secondary] containment.

Table 3.3.7.1-1 (page 1 of 1)
[Main Control Room Environmental Control] System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
[1. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2, 3~~, [a]~~	[2]	B	SR 3.3.7.1.1 SR 3.3.7.1.2 [SR 3.3.7.1.3] SR 3.3.7.1.4 SR 3.3.7.1.5]
[2. Drywell Pressure - High	1, 2, 3	[2]	B	SR 3.3.7.1.1 SR 3.3.7.1.2 [SR 3.3.7.1.3] SR 3.3.7.1.4 SR 3.3.7.1.5]
[3. Main Steam Line Flow - High	1, 2, 3	[2 per MSL]	B	SR 3.3.7.1.1 SR 3.3.7.1.2 [SR 3.3.7.1.3] SR 3.3.7.1.4 SR 3.3.7.1.5]
[4. Refueling Floor Area Radiation - High	1, 2, 3, [~~(a),~~ (a~~b~~)]	[1]	C	SR 3.3.7.1.1 SR 3.3.7.1.2 SR 3.3.7.1.4 SR 3.3.7.1.5]
5. Control Room Air Inlet Radiation - High	1, 2, 3, ~~(a),~~ (a~~b~~)	[1]	C	SR 3.3.7.1.1 SR 3.3.7.1.2 SR 3.3.7.1.4 SR 3.3.7.1.5

~~(a) During operations with a potential for draining the reactor vessel.~~

(a~~b~~) During movement of [recently] irradiated fuel assemblies in the [secondary] containment.

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS), *RPV WATER INVENTORY CONTROL, AND* ~~AND~~ REACTOR CORE ISOLATION COOLING SYSTEM (RCIC)~~, *AND RPV WATER INVENTORY CONTROL*~~

3.5.1 ECCS - Operating

LCO 3.5.1 Each ECCS injection/spray subsystem and the Automatic Depressurization System (ADS) function of [seven] safety/relief valves shall be OPERABLE.

--NOTE--
Low pressure coolant injection (LPCI) subsystems may be considered OPERABLE during alignment and operation for decay heat removal with reactor steam dome pressure less than [the Residual Heat Removal (RHR) cut in permissive pressure] in MODE 3, if capable of being manually realigned and not otherwise inoperable.

APPLICABILITY: MODE 1,
MODES 2 and 3, except high pressure coolant injection (HPCI) and ADS valves are not required to be OPERABLE with reactor steam dome pressure ≤ [150] psig.

ACTIONS

--NOTE--
LCO 3.0.4.b is not applicable to HPCI.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One low pressure ECCS injection/spray subsystem inoperable. <u>OR</u> One LPCI pump in both LPCI subsystems inoperable.	A.1 Restore low pressure ECCS injection/spray subsystem(s) to OPERABLE status.	7 days

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)*, RPV WATER INVENTORY CONTROL, AND* ~~AND~~ REACTOR CORE ISOLATION COOLING *(RCIC)* SYSTEM ~~(RCIC), AND RPV WATER INVENTORY CONTROL~~

3.5.2 *Reactor Pressure Vessel (RPV) Water Inventory Control* ~~ECCS - Shutdown~~

LCO 3.5.2 *DRAIN TIME of RPV water inventory to the top of active fuel (TAF) shall be ≥ 36 hours.*

AND

One ~~Two~~ low pressure ECCS injection/spray subsystem~~s~~ shall be OPERABLE.

--NOTE---
A ~~One~~ *Low Pressure Coolant Injection (*LPCI*)* subsystem may be considered OPERABLE during alignment and operation for decay heat removal if capable of being manually realigned and not otherwise inoperable.

APPLICABILITY: MODE*S* 4 ~~,~~
~~MODE~~ *and* 5~~, except with the spent fuel storage pool gates removed and water level ≥ [23 ft] over the top of the reactor pressure vessel flange.~~

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. ~~One R~~required ECCS injection/spray subsystem inoperable.	A.1	Restore required ECCS injection/spray subsystem to OPERABLE status.	4 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1	*Initiate action to establish a method of water injection capable of operating without offsite electrical power.* ~~Initiate action to suspend operations with a potential for draining the reactor vessel (OPDRVs).~~	Immediately

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~C. Two required ECCS injection/spray subsystems inoperable.~~	~~C.1 Initiate action to suspend OPDRVs.~~ ~~AND~~ ~~C.2 Restore one ECCS injection/spray subsystem to OPERABLE status.~~	~~Immediately~~ ~~4 hours~~
C. DRAIN TIME < 36 hours and ≥ 8 hours.	*C.1 Verify [secondary] containment boundary is capable of being established in less than the DRAIN TIME.* *AND* *C.2 Verify each [secondary] containment penetration flow path is capable of being isolated in less than the DRAIN TIME.* *AND* *C.3 Verify one standby gas treatment subsystem is capable of being placed in operation in less than the DRAIN TIME.*	*4 hours* *4 hours* *4 hours*
D. *DRAIN TIME < 8 hours.*~~Required Action C.2 and associated Completion Time not met.~~	*D.1 ----------- NOTE --------------- Required ECCS injection/spray subsystem or additional method of water injection shall be capable of operating without offsite electrical power. -----------------------------------* *Initiate action to establish* ~~Verify~~ *an additional method of water injection with water*	~~Immediately~~ *Immediately*

	sources capable of maintaining RPV water level > TAF for ≥ 36 hours.	
	AND	
	D.*2*~~1~~ *Initiate action to establish* ~~Initiate action to restore~~ ~~*establish*~~ [secondary] containment *boundary*~~to OPERABLE status~~.	Immediately~~]~~
	AND	
		~~Immediately~~

ACTIONS (continued)

CONDITION	*REQUIRED ACTION*	*COMPLETION TIME*
	D.3 *Initiate action to isolate each [secondary] containment penetration flow path or verify it can be manually isolated from the control room.*	Immediately
	AND	
	D.*4*~~2~~ ~~[~~Initiate action to *verify* ~~restore~~ one standby gas treatment subsystem ~~to OPERABLE status~~ *is capable of being placed in operation*.	Immediately ~~]~~
	~~AND~~	~~Immediately~~
	~~D.3 Initiate action to restore isolation capability in each required [secondary] containment penetration flow path not isolated.~~	
E. Required Action and associated Completion Time of Condition C or D not met. *OR* *DRAIN TIME < 1 hour.*	*E.1* *Initiate action to restore DRAIN TIME to ≥ 36 hours.*	*Immediately*

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.2.1	*Verify DRAIN TIME ≥ 36 hours.*	*[12 hours* *OR* *In accordance with the Surveillance Frequency Control Program]*
SR 3.5.2.*2*~~1~~	Verify, for ~~each~~ *a* required low pressure coolant injection (LPCI) subsystem, the suppression pool water level is ≥ [12 ft 2 inches].	[12 hours OR In accordance with the Surveillance Frequency Control Program]

~~SURVEILLANCE REQUIREMENTS (continued)~~

~~SURVEILLANCE~~		~~FREQUENCY~~
SR 3.5.2.*3*~~2~~	Verify, for ~~each~~ *a* required ~~core~~ *Core* ~~spray~~ *Spray* (CS) subsystem, the: a. Suppression pool water level is ≥ [12 ft 2 inches] or b. ~~------------------------NOTE---------------------------~~ ~~Only one required CS subsystem may take credit for this option during OPDRVs.~~ ~~--~~ Condensate storage tank water level is ≥ [12 ft].	[12 hours <u>OR</u> In accordance with the Surveillance Frequency Control Program]

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		*FREQUENCY*
SR 3.5.2.*4*~~3~~	Verify, for ~~each~~ *the* required ECCS injection/spray subsystem, the piping is filled with water from the pump discharge valve to the injection valve.	[31 days OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.*5*~~4~~	Verify*, for* ~~each~~ *the* required ECCS injection/spray subsystem*, each* manual, power operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position.	[31 days OR In accordance with the Surveillance Frequency Control Program]

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.2.~~5~~6	Operate the required ECCS injection/spray subsystem through the recirculation line for ≥ 10 minutes. ~~Verify each required ECCS pump develops the specified flow rate [against a system head corresponding to the specified reactor pressure].~~ ~~[System Head / No. of / Corresponding to a Reactor / System / Flow Rate / Pumps / Pressure of]~~ ~~CS ≥ [4250] gpm [1] ≥ [113] psig~~ ~~LPCI ≥ [7700] gpm [1] ≥ [20] psig~~	~~[In accordance with the Inservice Testing Program~~ ~~OR~~ [92 days~~]~~ OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.7	Verify each valve credited for automatically isolating a penetration flow path actuates to the isolation position on an actual or simulated isolation signal.	[[18] months OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.~~6~~8	------------------------------NOTE------------------------------ Vessel injection/spray may be excluded. -- Verify the required ECCS injection/spray subsystem actuates on a manual initiation signal~~an actual or simulated automatic initiation signal~~.	[[18] months OR In accordance with the Surveillance Frequency Control Program]

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS), *RPV WATER INVENTORY CONTROL*, AND ~~AND~~ REACTOR CORE ISOLATION COOLING SYSTEM (RCIC)

3.5.3 RCIC System

LCO 3.5.3 The RCIC System shall be OPERABLE.

APPLICABILITY: MODE 1,
MODES 2 and 3 with reactor steam dome pressure > [150] psig.

ACTIONS

---NOTE---
LCO 3.0.4.b is not applicable to RCIC.

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. RCIC System inoperable.	A.1	Verify by administrative means High Pressure Coolant Injection System is OPERABLE.	Immediately
	<u>AND</u>		
	A.2	Restore RCIC System to OPERABLE status.	14 days
B. Required Action and associated Completion Time not met.	B.1	---------------NOTE-------------- LCO 3.0.4.a is not applicable when entering MODE 3. ------------------------------------- Be in MODE 3.	 12 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
G. [Required Action and associated Completion Time of Condition A, B, C, D, or E not met for PCIV(s) required to be OPERABLE during movement of [recently] irradiated fuel assemblies in [secondary] containment.	G.1	---------------NOTE-------------- LCO 3.0.3 is not applicable. ------------------------------------- Suspend movement of [recently] irradiated fuel assemblies in [secondary] containment.	Immediately]
H. [Required Action and associated Completion Time of Condition A, B, C, D, or E not met for PCIV(s) required to be OPERABLE during MODE 4 or 5 ~~or during operations with a potential for draining the reactor vessel (OPDRVs)~~.	~~H.1~~ ~~OR~~ H.*1*~~2~~	~~Initiate action to suspend OPDRVs.~~ Initiate action to restore valve(s) to OPERABLE status.	~~Immediately~~ Immediately]

3.6 CONTAINMENT SYSTEMS

3.6.4.1 [Secondary] Containment

LCO 3.6.4.1 The [secondary] containment shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3,
During movement of [recently] irradiated fuel assemblies in the [secondary] containment~~,~~
~~During operations with a potential for draining the reactor vessel (OPDRVs).~~

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. [Secondary] containment inoperable in MODE 1, 2, or 3.	A.1	Restore [secondary] containment to OPERABLE status.	4 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1	---------------NOTE-------------- LCO 3.0.4.a is not applicable when entering MODE 3. ------------------------------------- Be in MODE 3.	12 hours
C. [Secondary] containment inoperable during movement of [recently] irradiated fuel assemblies in the [secondary] containment ~~or during OPDRVs~~.	C.1	---------------NOTE-------------- LCO 3.0.3 is not applicable. ------------------------------------- Suspend movement of [recently] irradiated fuel assemblies in the [secondary] containment.	Immediately
	~~AND~~		
	~~C.2~~	~~Initiate action to suspend OPDRVs.~~	~~Immediately~~

3.6 CONTAINMENT SYSTEMS

3.6.4.2 Secondary Containment Isolation Valves (SCIVs)

LCO 3.6.4.2 Each SCIV shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3,
During movement of [recently] irradiated fuel assemblies in the [secondary] containment~~,~~
~~During operations with a potential for draining the reactor vessel (OPDRVs)~~.

ACTIONS

-----NOTES-----

1. Penetration flow paths may be unisolated intermittently under administrative controls.

2. Separate Condition entry is allowed for each penetration flow path.

3. Enter applicable Conditions and Required Actions for systems made inoperable by SCIVs.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more penetration flow paths with one SCIV inoperable.	A.1 Isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, or blind flange. <u>AND</u>	8 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition A or B not met during movement of [recently] irradiated fuel assemblies in the [secondary] containment ~~or during OPDRVs~~.	D.1 ---------------NOTE-------------- LCO 3.0.3 is not applicable. ------------------------------------ Suspend movement of [recently] irradiated fuel assemblies in the [secondary] containment.	 Immediately
	~~AND~~	
	~~D.2 Initiate action to suspend OPDRVs.~~	~~Immediately~~

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.4.2.1	-----------------------------NOTES---------------------------- 1. Valves and blind flanges in high radiation areas may be verified by use of administrative means. 2. Not required to be met for SCIVs that are open under administrative controls. --- Verify each secondary containment isolation manual valve and blind flange that is not locked, sealed, or otherwise secured and is required to be closed during accident conditions is closed.	 [31 days OR In accordance with the Surveillance Frequency Control Program]

3.6 CONTAINMENT SYSTEMS

3.6.4.3 Standby Gas Treatment (SGT) System

LCO 3.6.4.3 [Two] SGT subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3,
During movement of [recently] irradiated fuel assemblies in the [secondary] containment~~,~~
~~During operations with a potential for draining the reactor vessel (OPDRVs).~~

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One SGT subsystem inoperable.	A.1 Restore SGT subsystem to OPERABLE status.	7 days
B. Required Action and associated Completion Time of Condition A not met in MODE 1, 2, or 3.	B.1 ---------------NOTE-------------- LCO 3.0.4.a is not applicable when entering MODE 3. ------------------------------------- Be in MODE 3.	12 hours
C. Required Action and associated Completion Time of Condition A not met during movement of [recently] irradiated fuel assemblies in the [secondary] containment ~~or during OPDRVs~~.	--------------------NOTE------------------- LCO 3.0.3 is not applicable. --	
	C.1 Place OPERABLE SGT subsystem in operation.	Immediately
	OR	
	C.2~~.1~~ Suspend movement of [recently] irradiated fuel assemblies in [secondary] containment.	Immediately
	~~AND~~	

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	~~C.2.2 Initiate action to suspend OPDRVs.~~	~~Immediately~~
D. Two SGT subsystems inoperable in MODE 1, 2, or 3.	D.1 ---------------NOTE-------------- LCO 3.0.4.a is not applicable when entering MODE 3. ------------------------------------- Be in MODE 3.	12 hours
E. Two SGT subsystems inoperable during movement of [recently] irradiated fuel assemblies in the [secondary] containment ~~or during OPDRVs~~.	E.1 ---------------NOTE-------------- LCO 3.0.3 is not applicable. ------------------------------------- Suspend movement of [recently] irradiated fuel assemblies in [secondary] containment. ~~AND~~ ~~E.2 Initiate action to suspend OPDRVs.~~	Immediately ~~Immediately~~

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.4.3.1	Operate each SGT subsystem for ≥ [10] continuous hours [with heaters operating].	[31 days OR In accordance with the Surveillance Frequency Control Program]

3.7 PLANT SYSTEMS

3.7.4 [Main Control Room Environmental Control (MCREC)] System

LCO 3.7.4 Two [MCREC] subsystems shall be OPERABLE.

---NOTE---
The main control room envelope (CRE) boundary may be opened intermittently under administrative control.

APPLICABILITY: MODES 1, 2, and 3,
During movement of [recently] irradiated fuel assemblies in the [secondary] containment~~,~~
~~During operations with a potential for draining the reactor vessel (OPDRVs).~~

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One [MCREC] subsystem inoperable for reasons other than Condition B.	A.1 Restore [MCREC] subsystem to OPERABLE status.	7 days
B. One or more [MCREC] subsystems inoperable due to inoperable CRE boundary in MODE 1, 2, or 3.	B.1 Initiate action to implement mitigating actions.	Immediately
	<u>AND</u>	
	B.2 Verify mitigating actions ensure CRE occupant exposures to radiological, chemical, and smoke hazards will not exceed limits.	24 hours
	<u>AND</u>	
	B.3 Restore CRE boundary to OPERABLE status.	90 days

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Required Action and associated Completion Time of Condition A or B not met in MODE 1, 2, or 3.	C.1 ---------------NOTE-------------- LCO 3.0.4.a is not applicable when entering MODE 3. ------------------------------------- Be in MODE 3.	12 hours
D. Required Action and associated Completion Time of Condition A not met during movement of [recently] irradiated fuel assemblies in the [secondary] containment ~~or during OPDRVs~~.	--------------------NOTE------------------- LCO 3.0.3 is not applicable. --- D.1 ---------------NOTE-------------- [Place in toxic gas protection mode if automatic transfer to toxic gas protection mode is inoperable.] ------------------------------------- Place OPERABLE [MCREC] subsystem in [pressurization] mode.	Immediately
	OR	
	D.2~~.1~~ Suspend movement of [recently] irradiated fuel assemblies in the [secondary] containment.	Immediately
	~~AND~~	
	~~D.2.2 Initiate action to suspend OPDRVs.~~	~~Immediately~~
E. Two [MCREC] subsystems inoperable in MODE 1, 2, or 3 for reasons other than Condition B.	E.1 ---------------NOTE-------------- LCO 3.0.4.a is not applicable when entering MODE 3. ------------------------------------- Be in MODE 3.	12 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. Two [MCREC] subsystems inoperable during movement of [recently] irradiated fuel assemblies in the [secondary] containment ~~or during OPDRVs~~. OR One or more [MCREC] subsystems inoperable due to an inoperable CRE boundary during movement of [recently] irradiated fuel assemblies in the [secondary] containment ~~or during OPDRVs~~.	--------------------NOTE------------------- LCO 3.0.3 is not applicable. --- F.1 Suspend movement of [recently] irradiated fuel assemblies in the [secondary] containment. ~~AND~~ ~~F.2 Initiate action to suspend OPDRVs.~~	Immediately ~~Immediately~~

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.4.1	Operate each [MCREC] subsystem for [≥ 10 continuous hours with the heaters operating or (for systems without heaters) ≥ 15 minutes].	[31 days OR In accordance with the Surveillance Frequency Control Program]
SR 3.7.4.2	Perform required [MCREC] filter testing in accordance with the [Ventilation Filter Testing Program (VFTP)].	In accordance with the [VFTP]

3.7 PLANT SYSTEMS

3.7.5 [Control Room Air Conditioning (AC)] System

LCO 3.7.5 Two [control room AC] subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3,
During movement of [recently] irradiated fuel assemblies in the [secondary] containment~~,~~
~~During operations with a potential for draining the reactor vessel (OPDRVs).~~

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One [control room AC] subsystem inoperable.	A.1 Restore [control room AC] subsystem to OPERABLE status.	30 days
B. Two [control room AC] subsystems inoperable.	B.1 Verify control room area temperature < [90]°F. AND B.2 Restore one [control room AC] subsystem to OPERABLE status.	Once per 4 hours 72 hours
C. Required Action and associated Completion Time of Condition A or B not met in MODE 1, 2, or 3.	C.1 ---------------NOTE-------------- LCO 3.0.4.a is not applicable when entering MODE 3. ------------------------------------- Be in MODE 3.	12 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition A not met during movement of [recently] irradiated fuel assemblies in the [secondary] containment ~~or during OPDRVs~~.	--------------------NOTE------------------- LCO 3.0.3 is not applicable. --- D.1 Place OPERABLE [control room AC] subsystem in operation. OR D.2~~.1~~ Suspend movement of [recently] irradiated fuel assemblies in the [secondary] containment. ~~AND~~ ~~D.2.2 Initiate action to suspend OPDRVs.~~	 Immediately Immediately ~~Immediately~~
E. Required Action and associated Completion Time of Condition B not met during movement of [recently] irradiated fuel assemblies in the [secondary] containment ~~or during OPDRVs~~.	--------------------NOTE------------------- LCO 3.0.3 is not applicable. --- E.1 Suspend movement of [recently] irradiated fuel assemblies in the [secondary] containment. ~~AND~~ ~~E.2 Initiate actions to suspend OPDRVs.~~	 Immediately ~~Immediately~~

3.8 ELECTRICAL POWER SYSTEMS

3.8.2 AC Sources - Shutdown

LCO 3.8.2 The following AC electrical power sources shall be OPERABLE:

a. One qualified circuit between the offsite transmission network and the onsite Class 1E AC electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems - Shutdown" and

b. One diesel generator (DG) capable of supplying one division of the onsite Class 1E AC electrical power distribution subsystem(s) required by LCO 3.8.10.

APPLICABILITY: MODES 4 and 5,
During movement of [recently] irradiated fuel assemblies in the [secondary] containment.

ACTIONS

---NOTE---
LCO 3.0.3 is not applicable.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required offsite circuit inoperable.	--------------------NOTE------------------- Enter applicable Condition and Required Actions of LCO 3.8.10, with one required division de-energized as a result of Condition A. --	
	A.1 Declare affected required feature(s), with no offsite power available, inoperable.	Immediately
	<u>OR</u>	

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	A.2.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	A.2.2 Suspend movement of [recently] irradiated fuel assemblies in the [secondary] containment.	Immediately
	AND	
	~~A.2.3 Initiate action to suspend operations with a potential for draining the reactor vessel (OPDRVs).~~	~~Immediately~~
	~~AND~~	
	A.2.~~3~~4 Initiate action to restore required offsite power circuit to OPERABLE status.	Immediately
B. One required DG inoperable.	B.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	B.2 Suspend movement of [recently] irradiated fuel assemblies in [secondary] containment.	Immediately
	~~AND~~	
	~~B.3 Initiate action to suspend OPDRVs.~~	~~Immediately~~
	AND	

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	B.34 Initiate action to restore required DG to OPERABLE status.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.2.1	------------------------------NOTES----------------------------- 1. The following SRs are not required to be performed: SR 3.8.1.3, SR 3.8.1.9 through SR 3.8.1.11, SR 3.8.1.13 through SR 3.8.16, [SR 3.8.1.18], and SR 3.8.1.19. 2. SR 3.8.1.12 and SR 3.8.1.19 are not required to be met when associated ECCS subsystem(s) are not required to be OPERABLE per LCO 3.5.2, "ECCS-Shutdown." --- For AC sources required to be OPERABLE the SRs of Specification 3.8.1, except SR 3.8.1.8, SR 3.8.1.17, and SR 3.8.1.20, are applicable.	In accordance with applicable SRs

3.8 ELECTRICAL POWER SYSTEMS

3.8.5 DC Sources - Shutdown

LCO 3.8.5

[DC electrical power subsystems shall be OPERABLE to support the DC electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems - Shutdown."]

[One DC electrical power subsystem shall be OPERABLE.]

-----------------------------------REVIEWER'S NOTE---------------------------------
This second option above applies for plants having a pre-ITS licensing basis (CTS) for electrical power requirements during shutdown conditions that required only one DC electrical power subsystem to be OPERABLE. Action A and the bracketed optional wording in Condition B are also eliminated for this case. The first option above is adopted for plants that have a CTS requiring the same level of DC electrical power subsystem support as is required for power operating conditions.

APPLICABILITY: MODES 4 and 5,
During movement of [recently] irradiated fuel assemblies in the [secondary] containment.

ACTIONS

--NOTE--
LCO 3.0.3 is not applicable.

CONDITION	REQUIRED ACTION		COMPLETION TIME
[A. One [or two] battery charger[s on one subsystem] inoperable. AND The redundant subsystem battery and charger[s] OPERABLE.	A.1 AND	Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	2 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	A.2 Verify battery float current ≤ [2] amps. <u>AND</u> A.3 Restore battery charger[s] to OPERABLE status.	Once per [12] hours [72] hours]
B. One [or more] required DC electrical power subsystem[s] inoperable [for reasons other than Condition A. <u>OR</u> Required Action and associated Completion Time of Condition A not met.]	B.1 Declare affected required feature(s) inoperable. <u>OR</u> B.2.1 Suspend CORE ALTERATIONS. <u>AND</u> B.2.2 Suspend movement of [recently] irradiated fuel assemblies in the [secondary] containment. ~~<u>AND</u>~~ ~~B.2.3 Initiate action to suspend operations with a potential for draining the reactor vessel.~~ <u>AND</u> B.2.~~3~~4 Initiate action to restore required DC electrical power subsystems to OPERABLE status.	Immediately Immediately Immediately ~~Immediately~~ Immediately

3.8 ELECTRICAL POWER SYSTEMS

3.8.8 Inverters - Shutdown

LCO 3.8.8

[Inverter(s) shall be OPERABLE to support the onsite Class 1E AC vital bus electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems - Shutdown."]

[One] inverter[s] shall be OPERABLE.]

-----------------------------------REVIEWER'S NOTE---------------------------------
This second option above applies for plants having a pre-ITS licensing basis (CTS) for electrical power requirements during shutdown conditions that required only [one] inverter to be OPERABLE. The "[or more]" optional wording in Condition A is also eliminated for this case. The first option above is adopted for plants that have a CTS requiring the same level of DC electrical power subsystem/inverter support as is required for power operating conditions.

APPLICABILITY: MODES 4 and 5,
During movement of [recently] irradiated fuel assemblies in the [secondary] containment.

ACTIONS

---NOTE---
LCO 3.0.3 is not applicable.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One [or more] [required] inverter[s] inoperable.	A.1 Declare affected required feature(s) inoperable. <u>OR</u> A.2.1 Suspend CORE ALTERATIONS. <u>AND</u>	Immediately Immediately

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	A.2.2 Suspend handling of [recently] irradiated fuel assemblies in the [secondary] containment. AND ~~A.2.3 Initiate action to suspend operations with a potential for draining the reactor vessel.~~ ~~AND~~ A.2.34 Initiate action to restore [required] inverters to OPERABLE status.	Immediately ~~Immediately~~ Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.8.1	Verify correct inverter voltage, [frequency,] and alignments to [required] AC vital buses.	[7 days OR In accordance with the Surveillance Frequency Control Program]

3.8 ELECTRICAL POWER SYSTEMS

3.8.10 Distribution Systems - Shutdown

LCO 3.8.10 The necessary portions of the AC, DC, [and AC vital bus] electrical power distribution subsystems shall be OPERABLE to support equipment required to be OPERABLE.

APPLICABILITY: MODES 4 and 5,
During movement of [recently] irradiated fuel assemblies in the [secondary] containment.

ACTIONS

--NOTE--
LCO 3.0.3 is not applicable.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required AC, DC, [or AC vital bus] electrical power distribution subsystems inoperable.	A.1 Declare associated supported required feature(s) inoperable.	Immediately
	OR	
	A.2.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	A.2.2 Suspend handling of [recently] irradiated fuel assemblies in the [secondary] containment.	Immediately
	~~AND~~	

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	~~A.2.3 Initiate action to suspend operations with a potential for draining the reactor vessel.~~	~~Immediately~~
	AND	
	A.2.~~3~~4 Initiate actions to restore required AC, DC, [and AC vital bus] electrical power distribution subsystems to OPERABLE status.	Immediately
	AND	
	A.2.~~4~~5 Declare associated required shutdown cooling subsystem(s) inoperable and not in operation.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.10.1	Verify correct breaker alignments and voltage to required AC, DC, [and AC vital bus] electrical power distribution subsystems.	[7 days OR In accordance with the Surveillance Frequency Control Program]

5.5 Programs and Manuals

5.5.15 Control Room Envelope (CRE) Habitability Program (continued)

The unfiltered air inleakage limit for radiological challenges is the inleakage flow rate assumed in the licensing basis analyses of DBA consequences. Unfiltered air inleakage limits for hazardous chemicals must ensure that exposure of CRE occupants to these hazards will be within the assumptions in the licensing basis.

f. The provisions of SR 3.0.2 are applicable to the Frequencies for assessing CRE habitability, determining CRE unfiltered inleakage, and measuring CRE pressure and assessing the CRE boundary as required by paragraphs c and d, respectively.

5.5.16 [Setpoint Control Program

This program shall establish the requirements for ensuring that setpoints for automatic protective devices are initially within and remain within the assumptions of the applicable safety analyses, provides a means for processing changes to instrumentation setpoints, and identifies setpoint methodologies to ensure instrumentation will function as required. The program shall ensure that testing of automatic protective devices related to variables having significant safety functions as delineated by 10 CFR 50.36(c)(1)(ii)(A) verifies that instrumentation will function as required.

a. The program shall list the Functions in the following specifications to which it applies:

1. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation;"
2. LCO 3.3.1.2, "Source Range Monitor (SRM) Instrumentation;"
3. LCO 3.3.2.1, "Control Rod Block Instrumentation;"
4. LCO 3.3.2.2, "Feedwater and Main Turbine High Water Level Trip Instrumentation;"
5. LCO 3.3.4.1, "End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation;"
6. LCO 3.3.4.2, "Anticipated Transient Without Scram Recirculation Pump Trip (ATWS-RPT) Instrumentation;"
7. LCO 3.3.5.1, "Emergency Core Cooling System (ECCS) Instrumentation;"
8. LCO 3.3.5.2, "Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation;"
9~~8~~. LCO 3.3.5.*3*~~2~~, "Reactor Core Isolation Cooling (RCIC) System Instrumentation;"
10~~9~~. LCO 3.3.6.1, "Primary Containment Isolation Instrumentation;"
1*1*~~0~~. LCO 3.3.6.2, "Secondary Containment Isolation Instrumentation;"
1*2*~~1~~. LCO 3.3.6.3, "Low-Low Set (LLS) Instrumentation;"
1*3*~~2~~. LCO 3.3.7.1, "[Main Control Room Environmental Control (MCREC)] System Instrumentation;"
1*4*~~3~~. LCO 3.3.8.1, "Loss of Power (LOP) Instrumentation;"

5.5 Programs and Manuals

5.5.16 Setpoint Control Program (continued)

15. LCO 3.3.8.2, "Reactor Protection System (RPS) Electric Power Monitoring."

b. The program shall require the [Limiting Trip Setpoint (LTSP)], [Nominal Trip Setpoint (NTSP)], Allowable Value (AV), As-Found Tolerance (AFT), and As-Left Tolerance (ALT) (as applicable) of the Functions described in paragraph a. are calculated using the NRC approved setpoint methodology, as listed below. In addition, the program shall contain the value of the [LTSP], [NTSP], AV, AFT, and ALT (as applicable) for each Function described in paragraph a. and shall identify the setpoint methodology used to calculate these values.

------------------------------------- Reviewer's Note --------------------------------------
List the NRC safety evaluation report by letter, date, and ADAMS accession number (if available) that approved the setpoint methodologies.
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1. [Insert reference to NRC safety evaluation that approved the setpoint methodology.]

c. The program shall establish methods to ensure that Functions described in paragraph a. will function as required by verifying the as-left and as-found settings are consistent with those established by the setpoint methodology.

d. --------------------------------- REVIEWER'S NOTE ------------------------------------
A license amendment request to implement a Setpoint Control Program must list the instrument functions to which the program requirements of paragraph d. will be applied. Paragraph d. shall apply to all Functions in the Reactor Protection System (RPS) Instrumentation, Control Rod Block Instrumentation, End of Cycle-Recirculation Pump Trip (EOC-RPT) Instrumentation, Emergency Core Cooling System (ECCS) Instrumentation, and Reactor Core Isolation Cooling (RCIC) Instrumentation specifications unless one or more of the following exclusions apply:

1. Manual actuation circuits, automatic actuation logic circuits or to instrument functions that derive input from contacts which have no associated sensor or adjustable device, e.g., limit switches, breaker position switches, manual actuation switches, float switches, proximity detectors, etc. are excluded. In addition, those permissives and interlocks that derive input from a sensor or adjustable device that is tested as part of another TS function are excluded.

2. Settings associated with safety relief valves are excluded. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Code for Operation and Maintenance of Nuclear Power Plants testing program.

5.5 Programs and Manuals

5.5.16 Setpoint Control Program (continued)

3. Functions and Surveillance Requirements which test only digital components are normally excluded. There is no expected change in result between SR performances for these components. Where separate as-left and as-found tolerance is established for digital component SRs, the requirements would apply.

The program shall identify the Functions described in paragraph a. that are automatic protective devices related to variables having significant safety functions as delineated by 10 CFR 50.36(c)(1)(ii)(A). The [LTSP] of these Functions are Limiting Safety System Settings. These Functions shall be demonstrated to be functioning as required by applying the following requirements during CHANNEL CALIBRATIONS, trip unit calibrations and CHANNEL FUNCTIONAL TESTS that verify the [LTSP or NTSP].

1 The as-found value of the instrument channel trip setting shall be compared with the previous as-left value or the specified [LTSP or NTSP].

2. If the as-found value of the instrument channel trip setting differs from the previous as-left value or the specified [LTSP or NTSP] by more than the pre-defined test acceptance criteria band (i.e., the specified AFT), then the instrument channel shall be evaluated before declaring the SR met and returning the instrument channel to service. This condition shall be entered in the plant corrective action program.

3. If the as-found value of the instrument channel trip setting is less conservative than the specified AV, then the SR is not met and the instrument channel shall be immediately declared inoperable.

4. The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the [LTSP or NTSP] at the completion of the surveillance test; otherwise, the channel is inoperable (setpoints may be more conservative than the [LTSP or NTSP] provided that the as-found and as-left tolerances apply to the actual setpoint used to confirm channel performance).

e. The program shall be specified in [insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference].]

5.5.17 [Surveillance Frequency Control Program

This program provides controls for Surveillance Frequencies. The program shall ensure that Surveillance Requirements specified in the Technical Specifications are performed at intervals sufficient to assure the associated Limiting Conditions for Operation are met.

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are connected to a one-out-of-two taken twice logic to initiate all three DGs (2A, 1B, and 2C). The DGs receive their initiation signals from the CS System initiation logic. The DGs can also be started manually from the control room and locally from the associated DG room. The DG initiation signal is a sealed in signal and must be manually reset. The DG initiation logic is reset by resetting the associated ECCS initiation logic. Upon receipt of a loss of coolant accident (LOCA) initiation signal, each DG is automatically started, is ready to load in approximately 12 seconds, and will run in standby conditions (rated voltage and speed, with the DG output breaker open). The DGs will only energize their respective Engineered Safety Feature buses if a loss of offsite power occurs. (Refer to Bases for LCO 3.3.8.1.)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The actions of the ECCS are explicitly assumed in the safety analyses of References 2, 3, and 4. The ECCS is initiated to preserve the integrity of the fuel cladding by limiting the post LOCA peak cladding temperature to less than the 10 CFR 50.46 limits.

ECCS instrumentation satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii). Certain instrumentation Functions are retained for other reasons and are described below in the individual Functions discussion.

Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy.

The OPERABILITY of the ECCS instrumentation is dependent upon the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.5.1-1. Each Function must have a required number of OPERABLE channels, with their setpoints set within the setting tolerance of the specified [LTSPs], where appropriate. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each ECCS subsystem must also respond within its assumed response time. Table 3.3.5.1-1 is modified by ~~two~~ *a* footnote~~s~~ *which* ~~. Footnote (a) is added to clarify that the associated functions are required to be OPERABLE in MODES 4 and 5 only when their supported ECCS are required to be OPERABLE per LCO 3.5.2, ECCS - Shutdown. Footnote (b)~~ is added to show that certain ECCS instrumentation Functions also perform DG initiation and actuation of other Technical Specifications (TS) equipment.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Allowable Values are specified for each ECCS Function specified in Table 3.3.5.1-1. [LTSPs] and the methodologies for calculation of the as-left and as-found tolerances are described in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. The [LTSPs] are selected to ensure that the setpoints remain conservative with respect to the as-found tolerance band between CHANNEL CALIBRATIONS. After each calibration the trip setpoint shall be left within the as-left band around the [LTSP].

[LTSPs] are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state. The analytical limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytical limits, corrected for calibration, process, and some of the instrument errors. The [LTSPs] are then determined, accounting for the remaining instrument errors (e.g., drift). The [LTSPs] derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

In general, the individual Functions are required to be OPERABLE in the MODES or other specified conditions that may require ECCS (or DG) initiation to mitigate the consequences of a design basis transient or accident. To ensure reliable ECCS and DG function, a combination of Functions is required to provide primary and secondary initiation signals.

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

<u>Core Spray and Low Pressure Coolant Injection Systems</u>

<u>1.a, 2.a. Reactor Vessel Water Level - Low Low Low, Level 1</u>

Low reactor pressure vessel (RPV) water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. The low pressure ECCS and associated DGs are initiated at Level 1 to ensure that core spray and flooding functions are available to prevent or minimize fuel damage. The Reactor Vessel Water Level - Low Low Low, Level 1 is one of the Functions assumed to be OPERABLE and capable of initiating the ECCS during the transients analyzed in References 2 and 4. In addition, the

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Reactor Vessel Water Level - Low Low Low, Level 1 Function is directly assumed in the analysis of the recirculation line break (Ref. 3). The core cooling function of the ECCS, along with the scram action of the Reactor Protection System (RPS), ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Reactor Vessel Water Level - Low Low Low, Level 1 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel.

The Reactor Vessel Water Level - Low Low Low, Level 1 Allowable Value is chosen to allow time for the low pressure core flooding systems to activate and provide adequate cooling.

Four channels of Reactor Vessel Water Level - Low Low Low, Level 1 Function are only required to be OPERABLE when the ECCS is required to be OPERABLE to ensure that no single instrument failure can preclude ECCS initiation. ~~Per Footnote (a) to Table 3.3.5.1-1, this ECCS Function is only required to be OPERABLE in MODES 4 and 5 whenever the associated ECCS is required to be OPERABLE per LCO 3.5.2. Refer to LCO 3.5.1 and LCO 3.5.2, "ECCS - Shutdown," for Applicability Bases for the low pressure ECCS subsystems; LCO 3.8.1, "AC Sources - Operating," and LCO 3.8.2, "AC Sources - Shutdown," for Applicability Bases for the DGs.~~

1.b, 2.b. Drywell Pressure – High

High pressure in the drywell could indicate a break in the reactor coolant pressure boundary (RCPB). The low pressure ECCS and associated DGs are initiated upon receipt of the Drywell Pressure - High Function in order to minimize the possibility of fuel damage. The Drywell Pressure - High Function, along with the Reactor Water Level - Low Low Low, Level 1 Function, is directly assumed in the analysis of the recirculation line break (Ref. 5). The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

High drywell pressure signals are initiated from four pressure transmitters that sense drywell pressure. The Allowable Value was selected to be as low as possible and be indicative of a LOCA inside primary containment.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The Drywell Pressure - High Function is required to be OPERABLE when the ECCS or DG is required to be OPERABLE in conjunction with times when the primary containment is required to be OPERABLE. Thus, four channels of the CS and LPCI Drywell Pressure - High Function are required to be OPERABLE in MODES 1, 2, and 3 to ensure that no single instrument failure can preclude ECCS and DG initiation. In MODES 4 and 5, the Drywell Pressure - High Function is not required, since there is insufficient energy in the reactor to pressurize the primary containment to Drywell Pressure - High setpoint. Refer to LCO 3.5.1 for Applicability Bases for the low pressure ECCS subsystems and to LCO 3.8.1 for Applicability Bases for the DGs.

<u>1.c, 2.c. Reactor Steam Dome Pressure - Low (Injection Permissive)</u>

Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS subsystems. This ensures that, prior to opening the injection valves of the low pressure ECCS subsystems, the reactor pressure has fallen to a value below these subsystems' maximum design pressure. The Reactor Steam Dome Pressure - Low is one of the Functions assumed to be OPERABLE and capable of permitting initiation of the ECCS during the transients analyzed in References 2 and 4. In addition, the Reactor Steam Dome Pressure - Low Function is directly assumed in the analysis of the recirculation line break (Ref. 3). The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

The Reactor Steam Dome Pressure - Low signals are initiated from four pressure transmitters that sense the reactor dome pressure.

The Allowable Value is low enough to prevent overpressuring the equipment in the low pressure ECCS, but high enough to ensure that the ECCS injection prevents the fuel peak cladding temperature from exceeding the limits of 10 CFR 50.46.

Four channels of Reactor Steam Dome Pressure - Low Function are only required to be OPERABLE when the ECCS is required to be OPERABLE to ensure that no single instrument failure can preclude ECCS initiation. ~~Per Footnote (a) to Table 3.3.5.1-1, this ECCS Function is only required to be OPERABLE in MODES 4 and 5 whenever the associated ECCS is required to be OPERABLE per LCO 3.5.2. Refer to LCO 3.5.1 and LCO 3.5.2 for Applicability Bases for the low pressure ECCS subsystems.~~

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

1.d, 2.g. Core Spray and Low Pressure Coolant Injection Pump Discharge Flow - Low (Bypass)

The minimum flow instruments are provided to protect the associated low pressure ECCS pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow is sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump. The LPCI and CS Pump Discharge Flow - Low Functions are assumed to be OPERABLE and capable of closing the minimum flow valves to ensure that the low pressure ECCS flows assumed during the transients and accidents analyzed in References 2, 3, and 4 are met. The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

One flow transmitter per ECCS pump is used to detect the associated subsystems' flow rates. The logic is arranged such that each transmitter causes its associated minimum flow valve to open. The logic will close the minimum flow valve once the closure setpoint is exceeded. The LPCI minimum flow valves are time delayed such that the valves will not open for 10 seconds after the switches detect low flow. The time delay is provided to limit reactor vessel inventory loss during the startup of the RHR shutdown cooling mode. The Pump Discharge Flow - Low Allowable Values are high enough to ensure that the pump flow rate is sufficient to protect the pump, yet low enough to ensure that the closure of the minimum flow valve is initiated to allow full flow into the core.

Each channel of Pump Discharge Flow - Low Function (two CS channels and four LPCI channels) is only required to be OPERABLE when the associated ECCS is required to be OPERABLE to ensure that no single instrument failure can preclude the ECCS function. ~~Per Footnote (a) to Table 3.3.5.1-1, this ECCS Function is only required to be OPERABLE in MODES 4 and 5 whenever the associated ECCS is required to be OPERABLE per LCO 3.5.2. Refer to LCO 3.5.1 and LCO 3.5.2 for Applicability Bases for the low pressure ECCS subsystems.~~

1.e, 2.h. Manual Initiation

The Manual Initiation push button channels introduce signals into the appropriate ECCS logic to provide manual initiation capability and are redundant to the automatic protective instrumentation. There is one push button for each of the CS and LPCI subsystems (i.e., two for CS and two for LPCI).

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The Manual Initiation Function is not assumed in any accident or transient analyses in the FSAR. However, the Function is retained for overall redundancy and diversity of the low pressure ECCS function as required by the NRC in the plant licensing basis.

There is no Allowable Value for this Function since the channels are mechanically actuated based solely on the position of the push buttons. Each channel of the Manual Initiation Function (one channel per subsystem) is only required to be OPERABLE when the associated ECCS is required to be OPERABLE. ~~Per Footnote (a) to Table 3.3.5.1-1, this ECCS Function is only required to be OPERABLE in MODES 4 and 5 whenever the associated ECCS is required to be OPERABLE per LCO 3.5.2. Refer to LCO 3.5.1 and LCO 3.5.2 for Applicability Bases for the low pressure ECCS subsystems.~~

<u>2.d. Reactor Steam Dome Pressure - Low (Recirculation Discharge Valve Permissive)</u>

Low reactor steam dome pressure signals are used as permissives for recirculation discharge valve closure. This ensures that the LPCI subsystems inject into the proper RPV location assumed in the safety analysis. The Reactor Steam Dome Pressure - Low is one of the Functions assumed to be OPERABLE and capable of closing the valve during the transients analyzed in References 2 and 4. The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46. The Reactor Steam Dome Pressure - Low Function is directly assumed in the analysis of the recirculation line break (Ref. 3).

The Reactor Steam Dome Pressure - Low signals are initiated from four pressure transmitters that sense the reactor dome pressure.

The Allowable Value is chosen to ensure that the valves close prior to commencement of LPCI injection flow into the core, as assumed in the safety analysis.

Four channels of the Reactor Steam Dome Pressure - Low Function are only required to be OPERABLE in MODES 1, 2, and 3 with the associated recirculation pump discharge valve open. With the valve(s) closed, the function instrumentation has been performed; thus, the Function is not required. In MODES 4 and 5, the loop injection location is not critical since LPCI injection through the recirculation loop in either direction will still ensure that LPCI flow reaches the core (i.e., there is no significant reactor steam dome back pressure).

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

2.e. Reactor Vessel Shroud Level - Level 0

The Level 0 Function is provided as a permissive to allow the RHR System to be manually aligned from the LPCI mode to the suppression pool cooling/spray or drywell spray modes. The permissive ensures that water in the vessel is approximately two thirds core height before the manual transfer is allowed. This ensures that LPCI is available to prevent or minimize fuel damage. This function may be overridden during accident conditions as allowed by plant procedures. Reactor Vessel Shroud Level - Level 0 Function is implicitly assumed in the analysis of the recirculation line break (Ref. 3) since the analysis assumes that no LPCI flow diversion occurs when reactor water level is below Level 0.

Reactor Vessel Shroud Level - Level 0 signals are initiated from two level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. The Reactor Vessel Shroud Level - Level 0 Allowable Value is chosen to allow the low pressure core flooding systems to activate and provide adequate cooling before allowing a manual transfer.

Two channels of the Reactor Vessel Shroud Level - Level 0 Function are only required to be OPERABLE in MODES 1, 2, and 3. In MODES 4 and 5, the specified initiation time of the LPCI subsystems is not assumed, and other administrative controls are adequate to control the valves that this Function isolates (since the systems that the valves are opened for are not required to be OPERABLE in MODES 4 and 5 and are normally not used).

2.f. Low Pressure Coolant Injection Pump Start - Time Delay Relay

The purpose of this time delay is to stagger the start of the LPCI pumps that are in each of Divisions 1 and 2, thus limiting the starting transients on the 4.16 kV emergency buses. This Function is only necessary when power is being supplied from the standby power sources (DG). However, since the time delay does not degrade ECCS operation, it remains in the pump start logic at all times. The LPCI Pump Start - Time Delay Relays are assumed to be OPERABLE in the accident and transient analyses requiring ECCS initiation. That is, the analyses assume that the pumps will initiate when required and excess loading will not cause failure of the power sources.

There are four LPCI Pump Start - Time Delay Relays, one in each of the RHR pump start logic circuits. While each time delay relay is dedicated to a single pump start logic, a single failure of a LPCI Pump Start - Time Delay Relay could result in the failure of the two low pressure ECCS

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

pumps, powered for the same ESF bus, to perform their intended function within the assumed ECCS RESPONSE TIME (e.g., as in the case where both ECCS pumps on one ESF bus start simultaneously due to an inoperable time delay relay). This still leaves four of the six low pressure ECCS pumps OPERABLE; thus, the single failure criterion is met (i.e., loss of one instrument does not preclude ECCS initiation). The Allowable Value for the LPCI Pump Start - Time Delay Relays is chosen to be long enough so that most of the starting transient of the first pump is complete before starting the second pump on the same 4.16 kV emergency bus and short enough so that ECCS operation is not degraded.

Each LPCI Pump Start - Time Delay Relay Function is required to be OPERABLE only when the associated LPCI subsystem is required to be OPERABLE. ~~Per Footnote (a) to Table 3.3.5.1-1, this ECCS Function is only required to be OPERABLE in MODES 4 and 5 whenever the associated ECCS is required to be OPERABLE per LCO 3.5.2. Refer to LCO 3.5.1 and LCO 3.5.2 for Applicability Bases for the LPCI subsystems.~~

<u>HPCI System</u>

<u>3.a. Reactor Vessel Water Level - Low Low, Level 2</u>

Low RPV water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, the HPCI System is initiated at Level 2 to maintain level above the top of the active fuel. The Reactor Vessel Water Level - Low Low, Level 2 is one of the Functions assumed to be OPERABLE and capable of initiating HPCI during the transients analyzed in References 2 and 4. Additionally, the Reactor Vessel Water Level - Low Low, Level 2 Function associated with HPCI is directly assumed in the analysis of the recirculation line break (Ref. 3). The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Reactor Vessel Water Level - Low Low, Level 2 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel.

The Reactor Vessel Water Level - Low Low, Level 2 Allowable Value is high enough such that for complete loss of feedwater flow, the Reactor Core Isolation Cooling (RCIC) System flow with HPCI assumed to fail will be sufficient to avoid initiation of low pressure ECCS at Reactor Vessel Water Level - Low Low Low, Level 1.

ACTIONS (continued)

A.1

Required Action A.1 directs entry into the appropriate Condition referenced in Table 3.3.5.1-1. The applicable Condition referenced in the Table is Function dependent. Each time a channel is discovered inoperable, Condition A is entered for that channel and provides for transfer to the appropriate subsequent Condition.

B.1, B.2, and B.3

Required Actions B.1 and B.2 are intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same Function result in redundant automatic initiation capability being lost for the feature(s). Required Action B.1 features would be those that are initiated by Functions 1.a, 1.b, 2.a, and 2.b (e.g., low pressure ECCS). The Required Action B.2 system would be HPCI. For Required Action B.1, redundant automatic initiation capability is lost if (a) two Function 1.a channels are inoperable and untripped in the same trip system, (b) two Function 2.a channels are inoperable and untripped in the same trip system, (c) two Function 1.b channels are inoperable and untripped in the same system, or (d) two Function 2.b channels are inoperable and untripped in the same trip system. For low pressure ECCS, since each inoperable channel would have Required Action B.1 applied separately (refer to ACTIONS Note), each inoperable channel would only require the affected portion of the associated system of low pressure ECCS and DGs to be declared inoperable. However, since channels in both associated low pressure ECCS subsystems (e.g., both CS subsystems) are inoperable and untripped, and the Completion Times started concurrently for the channels in both subsystems, this results in the affected portions in the associated low pressure ECCS and DGs being concurrently declared inoperable.

For Required Action B.2, redundant automatic initiation capability is lost if two Function 3.a or two Function 3.b channels are inoperable and untripped in the same trip system. In this situation (loss of redundant automatic initiation capability), the 24 hour allowance of Required Action B.3 is not appropriate and the feature(s) associated with the inoperable, untripped channels must be declared inoperable within 1 hour. ~~As noted (Note 1 to Required Action B.1), Required Action B.1 is only applicable in MODES 1, 2, and 3. In MODES 4 and 5, the specific initiation time of the low pressure ECCS is not assumed and the probability of a LOCA is lower. Thus, a total loss of initiation capability for 24 hours (as allowed by Required Action B.3) is allowed during MODES 4~~

ACTIONS (continued)

~~and 5. There is no similar Note provided for Required Action B.2 since HPCI instrumentation is not required in MODES 4 and 5; thus, a Note is not necessary.~~

Notes are also provided (*the* Note ~~2~~ to Required Action B.1 and the Note to Required Action B.2) to delineate which Required Action is applicable for each Function that requires entry into Condition B if an associated channel is inoperable. This ensures that the proper loss of initiation capability check is performed. Required Action B.1 (the Required Action for certain inoperable channels in the low pressure ECCS subsystems) is not applicable to Function 2.e, since this Function provides backup to administrative controls ensuring that operators do not divert LPCI flow from injecting into the core when needed. Thus, a total loss of Function 2.e capability for 24 hours is allowed, since the LPCI subsystems remain capable of performing their intended function.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action B.1, the Completion Time only begins upon discovery that a redundant feature in the same system (e.g., both CS subsystems) cannot be automatically initiated due to inoperable, untripped channels within the same Function as described in the paragraph above. For Required Action B.2, the Completion Time only begins upon discovery that the HPCI System cannot be automatically initiated due to two inoperable, untripped channels for the associated Function in the same trip system. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

Because of the diversity of sensors available to provide initiation signals and the redundancy of the ECCS design, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 6) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action B.3. Placing the inoperable channel in trip would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. Alternately, if it is not desired to place the channel in trip (e.g., as in the case where placing the inoperable channel in trip would result in an initiation), Condition H must be entered and its Required Action taken.

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ACTIONS (continued)

C.1 and C.2

Required Action C.1 is intended to ensure that appropriate actions are taken if multiple, inoperable channels within the same Function result in redundant automatic initiation capability being lost for the feature(s). Required Action C.1 features would be those that are initiated by Functions 1.c, 2.c, 2.d, and 2.f (i.e., low pressure ECCS). Redundant automatic initiation capability is lost if either (a) two Function 1.c channels are inoperable in the same trip system, (b) two Function 2.c channels are inoperable in the same trip system, (c) two Function 2.d channels are inoperable in the same trip system, or (d) two or more Function 2.f channels are inoperable. In this situation (loss of redundant automatic initiation capability), the 24 hour allowance of Required Action C.2 is not appropriate and the feature(s) associated with the inoperable channels must be declared inoperable within 1 hour. Since each inoperable channel would have Required Action C.1 applied separately (refer to ACTIONS Note), each inoperable channel would only require the affected portion of the associated system to be declared inoperable. However, since channels for both low pressure ECCS subsystems are inoperable (e.g., both CS subsystems), and the Completion Times started concurrently for the channels in both subsystems, this results in the affected portions in both subsystems being concurrently declared inoperable. For Functions 1.c, 2.d, and 2.f, the affected portions are the associated low pressure ECCS pumps. ~~As noted (Note 1), Required Action C.1 is only applicable in MODES 1, 2, and 3. In MODES 4 and 5, the specific initiation time of the ECCS is not assumed and the probability of a LOCA is lower. Thus, a total loss of automatic initiation capability for 24 hours (as allowed by Required Action C.2) is allowed during MODES 4 and 5.~~

The Note ~~2~~ states that Required Action C.1 is only applicable for Functions 1.c, 2.c, 2.d, and 2.f. Required Action C.1 is not applicable to Functions 1.e, 2.h, and 3.g (which also require entry into this Condition if a channel in these Functions is inoperable), since they are the Manual Initiation Functions and are not assumed in any accident or transient analysis. Thus, a total loss of manual initiation capability for 24 hours (as allowed by Required Action C.2) is allowed. Required Action C.1 is also not applicable to Function 3.c (which also requires entry into this Condition if a channel in this Function is inoperable), since the loss of one channel results in a loss of the Function (two-out-of-two logic). This loss was considered during the development of Reference 6 and considered acceptable for the 24 hours allowed by Required Action C.2.

ACTIONS (continued)

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action C.1, the Completion Time only begins upon discovery that the same feature in both subsystems (e.g., both CS subsystems) cannot be automatically initiated due to inoperable channels within the same Function as described in the paragraph above. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration of channels.

Because of the diversity of sensors available to provide initiation signals and the redundancy of the ECCS design, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 6) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, Condition H must be entered and its Required Action taken. The Required Actions do not allow placing the channel in trip since this action would either cause the initiation or it would not necessarily result in a safe state for the channel in all events.

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

Required Action D.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same Function result in a complete loss of automatic component initiation capability for the HPCI System. Automatic component initiation capability is lost if two Function 3.d channels or two Function 3.e channels are inoperable and untripped. In this situation (loss of automatic suction swap), the 24 hour allowance of Required Actions D.2.1 and D.2.2 is not appropriate and the HPCI System must be declared inoperable within 1 hour after discovery of loss of HPCI initiation capability. As noted, Required Action D.1 is only applicable if the HPCI pump suction is not aligned to the suppression pool, since, if aligned, the Function is already performed.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action D.1, the Completion Time only begins upon discovery that the HPCI System cannot be automatically aligned to the suppression pool due to two inoperable, untripped channels in the same Function. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

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ACTIONS (continued)

Because of the diversity of sensors available to provide initiation signals and the redundancy of the ECCS design, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 6) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action D.2.1 or the suction source must be aligned to the suppression pool per Required Action D.2.2. Placing the inoperable channel in trip performs the intended function of the channel (shifting the suction source to the suppression pool). Performance of either of these two Required Actions will allow operation to continue. If Required Action D.2.1 or D.2.2 is performed, measures should be taken to ensure that the HPCI System piping remains filled with water. Alternately, if it is not desired to perform Required Actions D.2.1 and D.2.2 (e.g., as in the case where shifting the suction source could drain down the HPCI suction piping), Condition H must be entered and its Required Action taken.

E.1 and E.2

Required Action E.1 is intended to ensure that appropriate actions are taken if multiple, inoperable channels within the Core Spray and Low Pressure Coolant Injection Pump Discharge Flow - Low Bypass Functions result in redundant automatic initiation capability being lost for the feature(s). For Required Action E.1, the features would be those that are initiated by Functions 1.d and 2.g (e.g., low pressure ECCS). Redundant automatic initiation capability is lost if (a) two Function 1.d channels are inoperable or (b) one or more Function 2.g channels associated with pumps in LPCI subsystem A and one or more Function 2.g channels associated with pumps in LPCI subsystem B are inoperable. Since each inoperable channel would have Required Action E.1 applied separately (refer to ACTIONS Note), each inoperable channel would only require the affected low pressure ECCS pump to be declared inoperable. However, since channels for more than one low pressure ECCS pump are inoperable, and the Completion Times started concurrently for the channels of the low pressure ECCS pumps, this results in the affected low pressure ECCS pumps being concurrently declared inoperable.

In this situation (loss of redundant automatic initiation capability), the 7 day allowance of Required Action E.2 is not appropriate and the subsystem associated with each inoperable channel must be declared inoperable within 1 hour. ~~As noted (Note 1 to Required Action E.1), Required Action E.1 is only applicable in MODES 1, 2, and 3. In MODES 4 and 5, the specific initiation time of the ECCS is not assumed~~

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~~and the probability of a LOCA is lower. Thus, a total loss of initiation capability for 7 days (as allowed by Required Action E.2) is allowed during MODES 4 and 5.~~ A Note is also provided (*the* Note ~~2~~ to Required Action E.1) to delineate that Required Action E.1 is only applicable to low pressure ECCS Functions. Required Action E.1 is not applicable to HPCI Function 3.f since the loss of one channel results in a loss of the Function (one-out-of-one logic). This loss was considered during the development of Reference 6 and considered acceptable for the 7 days allowed by Required Action E.2.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock."

For Required Action E.1, the Completion Time only begins upon discovery that a redundant feature in the same system (e.g., both CS subsystems) cannot be automatically initiated due to inoperable channels within the same Function as described in the paragraph above. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration of channels.

If the instrumentation that controls the pump minimum flow valve is inoperable, such that the valve will not automatically open, extended pump operation with no injection path available could lead to pump overheating and failure. If there were a failure of the instrumentation, such that the valve would not automatically close, a portion of the pump flow could be diverted from the reactor vessel injection path, causing insufficient core cooling. These consequences can be averted by the operator's manual control of the valve, which would be adequate to maintain ECCS pump protection and required flow. Furthermore, other ECCS pumps would be sufficient to complete the assumed safety function if no additional single failure were to occur. The 7 day Completion Time of Required Action E.2 to restore the inoperable channel to OPERABLE status is reasonable based on the remaining capability of the associated ECCS subsystems, the redundancy available in the ECCS design, and the low probability of a DBA occurring during the allowed out of service time. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, Condition H must be entered and its Required Action taken. The Required Actions do not allow placing the channel in trip since this action would not necessarily result in a safe state for the channel in all events.

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initiation signal is a sealed in signal and must be manually reset. The DG initiation logic is reset by resetting the associated ECCS initiation logic. Upon receipt of a loss of coolant accident (LOCA) initiation signal, each DG is automatically started, is ready to load in approximately 12 seconds, and will run in standby conditions (rated voltage and speed, with the DG output breaker open). The DGs will only energize their respective Engineered Safety Feature buses if a loss of offsite power occurs. (Refer to Bases for LCO 3.3.8.1.)

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The actions of the ECCS are explicitly assumed in the safety analyses of References 2, 3, and 4. The ECCS is initiated to preserve the integrity of the fuel cladding by limiting the post LOCA peak cladding temperature to less than the 10 CFR 50.46 limits.

ECCS instrumentation satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii). Certain instrumentation Functions are retained for other reasons and are described below in the individual Functions discussion.

Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy.

The OPERABILITY of the ECCS instrumentation is dependent upon the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.5.1-1. Each Function must have a required number of OPERABLE channels, with their setpoints set within the setting tolerance of the specified [LTSPs], where appropriate. The actual setpoint is calibrated consistent with the SCP. Each ECCS subsystem must also respond within its assumed response time. Table 3.3.5.1-1 is modified by ~~two~~ *a* footnote~~s~~ *which* ~~. Footnote (a) is added to clarify that the associated functions are required to be OPERABLE in MODES 4 and 5 only when their supported ECCS are required to be OPERABLE per LCO 3.5.2, ECCS - Shutdown. Footnote (b)~~ is added to show that certain ECCS instrumentation Functions also perform DG initiation and actuation of other Technical Specifications (TS) equipment.

Allowable Values are specified for each ECCS Function specified in the SCP. [LTSPs] and the methodologies for calculation of the as-left and as-found tolerances are described in the SCP controlled under 10 CFR 50.59. The [LTSPs] are selected to ensure that the setpoints

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remain conservative with respect to the as-found tolerance band between CHANNEL CALIBRATIONS. After each calibration the trip setpoint shall be left within the as-left band around the [LTSP].

[LTSPs] are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state. The analytical limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytical limits, corrected for calibration, process, and some of the instrument errors. The [LTSPs] are then determined, accounting for the remaining instrument errors (e.g., drift). The [LTSPs] derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

In general, the individual Functions are required to be OPERABLE in the MODES or other specified conditions that may require ECCS (or DG) initiation to mitigate the consequences of a design basis transient or accident. To ensure reliable ECCS and DG function, a combination of Functions is required to provide primary and secondary initiation signals.

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

Core Spray and Low Pressure Coolant Injection Systems

1.a, 2.a. Reactor Vessel Water Level - Low Low Low, Level 1

Low reactor pressure vessel (RPV) water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. The low pressure ECCS and associated DGs are initiated at Level 1 to ensure that core spray and flooding functions are available to prevent or minimize fuel damage. The Reactor Vessel Water Level - Low Low Low, Level 1 is one of the Functions assumed to be OPERABLE and capable of initiating the ECCS during the transients analyzed in References 2 and 4. In addition, the Reactor Vessel Water Level - Low Low Low, Level 1 Function is directly assumed in the analysis of the recirculation line break (Ref. 3). The core cooling function of the ECCS, along with the scram action of the Reactor Protection System (RPS), ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

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APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Reactor Vessel Water Level - Low Low Low, Level 1 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel.

The Reactor Vessel Water Level - Low Low Low, Level 1 Allowable Value is chosen to allow time for the low pressure core flooding systems to activate and provide adequate cooling.

Four channels of Reactor Vessel Water Level - Low Low Low, Level 1 Function are only required to be OPERABLE when the ECCS is required to be OPERABLE to ensure that no single instrument failure can preclude ECCS initiation~~. Per Footnote (a) to Table 3.3.5.1-1, this ECCS Function is only required to be OPERABLE in MODES 4 and 5 whenever the associated ECCS is required to be OPERABLE per LCO 3.5.2. Refer to LCO 3.5.1 and LCO 3.5.2, "ECCS - Shutdown," for Applicability Bases for the low pressure ECCS subsystems; LCO 3.8.1, "AC Sources - Operating," and LCO 3.8.2, "AC Sources - Shutdown," for Applicability Bases for the DGs.~~

1.b, 2.b. Drywell Pressure – High

High pressure in the drywell could indicate a break in the reactor coolant pressure boundary (RCPB). The low pressure ECCS and associated DGs are initiated upon receipt of the Drywell Pressure - High Function in order to minimize the possibility of fuel damage. The Drywell Pressure - High Function, along with the Reactor Water Level - Low Low Low, Level 1 Function, is directly assumed in the analysis of the recirculation line break (Ref. 5). The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

High drywell pressure signals are initiated from four pressure transmitters that sense drywell pressure. The Allowable Value was selected to be as low as possible and be indicative of a LOCA inside primary containment.

The Drywell Pressure - High Function is required to be OPERABLE when the ECCS or DG is required to be OPERABLE in conjunction with times when the primary containment is required to be OPERABLE. Thus, four channels of the CS and LPCI Drywell Pressure - High Function are required to be OPERABLE in MODES 1, 2, and 3 to ensure that no single instrument failure can preclude ECCS and DG initiation. In MODES 4 and 5, the Drywell Pressure - High Function is not required, since there is insufficient energy in the reactor to pressurize the primary containment to

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Drywell Pressure - High setpoint. Refer to LCO 3.5.1 for Applicability Bases for the low pressure ECCS subsystems and to LCO 3.8.1 for Applicability Bases for the DGs.

1.c, 2.c. Reactor Steam Dome Pressure - Low (Injection Permissive)

Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS subsystems. This ensures that, prior to opening the injection valves of the low pressure ECCS subsystems, the reactor pressure has fallen to a value below these subsystems' maximum design pressure. The Reactor Steam Dome Pressure - Low is one of the Functions assumed to be OPERABLE and capable of permitting initiation of the ECCS during the transients analyzed in References 2 and 4. In addition, the Reactor Steam Dome Pressure - Low Function is directly assumed in the analysis of the recirculation line break (Ref. 3). The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

The Reactor Steam Dome Pressure - Low signals are initiated from four pressure transmitters that sense the reactor dome pressure.

The Allowable Value is low enough to prevent overpressuring the equipment in the low pressure ECCS, but high enough to ensure that the ECCS injection prevents the fuel peak cladding temperature from exceeding the limits of 10 CFR 50.46.

Four channels of Reactor Steam Dome Pressure - Low Function are only required to be OPERABLE when the ECCS is required to be OPERABLE to ensure that no single instrument failure can preclude ECCS initiation. ~~Per Footnote (a) to Table 3.3.5.1-1, this ECCS Function is only required to be OPERABLE in MODES 4 and 5 whenever the associated ECCS is required to be OPERABLE per LCO 3.5.2. Refer to LCO 3.5.1 and LCO 3.5.2 for Applicability Bases for the low pressure ECCS subsystems.~~

1.d, 2.g. Core Spray and Low Pressure Coolant Injection Pump Discharge Flow - Low (Bypass)

The minimum flow instruments are provided to protect the associated low pressure ECCS pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow is sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump. The LPCI and

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CS Pump Discharge Flow - Low Functions are assumed to be OPERABLE and capable of closing the minimum flow valves to ensure that the low pressure ECCS flows assumed during the transients and accidents analyzed in References 2, 3, and 4 are met. The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

One flow transmitter per ECCS pump is used to detect the associated subsystems' flow rates. The logic is arranged such that each transmitter causes its associated minimum flow valve to open. The logic will close the minimum flow valve once the closure setpoint is exceeded. The LPCI minimum flow valves are time delayed such that the valves will not open for 10 seconds after the switches detect low flow. The time delay is provided to limit reactor vessel inventory loss during the startup of the RHR shutdown cooling mode. The Pump Discharge Flow - Low Allowable Values are high enough to ensure that the pump flow rate is sufficient to protect the pump, yet low enough to ensure that the closure of the minimum flow valve is initiated to allow full flow into the core.

Each channel of Pump Discharge Flow - Low Function (two CS channels and four LPCI channels) is only required to be OPERABLE when the associated ECCS is required to be OPERABLE to ensure that no single instrument failure can preclude the ECCS function. ~~Per Footnote (a) to Table 3.3.5.1-1, this ECCS Function is only required to be OPERABLE in MODES 4 and 5 whenever the associated ECCS is required to be OPERABLE per LCO 3.5.2. Refer to LCO 3.5.1 and LCO 3.5.2 for Applicability Bases for the low pressure ECCS subsystems.~~

1.e, 2.h. Manual Initiation

The Manual Initiation push button channels introduce signals into the appropriate ECCS logic to provide manual initiation capability and are redundant to the automatic protective instrumentation. There is one push button for each of the CS and LPCI subsystems (i.e., two for CS and two for LPCI).

The Manual Initiation Function is not assumed in any accident or transient analyses in the FSAR. However, the Function is retained for overall redundancy and diversity of the low pressure ECCS function as required by the NRC in the plant licensing basis.

There is no Allowable Value for this Function since the channels are mechanically actuated based solely on the position of the push buttons. Each channel of the Manual Initiation Function (one channel per

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

subsystem) is only required to be OPERABLE when the associated ECCS is required to be OPERABLE. ~~Per Footnote (a) to Table 3.3.5.1-1, this ECCS Function is only required to be OPERABLE in MODES 4 and 5 whenever the associated ECCS is required to be OPERABLE per LCO 3.5.2. Refer to LCO 3.5.1 and LCO 3.5.2 for Applicability Bases for the low pressure ECCS subsystems.~~

<u>2.d. Reactor Steam Dome Pressure - Low (Recirculation Discharge Valve Permissive)</u>

Low reactor steam dome pressure signals are used as permissives for recirculation discharge valve closure. This ensures that the LPCI subsystems inject into the proper RPV location assumed in the safety analysis. The Reactor Steam Dome Pressure - Low is one of the Functions assumed to be OPERABLE and capable of closing the valve during the transients analyzed in References 2 and 4. The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46. The Reactor Steam Dome Pressure - Low Function is directly assumed in the analysis of the recirculation line break (Ref. 3).

The Reactor Steam Dome Pressure - Low signals are initiated from four pressure transmitters that sense the reactor dome pressure.

The Allowable Value is chosen to ensure that the valves close prior to commencement of LPCI injection flow into the core, as assumed in the safety analysis.

Four channels of the Reactor Steam Dome Pressure - Low Function are only required to be OPERABLE in MODES 1, 2, and 3 with the associated recirculation pump discharge valve open. With the valve(s) closed, the function instrumentation has been performed; thus, the Function is not required. In MODES 4 and 5, the loop injection location is not critical since LPCI injection through the recirculation loop in either direction will still ensure that LPCI flow reaches the core (i.e., there is no significant reactor steam dome back pressure).

<u>2.e. Reactor Vessel Shroud Level - Level 0</u>

The Level 0 Function is provided as a permissive to allow the RHR System to be manually aligned from the LPCI mode to the suppression pool cooling/spray or drywell spray modes. The permissive ensures that water in the vessel is approximately two thirds core height before the manual transfer is allowed. This ensures that LPCI is available to prevent or minimize fuel damage. This function may be overridden during

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

accident conditions as allowed by plant procedures. Reactor Vessel Shroud Level - Level 0 Function is implicitly assumed in the analysis of the recirculation line break (Ref. 3) since the analysis assumes that no LPCI flow diversion occurs when reactor water level is below Level 0.

Reactor Vessel Shroud Level - Level 0 signals are initiated from two level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. The Reactor Vessel Shroud Level - Level 0 Allowable Value is chosen to allow the low pressure core flooding systems to activate and provide adequate cooling before allowing a manual transfer.

Two channels of the Reactor Vessel Shroud Level - Level 0 Function are only required to be OPERABLE in MODES 1, 2, and 3. In MODES 4 and 5, the specified initiation time of the LPCI subsystems is not assumed, and other administrative controls are adequate to control the valves that this Function isolates (since the systems that the valves are opened for are not required to be OPERABLE in MODES 4 and 5 and are normally not used).

2.f. Low Pressure Coolant Injection Pump Start - Time Delay Relay

The purpose of this time delay is to stagger the start of the LPCI pumps that are in each of Divisions 1 and 2, thus limiting the starting transients on the 4.16 kV emergency buses. This Function is only necessary when power is being supplied from the standby power sources (DG). However, since the time delay does not degrade ECCS operation, it remains in the pump start logic at all times. The LPCI Pump Start - Time Delay Relays are assumed to be OPERABLE in the accident and transient analyses requiring ECCS initiation. That is, the analyses assume that the pumps will initiate when required and excess loading will not cause failure of the power sources.

There are four LPCI Pump Start - Time Delay Relays, one in each of the RHR pump start logic circuits. While each time delay relay is dedicated to a single pump start logic, a single failure of a LPCI Pump Start - Time Delay Relay could result in the failure of the two low pressure ECCS pumps, powered for the same ESF bus, to perform their intended function within the assumed ECCS RESPONSE TIME (e.g., as in the case where both ECCS pumps on one ESF bus start simultaneously due to an inoperable time delay relay). This still leaves four of the six low pressure ECCS pumps OPERABLE; thus, the single failure criterion is met (i.e., loss of one instrument does not preclude ECCS initiation). The Allowable

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Value for the LPCI Pump Start - Time Delay Relays is chosen to be long enough so that most of the starting transient of the first pump is complete before starting the second pump on the same 4.16 kV emergency bus and short enough so that ECCS operation is not degraded.

Each LPCI Pump Start - Time Delay Relay Function is required to be OPERABLE only when the associated LPCI subsystem is required to be OPERABLE. ~~Per Footnote (a) to Table 3.3.5.1-1, this ECCS Function is only required to be OPERABLE in MODES 4 and 5 whenever the associated ECCS is required to be OPERABLE per LCO 3.5.2. Refer to LCO 3.5.1 and LCO 3.5.2 for Applicability Bases for the LPCI subsystems.~~

HPCI System

3.a. Reactor Vessel Water Level - Low Low, Level 2

Low RPV water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, the HPCI System is initiated at Level 2 to maintain level above the top of the active fuel. The Reactor Vessel Water Level - Low Low, Level 2 is one of the Functions assumed to be OPERABLE and capable of initiating HPCI during the transients analyzed in References 2 and 4. Additionally, the Reactor Vessel Water Level - Low Low, Level 2 Function associated with HPCI is directly assumed in the analysis of the recirculation line break (Ref. 3). The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Reactor Vessel Water Level - Low Low, Level 2 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel.

The Reactor Vessel Water Level - Low Low, Level 2 Allowable Value is high enough such that for complete loss of feedwater flow, the Reactor Core Isolation Cooling (RCIC) System flow with HPCI assumed to fail will be sufficient to avoid initiation of low pressure ECCS at Reactor Vessel Water Level - Low Low Low, Level 1.

Four channels of Reactor Vessel Water Level - Low Low, Level 2 Function are required to be OPERABLE only when HPCI is required to be OPERABLE to ensure that no single instrument failure can preclude HPCI initiation. Refer to LCO 3.5.1 for HPCI Applicability Bases.

BASES

ACTIONS (continued)

A.1

Required Action A.1 directs entry into the appropriate Condition referenced in Table 3.3.5.1-1. The applicable Condition referenced in the Table is Function dependent. Each time a channel is discovered inoperable, Condition A is entered for that channel and provides for transfer to the appropriate subsequent Condition.

B.1, B.2, and B.3

Required Actions B.1 and B.2 are intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same Function result in redundant automatic initiation capability being lost for the feature(s). Required Action B.1 features would be those that are initiated by Functions 1.a, 1.b, 2.a, and 2.b (e.g., low pressure ECCS). The Required Action B.2 system would be HPCI. For Required Action B.1, redundant automatic initiation capability is lost if (a) two Function 1.a channels are inoperable and untripped in the same trip system, (b) two Function 2.a channels are inoperable and untripped in the same trip system, (c) two Function 1.b channels are inoperable and untripped in the same system, or (d) two Function 2.b channels are inoperable and untripped in the same trip system. For low pressure ECCS, since each inoperable channel would have Required Action B.1 applied separately (refer to ACTIONS Note), each inoperable channel would only require the affected portion of the associated system of low pressure ECCS and DGs to be declared inoperable. However, since channels in both associated low pressure ECCS subsystems (e.g., both CS subsystems) are inoperable and untripped, and the Completion Times started concurrently for the channels in both subsystems, this results in the affected portions in the associated low pressure ECCS and DGs being concurrently declared inoperable.

For Required Action B.2, redundant automatic initiation capability is lost if two Function 3.a or two Function 3.b channels are inoperable and untripped in the same trip system. In this situation (loss of redundant automatic initiation capability), the 24 hour allowance of Required Action B.3 is not appropriate and the feature(s) associated with the inoperable, untripped channels must be declared inoperable within 1 hour. ~~As noted (Note 1 to Required Action B.1), Required Action B.1 is only applicable in MODES 1, 2, and 3. In MODES 4 and 5, the specific initiation time of the low pressure ECCS is not assumed and the probability of a LOCA is lower. Thus, a total loss of initiation capability for 24 hours (as allowed by Required Action B.3) is allowed during MODES 4~~

BASES

ACTIONS (continued)

~~and 5. There is no similar Note provided for Required Action B.2 since HPCI instrumentation is not required in MODES 4 and 5; thus, a Note is not necessary.~~

Notes are also provided (*the* Note ~~2~~ to Required Action B.1 and the Note to Required Action B.2) to delineate which Required Action is applicable for each Function that requires entry into Condition B if an associated channel is inoperable. This ensures that the proper loss of initiation capability check is performed. Required Action B.1 (the Required Action for certain inoperable channels in the low pressure ECCS subsystems) is not applicable to Function 2.e, since this Function provides backup to administrative controls ensuring that operators do not divert LPCI flow from injecting into the core when needed. Thus, a total loss of Function 2.e capability for 24 hours is allowed, since the LPCI subsystems remain capable of performing their intended function.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action B.1, the Completion Time only begins upon discovery that a redundant feature in the same system (e.g., both CS subsystems) cannot be automatically initiated due to inoperable, untripped channels within the same Function as described in the paragraph above. For Required Action B.2, the Completion Time only begins upon discovery that the HPCI System cannot be automatically initiated due to two inoperable, untripped channels for the associated Function in the same trip system. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

Because of the diversity of sensors available to provide initiation signals and the redundancy of the ECCS design, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 6) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action B.3. Placing the inoperable channel in trip would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. Alternately, if it is not desired to place the channel in trip (e.g., as in the case where placing the inoperable channel in trip would result in an initiation), Condition H must be entered and its Required Action taken.

BASES

ACTIONS (continued)

C.1 and C.2

Required Action C.1 is intended to ensure that appropriate actions are taken if multiple, inoperable channels within the same Function result in redundant automatic initiation capability being lost for the feature(s). Required Action C.1 features would be those that are initiated by Functions 1.c, 2.c, 2.d, and 2.f (i.e., low pressure ECCS). Redundant automatic initiation capability is lost if either (a) two Function 1.c channels are inoperable in the same trip system, (b) two Function 2.c channels are inoperable in the same trip system, (c) two Function 2.d channels are inoperable in the same trip system, or (d) two or more Function 2.f channels are inoperable. In this situation (loss of redundant automatic initiation capability), the 24 hour allowance of Required Action C.2 is not appropriate and the feature(s) associated with the inoperable channels must be declared inoperable within 1 hour. Since each inoperable channel would have Required Action C.1 applied separately (refer to ACTIONS Note), each inoperable channel would only require the affected portion of the associated system to be declared inoperable. However, since channels for both low pressure ECCS subsystems are inoperable (e.g., both CS subsystems), and the Completion Times started concurrently for the channels in both subsystems, this results in the affected portions in both subsystems being concurrently declared inoperable. For Functions 1.c, 2.d, and 2.f, the affected portions are the associated low pressure ECCS pumps. ~~As noted (Note 1), Required Action C.1 is only applicable in MODES 1, 2, and 3. In MODES 4 and 5, the specific initiation time of the ECCS is not assumed and the probability of a LOCA is lower. Thus, a total loss of automatic initiation capability for 24 hours (as allowed by Required Action C.2) is allowed during MODES 4 and 5.~~

The Note ~~2~~ states that Required Action C.1 is only applicable for Functions 1.c, 2.c, 2.d, and 2.f. Required Action C.1 is not applicable to Functions 1.e, 2.h, and 3.g (which also require entry into this Condition if a channel in these Functions is inoperable), since they are the Manual Initiation Functions and are not assumed in any accident or transient analysis. Thus, a total loss of manual initiation capability for 24 hours (as allowed by Required Action C.2) is allowed. Required Action C.1 is also not applicable to Function 3.c (which also requires entry into this Condition if a channel in this Function is inoperable), since the loss of one channel results in a loss of the Function (two-out-of-two logic). This loss was considered during the development of Reference 6 and considered acceptable for the 24 hours allowed by Required Action C.2.

BASES

ACTIONS (continued)

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action C.1, the Completion Time only begins upon discovery that the same feature in both subsystems (e.g., both CS subsystems) cannot be automatically initiated due to inoperable channels within the same Function as described in the paragraph above. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration of channels.

Because of the diversity of sensors available to provide initiation signals and the redundancy of the ECCS design, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 6) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, Condition H must be entered and its Required Action taken. The Required Actions do not allow placing the channel in trip since this action would either cause the initiation or it would not necessarily result in a safe state for the channel in all events.

<u>D.1, D.2.1, and D.2.2</u>

Required Action D.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same Function result in a complete loss of automatic component initiation capability for the HPCI System. Automatic component initiation capability is lost if two Function 3.d channels or two Function 3.e channels are inoperable and untripped. In this situation (loss of automatic suction swap), the 24 hour allowance of Required Actions D.2.1 and D.2.2 is not appropriate and the HPCI System must be declared inoperable within 1 hour after discovery of loss of HPCI initiation capability. As noted, Required Action D.1 is only applicable if the HPCI pump suction is not aligned to the suppression pool, since, if aligned, the Function is already performed.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action D.1, the Completion Time only begins upon discovery that the HPCI System cannot be automatically aligned to the suppression pool due to two inoperable, untripped channels in the same Function. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

BASES

ACTIONS (continued)

Because of the diversity of sensors available to provide initiation signals and the redundancy of the ECCS design, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 6) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action D.2.1 or the suction source must be aligned to the suppression pool per Required Action D.2.2. Placing the inoperable channel in trip performs the intended function of the channel (shifting the suction source to the suppression pool). Performance of either of these two Required Actions will allow operation to continue. If Required Action D.2.1 or D.2.2 is performed, measures should be taken to ensure that the HPCI System piping remains filled with water. Alternately, if it is not desired to perform Required Actions D.2.1 and D.2.2 (e.g., as in the case where shifting the suction source could drain down the HPCI suction piping), Condition H must be entered and its Required Action taken.

E.1 and E.2

Required Action E.1 is intended to ensure that appropriate actions are taken if multiple, inoperable channels within the Core Spray and Low Pressure Coolant Injection Pump Discharge Flow - Low Bypass Functions result in redundant automatic initiation capability being lost for the feature(s). For Required Action E.1, the features would be those that are initiated by Functions 1.d and 2.g (e.g., low pressure ECCS). Redundant automatic initiation capability is lost if (a) two Function 1.d channels are inoperable or (b) one or more Function 2.g channels associated with pumps in LPCI subsystem A and one or more Function 2.g channels associated with pumps in LPCI subsystem B are inoperable. Since each inoperable channel would have Required Action E.1 applied separately (refer to ACTIONS Note), each inoperable channel would only require the affected low pressure ECCS pump to be declared inoperable. However, since channels for more than one low pressure ECCS pump are inoperable, and the Completion Times started concurrently for the channels of the low pressure ECCS pumps, this results in the affected low pressure ECCS pumps being concurrently declared inoperable.

In this situation (loss of redundant automatic initiation capability), the 7 day allowance of Required Action E.2 is not appropriate and the subsystem associated with each inoperable channel must be declared inoperable within 1 hour. ~~As noted (Note 1 to Required Action E.1), Required Action E.1 is only applicable in MODES 1, 2, and 3. In MODES 4 and 5, the specific initiation time of the ECCS is not assumed~~

BASES

ACTIONS (continued)

~~and the probability of a LOCA is lower. Thus, a total loss of initiation capability for 7 days (as allowed by Required Action E.2) is allowed during MODES 4 and 5.~~ A Note is also provided (*the* Note ~~2~~ to Required Action E.1) to delineate that Required Action E.1 is only applicable to low pressure ECCS Functions. Required Action E.1 is not applicable to HPCI Function 3.f since the loss of one channel results in a loss of the Function (one-out-of-one logic). This loss was considered during the development of Reference 6 and considered acceptable for the 7 days allowed by Required Action E.2.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock."

For Required Action E.1, the Completion Time only begins upon discovery that a redundant feature in the same system (e.g., both CS subsystems) cannot be automatically initiated due to inoperable channels within the same Function as described in the paragraph above. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration of channels.

If the instrumentation that controls the pump minimum flow valve is inoperable, such that the valve will not automatically open, extended pump operation with no injection path available could lead to pump overheating and failure. If there were a failure of the instrumentation, such that the valve would not automatically close, a portion of the pump flow could be diverted from the reactor vessel injection path, causing insufficient core cooling. These consequences can be averted by the operator's manual control of the valve, which would be adequate to maintain ECCS pump protection and required flow. Furthermore, other ECCS pumps would be sufficient to complete the assumed safety function if no additional single failure were to occur. The 7 day Completion Time of Required Action E.2 to restore the inoperable channel to OPERABLE status is reasonable based on the remaining capability of the associated ECCS subsystems, the redundancy available in the ECCS design, and the low probability of a DBA occurring during the allowed out of service time. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, Condition H must be entered and its Required Action taken. The Required Actions do not allow placing the channel in trip since this action would not necessarily result in a safe state for the channel in all events.

B 3.3 INSTRUMENTATION

B 3.3.5.2A Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation (Without Setpoint Control Program)

BASES

BACKGROUND

The RPV contains penetrations below the top of the active fuel (TAF) that have the potential to drain the reactor coolant inventory to below the TAF. If the water level should drop below the TAF, the ability to remove decay heat is reduced, which could lead to elevated cladding temperatures and clad perforation. Safety Limit 2.1.1.3 requires the RPV water level to be above the top of the active irradiated fuel at all times to prevent such elevated cladding temperatures.

Technical Specifications are required by 10 CFR 50.36 to include limiting safety system settings (LSSS) for variables that have significant safety functions. LSSS are defined by the regulation as "Where a LSSS is specified for a variable on which a safety limit has been placed, the setting must be chosen so that automatic protective actions will correct the abnormal situation before a Safety Limit (SL) is exceeded." The Analytical Limit is the limit of the process variable at which a safety action is initiated to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur. The actual settings for the automatic isolation channels are the same as those established for the same functions in MODES 1, 2, and 3 in LCO 3.3.5.1, "Emergency Core Cooling System (ECCS) Instrumentation," or LCO 3.3.6.1, "Primary Containment Isolation instrumentation".

With the unit in MODE 4 or 5, RPV water inventory control is not required to mitigate any events or accidents evaluated in the safety analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material should a draining event occur. Under the definition of DRAIN TIME, some penetration flow paths may be excluded from the DRAIN TIME calculation if they will be isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the TAF when actuated by RPV water level isolation instrumentation.

BASES

BACKGROUND (continued)

The purpose of the RPV Water Inventory Control Instrumentation is to support the requirements of LCO 3.5.2, "Reactor Pressure Vessel (RPV) Water Inventory Control," and the definition of DRAIN TIME. There are functions that are required for manual initiation or operation of the ECCS injection/spray subsystem required to be OPERABLE by LCO 3.5.2 and other functions that support automatic isolation of Residual Heat Removal subsystem and Reactor Water Cleanup system penetration flow path(s) on low RPV water level.

The RPV Water Inventory Control Instrumentation supports operation of core spray (CS) and low pressure coolant injection (LPCI). The equipment involved with each of these systems is described in the Bases for LCO 3.5.2.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

With the unit in MODE 4 or 5, RPV water inventory control is not required to mitigate any events or accidents evaluated in the safety analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material should a draining event occur.

A double-ended guillotine break of the Reactor Coolant System (RCS) is not postulated in MODES 4 and 5 due to the reduced RCS pressure, reduced piping stresses, and ductile piping systems. Instead, an event is postulated in which a single operator error or initiating event allows draining of the RPV water inventory through a single penetration flow path with the highest flow rate, or the sum of the drain rates through multiple penetration flow paths susceptible to a common mode failure (e.g., seismic event, loss of normal power, single human error). It is assumed, based on engineering judgment, that while in MODES 4 and 5, one low pressure ECCS injection/spray subsystem can be manually initiated to maintain adequate reactor vessel water level.

As discussed in References 1, 2, 3, 4, and 5, operating experience has shown RPV water inventory to be significant to public health and safety. Therefore, RPV Water Inventory Control satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).

Permissive and interlock setpoints are generally considered as nominal values without regard to measurement accuracy.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

Core Spray and Low Pressure Coolant Injection Systems

1.a, 2.a. Reactor Steam Dome Pressure - Low (Injection Permissive)

Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS injection/spray subsystem manual injection functions. This function ensures that, prior to opening the injection valves of the low pressure ECCS subsystems, the reactor pressure has fallen to a value below these subsystems' maximum design pressure. While it is assured during MODES 4 and 5 that the reactor steam dome pressure will be below the ECCS maximum design pressure, the Reactor Steam Dome Pressure - Low signals are assumed to be OPERABLE and capable of permitting initiation of the ECCS.

The Reactor Steam Dome Pressure - Low signals are initiated from four pressure transmitters that sense the reactor dome pressure. The transmitters are connected to four trip units. The outputs of the trip units are connected to relays whose contacts are arranged in a one-out-of-two taken twice logic.

The Allowable Value is low enough to prevent overpressuring the equipment in the low pressure ECCS.

The four channels of Reactor Steam Dome Pressure - Low Function are required to be OPERABLE in MODES 4 and 5 when ECCS manual initiation is required to be OPERABLE by LCO 3.5.2.

1.b, 2.b. Core Spray and Low Pressure Coolant Injection Pump Discharge Flow - Low (Bypass)

The minimum flow instruments are provided to protect the associated low pressure ECCS pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow is sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump.

One flow transmitter per ECCS pump is used to detect the associated subsystems' flow rates. The logic is arranged such that each transmitter causes its associated minimum flow valve to open. The logic will close the minimum flow valve once the closure setpoint is exceeded. The LPCI minimum flow valves are time delayed such that the valves will not open for 10 seconds after the switches detect low flow. The time delay is

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

provided to limit reactor vessel inventory loss during the startup of the Residual Heat Removal (RHR) shutdown cooling mode.

The Pump Discharge Flow - Low Allowable Values are high enough to ensure that the pump flow rate is sufficient to protect the pump, yet low enough to ensure that the closure of the minimum flow valve is initiated to allow full flow into the core.

One channel of the Pump Discharge Flow - Low Function is required to be OPERABLE in MODES 4 and 5 when the associated Core Spray or LPCI pump is required to be OPERABLE by LCO 3.5.2 to ensure the pumps are capable of injecting into the Reactor Pressure Vessel when manually initiated.

<u>1.c, 2.c. Manual Initiation</u>

The Manual Initiation push button channels introduce signals into the appropriate ECCS logic to provide manual initiation capability. There is one push button for each of the CS and LPCI subsystems (i.e., two for CS and two for LPCI).

There is no Allowable Value for this Function since the channels are mechanically actuated based solely on the position of the push buttons. A channel of the Manual Initiation Function (one channel per subsystem) is required to be OPERABLE in MODES 4 and 5 when the associated ECCS subsystems are required to be OPERABLE per LCO 3.5.2.

<u>RHR System Isolation</u>

<u>3.a - Reactor Vessel Water Level - Low, Level 3</u>

The definition of Drain Time allows crediting the closing of penetration flow paths that are capable of being isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the TAF when actuated by RPV water level isolation instrumentation. The Reactor Vessel Water Level - Low, Level 3 Function associated with RHR System isolation may be credited for automatic isolation of penetration flow paths associated with the RHR System.

Reactor Vessel Water Level - Low, Level 3 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. While four channels (two channels per trip system) of the Reactor Vessel Water Level - Low, Level 3 Function are available, only two channels (all in the same trip system) are required to be OPERABLE.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The Reactor Vessel Water Level - Low, Level 3 Allowable Value was chosen to be the same as the Primary Containment Isolation Instrumentation Reactor Vessel Water Level - Low, Level 3 Allowable Value (LCO 3.3.6.1), since the capability to cool the fuel may be threatened.

The Reactor Vessel Water Level - Low, Level 3 Function is only required to be OPERABLE when automatic isolation of the associated penetration flow path is credited in calculating DRAIN TIME.

This Function isolates the Group 11 valves.

<u>Reactor Water Cleanup (RWCU) System Isolation</u>

<u>4.a - Reactor Vessel Water level - Low Low, Level 2</u>

The definition of Drain Time allows crediting the closing of penetration flow paths that are capable of being isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the TAF when actuated by RPV water level isolation instrumentation. The Reactor Vessel Water Level - Low Low, Level 2 Function associated with RWCU System isolation may be credited for automatic isolation of penetration flow paths associated with the RWCU System.

Reactor Vessel Water Level - Low Low, Level 2 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. While four channels (two channels per trip system) of the Reactor Vessel Water Level - Low, Level 2 Function are available, only two channels (all in the same trip system) are required to be OPERABLE.

The Reactor Vessel Water Level - Low Low, Level 2 Allowable Value was chosen to be the same as the ECCS Reactor Vessel Water Level - Low Low, Level 2 Allowable Value (LCO 3.3.5.1), since the capability to cool the fuel may be threatened.

The Reactor Vessel Water Level - Low Low, Level 2 Function is only required to be OPERABLE when automatic isolation of the associated penetration flow path is credited in calculating DRAIN TIME.

This Function isolates the Group 5 valves.

BASES

ACTIONS

A Note has been provided to modify the ACTIONS related to RPV Water Inventory Control instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition discovered to be inoperable or not within limits will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable RPV Water Inventory Control instrumentation channels provide appropriate compensatory measures for separate inoperable Condition entry for each inoperable RPV Water Inventory Control instrumentation channel.

A.1

Required Action A.1 directs entry into the appropriate Condition referenced in Table 3.3.5.2-1. The applicable Condition referenced in the Table is Function dependent. Each time a channel is discovered inoperable, Condition A is entered for that channel and provides for transfer to the appropriate subsequent Condition.

B.1 and B.2

RHR System Isolation, Reactor Vessel Water Level - Low Level 3, and Reactor Water Cleanup System, Reactor Vessel Water Level - Low Low, Level 2 functions are applicable when automatic isolation of the associated penetration flow path is credited in calculating Drain Time. If the instrumentation is inoperable, Required Action B.1 directs an immediate declaration that the associated penetration flow path(s) are incapable of automatic isolation. Required Action B.2 directs calculation of DRAIN TIME. The calculation cannot credit automatic isolation of the affected penetration flow paths.

BASES

ACTIONS (continued)

C.1

Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS injection/spray subsystem manual injection functions. If the permissive is inoperable, manual initiation of ECCS is prohibited. Therefore, the permissive must be placed in the trip condition within 1 hour. With the permissive in the trip condition, manual initiation may be performed. Prior to placing the permissive in the tripped condition, the operator can take manual control of the pump and the injection valve to inject water into the RPV.

The Completion Time of 1 hour is intended to allow the operator time to evaluate any discovered inoperabilities and to place the channel in trip.

D.1

If a Core Spray or Low Pressure Coolant Injection Pump Discharge Flow - Low bypass function is inoperable, there is a risk that the associated low pressure ECCS pump could overheat when the pump is operating and the associated injection valve is not fully open. In this condition, the operator can take manual control of the pump and the injection valve to ensure the pump does not overheat. If a manual initiation function is inoperable, the ECCS subsystem pumps can be started manually and the valves can be opened manually, but this is not the preferred condition.

The 24 hour Completion Time was chosen to allow time for the operator to evaluate and repair any discovered inoperabilities. The Completion Time is appropriate given the ability to manually start the ECCS pumps and open the injection valves and to manually ensure the pump does not overheat.

E.1

With the Required Action and associated Completion Time of Condition C or D not met, the associated low pressure ECCS injection/spray subsystem may be incapable of performing the intended function, and must be declared inoperable immediately.

BASES

SURVEILLANCE REQUIREMENTS

As noted in the beginning of the SRs, the SRs for each RPV Water Inventory Control instrument Function are found in the SRs column of Table 3.3.5.2-1.

SR 3.3.5.2.1

Performance of the CHANNEL CHECK ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A CHANNEL CHECK guarantees that undetected outright channel failure is limited; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL FUNCTIONAL TEST.

Agreement criteria are determined by the plant staff, based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

[The Frequency of 12 hours is based upon operating experience that demonstrates channel failure is rare.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]

The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.5.2.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests.

Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

[The Frequency of 92 days is based upon operating experience that demonstrates channel failure is rare.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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SR 3.3.5.2.3

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required initiation logic for a specific channel. The system functional testing performed in LCO 3.5.2 overlaps this Surveillance to complete testing of the assumed safety function.

[The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency.

OR

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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REFERENCES

1. Information Notice 84-81 "Inadvertent Reduction in Primary Coolant Inventory in Boiling Water Reactors During Shutdown and Startup," November 1984.

2. Information Notice 86-74, "Reduction of Reactor Coolant Inventory Because of Misalignment of RHR Valves," August 1986.

3. Generic Letter 92-04, "Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs Pursuant to 10 CFR 50.54(F), " August 1992.

4. NRC Bulletin 93-03, "Resolution of Issues Related to Reactor Vessel Water Level Instrumentation in BWRs," May 1993.

5. Information Notice 94-52, "Inadvertent Containment Spray and Reactor Vessel Draindown at Millstone 1," July 1994.

B 3.3 INSTRUMENTATION

B 3.3.5.2B Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation (With Setpoint Control Program)

BASES

BACKGROUND

The RPV contains penetrations below the top of the active fuel (TAF) that have the potential to drain the reactor coolant inventory to below the TAF. If the water level should drop below the TAF, the ability to remove decay heat is reduced, which could lead to elevated cladding temperatures and clad perforation. Safety Limit 2.1.1.3 requires the RPV water level to be above the top of the active irradiated fuel at all times to prevent such elevated cladding temperatures.

Technical Specifications are required by 10 CFR 50.36 to include limiting safety system settings (LSSS) for variables that have significant safety functions. LSSS are defined by the regulation as "Where a LSSS is specified for a variable on which a safety limit has been placed, the setting must be chosen so that automatic protective actions will correct the abnormal situation before a Safety Limit (SL) is exceeded." The Analytical Limit is the limit of the process variable at which a safety action is initiated to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur. The actual settings are identified and maintained in the Setpoint Control Program (SCP) controlled by 10 CFR 50.59.

With the unit in MODE 4 or 5, RPV water inventory control is not required to mitigate any events or accidents evaluated in the safety analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material should a draining event occur. Under the definition of DRAIN TIME, some penetration flow paths may be excluded from the DRAIN TIME calculation if they will be isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the TAF when actuated by RPV water level isolation instrumentation.

The purpose of the RPV Water Inventory Control Instrumentation is to support the requirements of LCO 3.5.2, “Reactor Pressure Vessel (RPV) Water Inventory Control,” and the definition of DRAIN TIME. There are functions that are required for manual initiation or operation of the ECCS

BASES

BACKGROUND (continued)

injection/spray subsystem required to be OPERABLE by LCO 3.5.2 and other functions that support automatic isolation of Residual Heat Removal subsystem and Reactor Water Cleanup system penetration flow path(s) on low RPV water level.

The RPV Water Inventory Control Instrumentation supports operation of core spray (CS) and low pressure coolant injection (LPCI). The equipment involved with each of these systems is described in the Bases for LCO 3.5.2.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

With the unit in MODE 4 or 5, RPV water inventory control is not required to mitigate any events or accidents evaluated in the safety analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material should a draining event occur.

A double-ended guillotine break of the Reactor Coolant System (RCS) is not postulated in MODES 4 and 5 due to the reduced RCS pressure, reduced piping stresses, and ductile piping systems. Instead, an event is postulated in which a single operator error or initiating event allows draining of the RPV water inventory through a single penetration flow path with the highest flow rate, or the sum of the drain rates through multiple penetration flow paths susceptible to a common mode failure (e.g., seismic event, loss of normal power, single human error). It is assumed, based on engineering judgment, that while in MODES 4 and 5, one low pressure ECCS injection/spray subsystem can be manually initiated to maintain adequate reactor vessel water level.

As discussed in References 1, 2, 3, 4, and 5, operating experience has shown RPV water inventory to be significant to public health and safety. Therefore, RPV Water Inventory Control satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).

Permissive and interlock setpoints are generally considered as nominal values without regard to measurement accuracy.

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Core Spray and Low Pressure Coolant Injection Systems

1.a, 2.a. Reactor Steam Dome Pressure - Low (Injection Permissive)

Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS injection/spray subsystem manual injection functions. This function ensures that, prior to opening the injection valves of the low pressure ECCS subsystems, the reactor pressure has fallen to a value below these subsystems' maximum design pressure. While it is assured during MODES 4 and 5 that the reactor steam dome pressure will be below the ECCS maximum design pressure, the Reactor Steam Dome Pressure - Low signals are assumed to be OPERABLE and capable of permitting initiation of the ECCS.

The Reactor Steam Dome Pressure - Low signals are initiated from four pressure transmitters that sense the reactor dome pressure. The transmitters are connected to four trip units. The outputs of the trip units are connected to relays whose contacts are arranged in a one-out-of-two taken twice logic.

The four channels of Reactor Steam Dome Pressure - Low Function are required to be OPERABLE in MODES 4 and 5 when ECCS manual initiation is required to be OPERABLE by LCO 3.5.2.

1.b, 2.b. Core Spray and Low Pressure Coolant Injection Pump Discharge Flow - Low (Bypass)

The minimum flow instruments are provided to protect the associated low pressure ECCS pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow is sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump.

One flow transmitter per ECCS pump is used to detect the associated subsystems' flow rates. The logic is arranged such that each transmitter causes its associated minimum flow valve to open. The logic will close the minimum flow valve once the closure setpoint is exceeded. The LPCI minimum flow valves are time delayed such that the valves will not open for 10 seconds after the switches detect low flow. The time delay is provided to limit reactor vessel inventory loss during the startup of the Residual Heat Removal (RHR) shutdown cooling mode.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

One channel of the Pump Discharge Flow - Low Function is required to be OPERABLE in MODES 4 and 5 when the associated Core Spray or LPCI pump is required to be OPERABLE by LCO 3.5.2 to ensure the pumps are capable of injecting into the Reactor Pressure Vessel when manually initiated.

1.c, 2.c. Manual Initiation

The Manual Initiation push button channels introduce signals into the appropriate ECCS logic to provide manual initiation capability. There is one push button for each of the CS and LPCI subsystems (i.e., two for CS and two for LPCI).

A channel of the Manual Initiation Function (one channel per subsystem) is required to be OPERABLE in MODES 4 and 5 when the associated ECCS subsystems are required to be OPERABLE per LCO 3.5.2.

RHR System Isolation

3.a - Reactor Vessel Water Level - Low, Level 3

The definition of DRAIN TIME allows crediting the closing of penetration flow paths that are capable of being automatically isolated by RPV water level isolation instrumentation prior to the RPV water level being equal to the TAF. The Reactor Vessel Water Level - Low, Level 3 Function associated with RHR System isolation may be credited for automatic isolation of penetration flow paths associated with the RHR System.

Reactor Vessel Water Level - Low, Level 3 signals are initiated from two channels per trip system that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. While four channels (two channels per trip system) of the Reactor Vessel Water Level - Low, Level 3 Function are available, only two channels (all in the same trip system) are required to be OPERABLE.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The Reactor Vessel Water Level - Low, Level 3 Function is only required to be OPERABLE when automatic isolation of the associated penetration flow path is credited in calculating DRAIN TIME.

This Function isolates the Group 11 valves.

Reactor Water Cleanup (RWCU) System Isolation

4.a - Reactor Vessel Water level - Low Low, Level 2

The definition of DRAIN TIME allows crediting the closing of penetration flow paths that are capable of being automatically isolated by RPV water level isolation instrumentation prior to the RPV water level being equal to the TAF. The Reactor Vessel Water Level - Low Low, Level 2 Function associated with RWCU System isolation may be credited for automatic isolation of penetration flow paths associated with the RWCU System.

Reactor Vessel Water Level - Low Low, Level 2 is initiated from two channels per trip system that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. While four channels (two channels per trip system) of the Reactor Vessel Water Level - Low, Level 2 Function are available, only two channels (all in the same trip system) are required to be OPERABLE.

The Reactor Vessel Water Level - Low Low, Level 2 Function is only required to be OPERABLE when automatic isolation of the associated penetration flow path is credited in calculating DRAIN TIME.

This Function isolates the Group 5 valves.

BASES

ACTIONS

A Note has been provided to modify the ACTIONS related to RPV Water Inventory Control instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition discovered to be inoperable or not within limits will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable RPV Water Inventory Control instrumentation channels provide appropriate compensatory measures for separate inoperable Condition entry for each inoperable RPV Water Inventory Control instrumentation channel.

<u>A.1</u>

Required Action A.1 directs entry into the appropriate Condition referenced in Table 3.3.5.2-1. The applicable Condition referenced in the Table is Function dependent. Each time a channel is discovered inoperable, Condition A is entered for that channel and provides for transfer to the appropriate subsequent Condition.

<u>B.1 and B.2</u>

RHR System Isolation, Reactor Vessel Water Level - Low Level 3, and Reactor Water Cleanup System, Reactor Vessel Water Level - Low Low, Level 2 functions are applicable when automatic isolation of the associated penetration flow path is credited in calculating Drain Time. If the instrumentation is inoperable, Required Action B.1 directs an immediate declaration that the associated penetration flow path(s) are incapable of automatic isolation. Required Action B.2 directs calculation of DRAIN TIME. The calculation cannot credit automatic isolation of the affected penetration flow paths.

BASES

ACTIONS (continued)

C.1

Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS injection/spray subsystem manual injection functions. If the permissive is inoperable, manual initiation of ECCS is prohibited. Therefore, the permissive must be placed in the trip condition within 1 hour. With the permissive in the trip condition, manual initiation may be performed. Prior to placing the permissive in the tripped condition, the operator can take manual control of the pump and the injection valve to inject water into the RPV.

The Completion Time of 1 hour is intended to allow the operator time to evaluate any discovered inoperabilities and to place the channel in trip.

D.1

If a Core Spray or Low Pressure Coolant Injection Pump Discharge Flow - Low bypass function is inoperable, there is a risk that the associated low pressure ECCS pump could overheat when the pump is operating and the associated injection valve is not fully open. In this condition, the operator can take manual control of the pump and the injection valve to ensure the pump does not overheat. If a manual initiation function is inoperable, the ECCS subsystem pumps can be started manually and the valves can be opened manually, but this is not the preferred condition.

The 24 hour Completion Time was chosen to allow time for the operator to evaluate and repair any discovered inoperabilities. The Completion Time is appropriate given the ability to manually start the ECCS pumps and open the injection valves and to manually ensure the pump does not overheat.

E.1

With the Required Action and associated Completion Time of Condition C or D not met, the associated low pressure ECCS injection/spray subsystem may be incapable of performing the intended function, and must be declared inoperable immediately.

BASES

SURVEILLANCE REQUIREMENTS

As noted in the beginning of the SRs, the SRs for each RPV Water Inventory Control instrument Function are found in the SRs column of Table 3.3.5.2-1.

SR 3.3.5.2.1

Performance of the CHANNEL CHECK ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A CHANNEL CHECK guarantees that undetected outright channel failure is limited; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL FUNCTIONAL TEST.

Agreement criteria are determined by the plant staff, based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

[The Frequency of 12 hours is based upon operating experience that demonstrates channel failure is rare.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.5.2.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests.

Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

[The Frequency of 92 days is based upon operating experience that demonstrates channel failure is rare.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]

SR 3.3.5.2.3

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required initiation logic for a specific channel. The system functional testing performed in LCO 3.5.2 overlaps this Surveillance to complete testing of the assumed safety function.

[The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency.

OR

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

REFERENCES

1. Information Notice 84-81 "Inadvertent Reduction in Primary Coolant Inventory in Boiling Water Reactors During Shutdown and Startup," November 1984.

2. Information Notice 86-74, "Reduction of Reactor Coolant Inventory Because of Misalignment of RHR Valves," August 1986.

3. Generic Letter 92-04, "Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs Pursuant to 10 CFR 50.54(F), " August 1992.

4. NRC Bulletin 93-03, "Resolution of Issues Related to Reactor Vessel Water Level Instrumentation in BWRs," May 1993.

5. Information Notice 94-52, "Inadvertent Containment Spray and Reactor Vessel Draindown at Millstone 1," July 1994.

B 3.3 INSTRUMENTATION

B 3.3.5.3~~2~~A Reactor Core Isolation Cooling (RCIC) System Instrumentation (Without Setpoint Control Program)

BASES

BACKGROUND

The purpose of the RCIC System instrumentation is to initiate actions to ensure adequate core cooling when the reactor vessel is isolated from its primary heat sink (the main condenser) and normal coolant makeup flow from the Reactor Feedwater System is unavailable, such that initiation of the low pressure Emergency Core Cooling Systems (ECCS) pumps does not occur. A more complete discussion of RCIC System operation is provided in the Bases of LCO 3.5.3, "RCIC System." This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the RCIC, as well as LCOs on other reactor system parameters and equipment performance.

Technical Specifications are required by 10 CFR 50.36 to include LSSSs for variables that have significant safety functions. LSSS are defined by the regulation as "Where a LSSS is specified for a variable on which a safety limit has been placed, the setting must be chosen so that automatic protective actions will correct the abnormal situation before a Safety Limit (SL) is exceeded." The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

-------------------------------- REVIEWER'S NOTE ----------------------------------
The term "Limiting Trip Setpoint" [LTSP] is generic terminology for the calculated trip setting (setpoint) value calculated by means of the plant specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term [LTSP] indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting.

"Nominal Trip Setpoint [NTSP]" is the suggested terminology for the actual setpoint implemented in the plant surveillance procedures where margin has been added to the calculated [LTSP]. The as-found and as-left tolerances will apply to the [NTSP] implemented in the Surveillance procedures to confirm channel performance.

BASES

BACKGROUND (continued)

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the methodology for calculating the as-left and as-found tolerances in Note b of Table 3.3.5.*3*~~2~~-1, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]" throughout these Bases.

If the [LTSP] is not included in Table 3.3.5.*3*~~2~~-1, the plant specific location for the [LTSP] or [NTSP] must be cited in Note b of Table 3.3.5.*3*~~2~~-1. The brackets indicate plant specific terms may apply, as reviewed and approved by the NRC.

The [Limiting Trip Setpoint (LTSP)] specified in Table 3.3.5.*3*~~2~~-1, is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the [LTSP] accounts for uncertainties in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the [LTSP] ensures that SLs are not exceeded. Therefore the [LTSP] meets the definition of an LSSS (Ref. 1).

The Allowable Value specified in Table 3.3.5.*3*~~2~~-1, serves as the LSSS such that a channel is OPERABLE if the trip setpoint is found not to exceed the Allowable Value. As such, the Allowable Value differs from the trip setpoint by an amount primarily equal to the expected instrument loop uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the device will still meet the LSSS definition and ensure that a SL is not exceeded at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval.

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. OPERABLE is defined in Technical Specifications as "...being capable of performing its safety function(s)." Relying solely on the [LTSP] to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel with a setting that

BASES

BACKGROUND (continued)

has been found to be different from the [LTSP] due to some drift of the setting may still be OPERABLE because drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the [LTSP] and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the protection channel. Therefore, the channel would still be OPERABLE because it would have performed its safety function and the only corrective action required would be to reset the channel within the established as-left tolerance around [LTSP] to account for further drift during the next surveillance interval. Note that, although the channel is OPERABLE under these circumstances, the trip setpoint must be left adjusted to a value within the as-left tolerance, in accordance with uncertainty assumptions stated in the referenced setpoint methodology (as-left criteria), and confirmed to be operating within the statistical allowances of the uncertainty terms assigned (as-found criteria).

However, there is also some point beyond which the channel would have not been able to perform its function due to, for example, greater than expected drift. This value needs to be specified in the Technical Specifications in order to define OPERABILITY of the channel and is designated as the Allowable Value.

If the actual setting (as-found setpoint) of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE, but degraded. The degraded condition will be further evaluated during performance of the SR. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and evaluating the channel response. If the channel is functioning as required and expected to pass the next surveillance, then the channel is OPERABLE and can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel as-found condition will be entered into the Corrective Action Program for further evaluation.

The RCIC System may be initiated by either automatic or manual means. Automatic initiation occurs for conditions of reactor vessel Low Low water level. The variable is monitored by four transmitters that are connected to four trip units. The outputs of the trip units are connected to relays whose contacts are arranged in a one-out-of-two taken twice logic arrangement. Once initiated, the RCIC logic seals in and can be reset by the operator only when the reactor vessel water level signals have cleared.

BASES

BACKGROUND (continued)

The RCIC test line isolation valve (which is also a primary containment isolation valve) is closed on a RCIC initiation signal to allow full system flow and maintain primary containment isolated in the event RCIC is not operating.

The RCIC System also monitors the water levels in the condensate storage tank (CST) and the suppression pool since these are the two sources of water for RCIC operation. Reactor grade water in the CST is the normal source. Upon receipt of a RCIC initiation signal, the CST suction valve is automatically signaled to open (it is normally in the open position) unless the pump suction from the suppression pool valves is open. If the water level in the CST falls below a preselected level, first the suppression pool suction valves automatically open, and then the CST suction valve automatically closes. Two level switches are used to detect low water level in the CST. Either switch can cause the suppression pool suction valves to open and the CST suction valve to close. The suppression pool suction valves also automatically open and the CST suction valve closes if high water level is detected in the suppression pool (one-out-of-two logic similar to the CST water level logic). To prevent losing suction to the pump, the suction valves are interlocked so that one suction path must be open before the other automatically closes.

The RCIC System provides makeup water to the reactor until the reactor vessel water level reaches the high water level (Level 8) trip (two-out-of-two logic), at which time the RCIC steam supply, steam supply bypass, and cooling water supply valves close (the injection valve also closes due to the closure of the steam supply valves). The RCIC System restarts if vessel level again drops to the low level initiation point (Level 2).

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The function of the RCIC System to provide makeup coolant to the reactor is used to respond to transient events. The RCIC System is not an Engineered Safety Feature System and no credit is taken in the safety analyses for RCIC System operation. The RCIC System instrumentation satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii). Certain instrumentation Functions are retained for other reasons and are described below in the individual Functions discussion.

Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy.

The OPERABILITY of the RCIC System instrumentation is dependent upon the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.5.3~~2~~-1. Each Function must have a required number of OPERABLE channels with their setpoints set within the setting tolerance of the [LTSPs], where appropriate. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each channel must also respond within its assumed response time.

Allowable Values are specified for each RCIC System instrumentation Function specified in Table 3.3.5.3~~2~~-1. [LTSPs] and the methodologies for calculation of the as-left and as-found tolerances are described in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. The [LTSP] are selected to ensure that the setpoints remain conservative to the as-left tolerance band between CHANNEL CALIBRATIONS. After each calibration the trip setpoint shall be left within the as-left band around the [LTSP].

[LTSPs] are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state. The analytical limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytical limits, corrected for calibration, process, and some of the instrument errors. The [LTSPs] are then determined, accounting for the remaining instrument errors (e.g., drift). The trip setpoints derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

The individual Functions are required to be OPERABLE in MODE 1, and in MODES 2 and 3 with reactor steam dome pressure > 150 psig since this is when RCIC is required to be OPERABLE. (Refer to LCO 3.5.3 for Applicability Bases for the RCIC System.)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

1. Reactor Vessel Water Level - Low Low, Level 2

Low reactor pressure vessel (RPV) water level indicates that normal feedwater flow is insufficient to maintain reactor vessel water level and that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, the RCIC System is initiated at Level 2 to assist in maintaining water level above the top of the active fuel.

Reactor Vessel Water Level - Low Low, Level 2 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel.

The Reactor Vessel Water Level - Low Low, Level 2 Allowable Value is set high enough such that for complete loss of feedwater flow, the RCIC System flow with high pressure coolant injection assumed to fail will be sufficient to avoid initiation of low pressure ECCS at Level 1.

Four channels of Reactor Vessel Water Level - Low Low, Level 2 Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure that no single instrument failure can preclude RCIC initiation. Refer to LCO 3.5.3 for RCIC Applicability Bases.

2. Reactor Vessel Water Level - High, Level 8

High RPV water level indicates that sufficient cooling water inventory exists in the reactor vessel such that there is no danger to the fuel. Therefore, the Level 8 signal is used to close the RCIC steam supply, steam supply bypass, and cooling water supply valves to prevent overflow into the main steam lines (MSLs). (The injection valve also closes due to the closure of the steam supply valve.)

Reactor Vessel Water Level - High, Level 8 signals for RCIC are initiated from two level transmitters from the narrow range water level measurement instrumentation, which sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The Reactor Vessel Water Level - High, Level 8 Allowable Value is high enough to preclude isolating the injection valve of the RCIC during normal operation, yet low enough to trip the RCIC System prior to water overflowing into the MSLs.

Two channels of Reactor Vessel Water Level - High, Level 8 Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure that no single instrument failure can preclude RCIC initiation. Refer to LCO 3.5.3 for RCIC Applicability Bases.

3. Condensate Storage Tank Level - Low

Low level in the CST indicates the unavailability of an adequate supply of makeup water from this normal source. Normally, the suction valve between the RCIC pump and the CST is open and, upon receiving a RCIC initiation signal, water for RCIC injection would be taken from the CST. However, if the water level in the CST falls below a preselected level, first the suppression pool suction valves automatically open, and then the CST suction valve (consistency) automatically closes. This ensures that an adequate supply of makeup water is available to the RCIC pump. To prevent losing suction to the pump, the suction valves are interlocked so that the suppression pool suction valves must be open before the CST suction valve automatically closes.

Two level switches are used to detect low water level in the CST. The Condensate Storage Tank Level - Low Function Allowable Value is set high enough to ensure adequate pump suction head while water is being taken from the CST.

Two channels of Condensate Storage Tank Level - Low Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure that no single instrument failure can preclude RCIC swap to suppression pool source. Refer to LCO 3.5.3 for RCIC Applicability Bases.

4. Suppression Pool Water Level - High

Excessively high suppression pool water level could result in the loads on the suppression pool exceeding design values should there be a blowdown of the reactor vessel pressure through the safety/relief valves. Therefore, signals indicating high suppression pool water level are used to transfer the suction source of RCIC from the CST to the suppression pool to eliminate the possibility of RCIC continuing to provide additional water from a source outside primary containment. This Function satisfies

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Criterion 3 of 10 CFR 50.36(c)(2)(ii). To prevent losing suction to the pump, the suction valves are interlocked so that the suppression pool suction valves must be open before the CST suction valve automatically closes.

Suppression pool water level signals are initiated from two level switches. The Allowable Value for the Suppression Pool Water Level - High Function is set low enough to ensure that RCIC will be aligned to take suction from the suppression pool before the water level reaches the point at which suppression design loads would be exceeded.

Two channels of Suppression Pool Water Level - High Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure that no single instrument failure can preclude RCIC swap to suppression pool source. Refer to LCO 3.5.3 for RCIC Applicability Bases.

5. Manual Initiation

The Manual Initiation push button switch introduces a signal into the RCIC System initiation logic that is redundant to the automatic protective instrumentation and provides manual initiation capability. There is one push button for the RCIC System.

The Manual Initiation Function is not assumed in any accident or transient analyses in the FSAR. However, the Function is retained for overall redundancy and diversity of the RCIC function as required by the NRC in the plant licensing basis.

There is no Allowable Value for this Function since the channel is mechanically actuated based solely on the position of the push button. One channel of Manual Initiation is required to be OPERABLE when RCIC is required to be OPERABLE.

ACTIONS

-----------------------------------REVIEWER'S NOTE-----------------------------------
Certain LCO Completion Times are based on approved topical reports. In order for a licensee to use the times, the licensee must justify the Completion Times as required by the staff Safety Evaluation Report (SER) for the topical report.

BASES

ACTIONS (continued)

A Note has been provided to modify the ACTIONS related to RCIC System instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition discovered to be inoperable or not within limits will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable RCIC System instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable RCIC System instrumentation channel.

A.1

Required Action A.1 directs entry into the appropriate Condition referenced in Table 3.3.5.~~2~~3-1. The applicable Condition referenced in the Table is Function dependent. Each time a channel is discovered to be inoperable, Condition A is entered for that channel and provides for transfer to the appropriate subsequent Condition.

B.1 and B.2

Required Action B.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same Function result in a complete loss of automatic initiation capability for the RCIC System. In this case, automatic initiation capability is lost if two Function 1 channels in the same trip system are inoperable and untripped. In this situation (loss of automatic initiation capability), the 24 hour allowance of Required Action B.2 is not appropriate, and the RCIC System must be declared inoperable within 1 hour after discovery of loss of RCIC initiation capability.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action B.1, the Completion Time only begins upon discovery that the RCIC System cannot be automatically initiated due to two inoperable, untripped Reactor Vessel Water Level - Low Low, Level 2 channels in the same trip system. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

BASES

ACTIONS (continued)

Because of the redundancy of sensors available to provide initiation signals and the fact that the RCIC System is not assumed in any accident or transient analysis, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 2) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action B.2. Placing the inoperable channel in trip would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. Alternately, if it is not desired to place the channel in trip (e.g., as in the case where placing the inoperable channel in trip would result in an initiation), Condition E must be entered and its Required Action taken.

C.1

A risk based analysis was performed and determined that an allowable out of service time of 24 hours (Ref. 2) is acceptable to permit restoration of any inoperable channel to OPERABLE status (Required Action C.1). A Required Action (similar to Required Action B.1) limiting the allowable out of service time, if a loss of automatic RCIC initiation capability exists, is not required. This Condition applies to the Reactor Vessel Water Level - High, Level 8 Function whose logic is arranged such that any inoperable channel will result in a loss of automatic RCIC initiation capability. As stated above, this loss of automatic RCIC initiation capability was analyzed and determined to be acceptable. This Condition also applies to the Manual Initiation Function. Since this Function is not assumed in any accident or transient analysis, a total loss of manual initiation capability (Required Action C.1) for 24 hours is allowed. The Required Action does not allow placing a channel in trip since this action would not necessarily result in a safe state for the channel in all events.

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

Required Action D.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same Function result in automatic component initiation capability being lost for the feature(s). For Required Action D.1, the RCIC System is the only associated feature. In this case, automatic initiation capability is lost if two Function 3 channels or two Function 4 channels are inoperable and untripped. In this situation (loss of automatic suction swap), the 24 hour allowance of Required Actions D.2.1 and D.2.2 is not appropriate, and the RCIC System must be declared inoperable within 1 hour from discovery

BASES

ACTIONS (continued)

of loss of RCIC initiation capability. As noted, Required Action D.1 is only applicable if the RCIC pump suction is not aligned to the suppression pool since, if aligned, the Function is already performed.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action D.1, the Completion Time only begins upon discovery that the RCIC System cannot be automatically aligned to the suppression pool due to two inoperable, untripped channels in the same Function. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

Because of the redundancy of sensors available to provide initiation signals and the fact that the RCIC System is not assumed in any accident or transient analysis, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 2) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action D.2.1, which performs the intended function of the channel (shifting the suction source to the suppression pool).

Alternatively, Required Action D.2.2 allows the manual alignment of the RCIC suction to the suppression pool, which also performs the intended function. If Required Action D.2.1 or D.2.2 is performed, measures should be taken to ensure that the RCIC System piping remains filled with water. If it is not desired to perform Required Actions D.2.1 and D.2.2 (e.g., as in the case where shifting the suction source could drain down the RCIC suction piping), Condition E must be entered and its Required Action taken.

<u>E.1</u>

With any Required Action and associated Completion Time not met, the RCIC System may be incapable of performing the intended function, and the RCIC System must be declared inoperable immediately.

SURVEILLANCE REQUIREMENTS

-----------------------------------REVIEWER'S NOTE-----------------------------------
Certain Frequencies are based on approved topical reports. In order for a licensee to use these Frequencies, the licensee must justify the Frequencies as required by the staff SER for the topical report.

BASES

SURVEILLANCE REQUIREMENTS (continued)

----------------------------------REVIEWER'S NOTE----------------------------------
Notes a and b are applied to the setpoint verification Surveillances for all RCIC System Instrumentation Functions in Table 3.3.5.~~2~~3-1 unless one or more of the following exclusions apply:

1. Manual actuation circuits, automatic actuation logic circuits or instrument functions that derive input from contacts which have no associated sensor or adjustable device, e.g., limit switches, breaker position switches, manual actuation switches, float switches, proximity detectors, etc. are excluded. In addition, those permissives and interlocks that derive input from a sensor or adjustable device that is tested as part of another TS function are excluded.

2. Settings associated with safety relief valves are excluded. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Code for Operation and Maintenance of Nuclear Power Plants testing program.

3. Functions and Surveillance Requirements which test only digital components are normally excluded. There is no expected change in result between SR performances for these components. Where separate as-left and as-found tolerance is established for digital component SRs, the requirements would apply.

A generic evaluation of RCIC System Instrumentation Functions resulted in Notes a and b being applied to the Functions shown in TS 3.3.5.3~~2~~. Each licensee adopting this change must review the list of potential Functions to identify whether any of the identified functions meet any of the exclusion criteria based on the plant specific design and safety analysis (AOOs). The footnotes applied to Function 3.3.5.3~~2~~-1.[2], Reactor Vessel Water Level - High, Level 8 are optional.

As noted in the beginning of the SRs, the SRs for each RCIC System instrument Function are found in the SRs column of Table 3.3.5.~~2~~3-1.

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours for Functions 2 and 5; and (b) for up to 6 hours for Functions 1, 3, and 4, provided the associated Function maintains trip capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required

BASES

SURVEILLANCE REQUIREMENTS (continued)

Actions taken. This Note is based on the reliability analysis (Ref. 2) assumption of the average time required to perform channel surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that the RCIC will initiate when necessary.

SR 3.3.5.3~~2~~.1

Performance of the CHANNEL CHECK ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a parameter on other similar channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined by the plant staff based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

[The Frequency of 12 hours is based upon operating experience that demonstrates channel failure is rare.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.5.3~~2~~.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.

Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

[The Frequency of 92 days is based on the reliability analysis of Reference 2.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]

SR 3.3.5.3~~2~~.3

The calibration of trip units provides a check of the actual trip setpoints. The channel must be declared inoperable if the trip setting is discovered to be less conservative than the Allowable Value specified in Table 3.3.5.3~~2~~-1. If the trip setting is discovered to be less conservative than the setting accounted for in the appropriate setpoint methodology, but is conservative with respect to the Allowable Value, the channel performance is still within the requirements of the plant safety analysis. Under these conditions, the setpoint must be readjusted to be equal to or more conservative than accounted for in the appropriate setpoint methodology.

BASES

SURVEILLANCE REQUIREMENTS (continued)

[The Frequency of 92 days is based on the reliability analysis of Reference 2.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

SR 3.3.5.3~~2~~.3 is modified by two Notes as identified in Table 3.3.5.3~~2~~-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. For channels determined to be OPERABLE but degraded, after returning the channel to service the performance of these channels will be evaluated under the plant Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures [Nominal Trip Setpoint (NTSP)], the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable. The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference].

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.5.3~~2~~.4 and SR 3.3.5.3~~2~~.5

A CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies the channel responds to the measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations consistent with the plant specific setpoint methodology.

[The Frequency of SR 3.3.5.3~~2~~.4 is based upon the assumption of a 92 day calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

The Frequency of SR 3.3.5.3~~2~~.5 is based upon the assumption of an 18 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

SR 3.3.5.3~~2~~.4 and SR 3.3.5.3~~2~~.5 are modified by two Notes as identified in Table 3.3.5.3~~2~~-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. For channels determined to be OPERABLE but degraded, after returning the channel to service the performance of these channels will be evaluated under the plant Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint

BASES

SURVEILLANCE REQUIREMENTS (continued)

more conservative than the [LTSP] is used in the plant surveillance procedures [NTSP], the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable. The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference].

SR 3.3.5.3~~2~~.6

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required initiation logic for a specific channel. The system functional testing performed in LCO 3.5.3 overlaps this Surveillance to provide complete testing of the safety function.

[The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

REFERENCES

1. Regulatory Guide 1,105, "Setpoints for Safety-Related Instrumentation," Revision 3.

2. NEDE-770-06-2, "Addendum to Bases for Changes to Surveillance Test Intervals and Allowed Out-of-Service Times for Selected Instrumentation Technical Specifications," February 1991.

B 3.3 INSTRUMENTATION

B 3.3.5.3~~2~~B Reactor Core Isolation Cooling (RCIC) System Instrumentation (With Setpoint Control Program)

BASES

BACKGROUND

The purpose of the RCIC System instrumentation is to initiate actions to ensure adequate core cooling when the reactor vessel is isolated from its primary heat sink (the main condenser) and normal coolant makeup flow from the Reactor Feedwater System is unavailable, such that initiation of the low pressure Emergency Core Cooling Systems (ECCS) pumps does not occur. A more complete discussion of RCIC System operation is provided in the Bases of LCO 3.5.3, "RCIC System." This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the RCIC, as well as LCOs on other reactor system parameters and equipment performance.

Technical Specifications are required by 10 CFR 50.36 to include LSSSs for variables that have significant safety functions. LSSS are defined by the regulation as "Where a LSSS is specified for a variable on which a safety limit has been placed, the setting must be chosen so that automatic protective actions will correct the abnormal situation before a Safety Limit (SL) is exceeded." The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

The LSSS values are identified and maintained in the Setpoint Control Program (SCP) controlled by 10 CFR 50.59.

------------------------------- REVIEWER'S NOTE ----------------------------------
The term "Limiting Trip Setpoint" [LTSP] is generic terminology for the calculated trip setting (setpoint) value calculated by means of the plant specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term [LTSP] indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting.

"Nominal Trip Setpoint [NTSP]" is the suggested terminology for the actual setpoint implemented in the plant surveillance procedures where margin has been added to the calculated [LTSP]. The as-found and as-left tolerances will apply to the [NTSP] implemented in the Surveillance procedures to confirm channel performance.

BASES

BACKGROUND (continued)

The [LTSP] and [NTSP] are located in the SCP.

The [Limiting Trip Setpoint (LTSP)] specified in the SCP, is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the [LTSP] accounts for uncertainties in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the [LTSP] ensures that SLs are not exceeded. Therefore the [LTSP] meets the definition of an LSSS (Ref. 1).

The Allowable Value specified in the SCP, serves as the LSSS such that a channel is OPERABLE if the trip setpoint is found not to exceed the Allowable Value. As such, the Allowable Value differs from the trip setpoint by an amount primarily equal to the expected instrument loop uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the device will still meet the LSSS definition and ensure that a SL is not exceeded at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval.

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. OPERABLE is defined in Technical Specifications as "...being capable of performing its safety function(s)." Relying solely on the [LTSP] to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel with a setting that has been found to be different from the [LTSP] due to some drift of the setting may still be OPERABLE because drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the [LTSP] and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the protection channel. Therefore, the channel would still be OPERABLE because it would have performed its safety function and the only corrective action required would be to reset the channel within the established as-left tolerance around [LTSP] to account for further drift during the next surveillance interval. Note that, although

BASES

BACKGROUND (continued)

the channel is OPERABLE under these circumstances, the trip setpoint must be left adjusted to a value within the as-left tolerance, in accordance with uncertainty assumptions stated in the referenced setpoint methodology (as-left criteria), and confirmed to be operating within the statistical allowances of the uncertainty terms assigned (as-found criteria).

However, there is also some point beyond which the channel would have not been able to perform its function due to, for example, greater than expected drift. This value needs to be specified in the Technical Specifications in order to define OPERABILITY of the channel and is designated as the Allowable Value.

If the actual setting (as-found setpoint) of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE, but degraded. The degraded condition will be further evaluated during performance of the SR. This evaluation will consist of resetting the channel setpoint to the [LTSP] (within the allowed tolerance), and evaluating the channel response. If the channel is functioning as required and expected to pass the next surveillance, then the channel is OPERABLE and can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel as-found condition will be entered into the Corrective Action Program for further evaluation.

The RCIC System may be initiated by either automatic or manual means. Automatic initiation occurs for conditions of reactor vessel Low Low water level. The variable is monitored by four transmitters that are connected to four trip units. The outputs of the trip units are connected to relays whose contacts are arranged in a one-out-of-two taken twice logic arrangement. Once initiated, the RCIC logic seals in and can be reset by the operator only when the reactor vessel water level signals have cleared.

The RCIC test line isolation valve (which is also a primary containment isolation valve) is closed on a RCIC initiation signal to allow full system flow and maintain primary containment isolated in the event RCIC is not operating.

The RCIC System also monitors the water levels in the condensate storage tank (CST) and the suppression pool since these are the two sources of water for RCIC operation. Reactor grade water in the CST is the normal source. Upon receipt of a RCIC initiation signal, the CST suction valve is automatically signaled to open (it is normally in the open position) unless the pump suction from the suppression pool valves is open. If the water level in the CST falls below a preselected level, first

BASES

BACKGROUND (continued)

the suppression pool suction valves automatically open, and then the CST suction valve automatically closes. Two level switches are used to detect low water level in the CST. Either switch can cause the suppression pool suction valves to open and the CST suction valve to close. The suppression pool suction valves also automatically open and the CST suction valve closes if high water level is detected in the suppression pool (one-out-of-two logic similar to the CST water level logic). To prevent losing suction to the pump, the suction valves are interlocked so that one suction path must be open before the other automatically closes.

The RCIC System provides makeup water to the reactor until the reactor vessel water level reaches the high water level (Level 8) trip (two-out-of-two logic), at which time the RCIC steam supply, steam supply bypass, and cooling water supply valves close (the injection valve also closes due to the closure of the steam supply valves). The RCIC System restarts if vessel level again drops to the low level initiation point (Level 2).

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The function of the RCIC System to provide makeup coolant to the reactor is used to respond to transient events. The RCIC System is not an Engineered Safety Feature System and no credit is taken in the safety analyses for RCIC System operation. The RCIC System instrumentation satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii). Certain instrumentation Functions are retained for other reasons and are described below in the individual Functions discussion.

Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy.

The OPERABILITY of the RCIC System instrumentation is dependent upon the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.5.~~2~~3-1. Each Function must have a required number of OPERABLE channels with their setpoints set within the setting tolerance of the [LTSPs], where appropriate. The actual setpoint is calibrated consistent with the SCP. Each channel must also respond within its assumed response time.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Allowable Values are specified for each RCIC System instrumentation Function specified in the SCP. [LTSPs] and the methodologies for calculation of the as-left and as-found tolerances are described in the SCP controlled under 10 CFR 50.59. The [LTSP] are selected to ensure that the setpoints remain conservative to the as-left tolerance band between CHANNEL CALIBRATIONS. After each calibration the trip setpoint shall be left within the as-left band around the [LTSP].

[LTSPs] are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state. The analytical limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytical limits, corrected for calibration, process, and some of the instrument errors. The [LTSPs] are then determined, accounting for the remaining instrument errors (e.g., drift). The trip setpoints derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

The individual Functions are required to be OPERABLE in MODE 1, and in MODES 2 and 3 with reactor steam dome pressure > 150 psig since this is when RCIC is required to be OPERABLE. (Refer to LCO 3.5.3 for Applicability Bases for the RCIC System.)

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

<u>1. Reactor Vessel Water Level - Low Low, Level 2</u>

Low reactor pressure vessel (RPV) water level indicates that normal feedwater flow is insufficient to maintain reactor vessel water level and that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, the RCIC System is initiated at Level 2 to assist in maintaining water level above the top of the active fuel.

Reactor Vessel Water Level - Low Low, Level 2 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The Reactor Vessel Water Level - Low Low, Level 2 Allowable Value is set high enough such that for complete loss of feedwater flow, the RCIC System flow with high pressure coolant injection assumed to fail will be sufficient to avoid initiation of low pressure ECCS at Level 1.

Four channels of Reactor Vessel Water Level - Low Low, Level 2 Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure that no single instrument failure can preclude RCIC initiation. Refer to LCO 3.5.3 for RCIC Applicability Bases.

2. Reactor Vessel Water Level - High, Level 8

High RPV water level indicates that sufficient cooling water inventory exists in the reactor vessel such that there is no danger to the fuel. Therefore, the Level 8 signal is used to close the RCIC steam supply, steam supply bypass, and cooling water supply valves to prevent overflow into the main steam lines (MSLs). (The injection valve also closes due to the closure of the steam supply valve.)

Reactor Vessel Water Level - High, Level 8 signals for RCIC are initiated from two level transmitters from the narrow range water level measurement instrumentation, which sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel.

The Reactor Vessel Water Level - High, Level 8 Allowable Value is high enough to preclude isolating the injection valve of the RCIC during normal operation, yet low enough to trip the RCIC System prior to water overflowing into the MSLs.

Two channels of Reactor Vessel Water Level - High, Level 8 Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure that no single instrument failure can preclude RCIC initiation. Refer to LCO 3.5.3 for RCIC Applicability Bases.

3. Condensate Storage Tank Level - Low

Low level in the CST indicates the unavailability of an adequate supply of makeup water from this normal source. Normally, the suction valve between the RCIC pump and the CST is open and, upon receiving a RCIC initiation signal, water for RCIC injection would be taken from the CST. However, if the water level in the CST falls below a preselected level, first the suppression pool suction valves automatically open, and then the CST suction valve (consistency) automatically closes. This

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

ensures that an adequate supply of makeup water is available to the RCIC pump. To prevent losing suction to the pump, the suction valves are interlocked so that the suppression pool suction valves must be open before the CST suction valve automatically closes.

Two level switches are used to detect low water level in the CST. The Condensate Storage Tank Level - Low Function Allowable Value is set high enough to ensure adequate pump suction head while water is being taken from the CST.

Two channels of Condensate Storage Tank Level - Low Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure that no single instrument failure can preclude RCIC swap to suppression pool source. Refer to LCO 3.5.3 for RCIC Applicability Bases.

4. Suppression Pool Water Level - High

Excessively high suppression pool water level could result in the loads on the suppression pool exceeding design values should there be a blowdown of the reactor vessel pressure through the safety/relief valves. Therefore, signals indicating high suppression pool water level are used to transfer the suction source of RCIC from the CST to the suppression pool to eliminate the possibility of RCIC continuing to provide additional water from a source outside primary containment. This Function satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii). To prevent losing suction to the pump, the suction valves are interlocked so that the suppression pool suction valves must be open before the CST suction valve automatically closes.

Suppression pool water level signals are initiated from two level switches. The Allowable Value for the Suppression Pool Water Level - High Function is set low enough to ensure that RCIC will be aligned to take suction from the suppression pool before the water level reaches the point at which suppression design loads would be exceeded.

Two channels of Suppression Pool Water Level - High Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure that no single instrument failure can preclude RCIC swap to suppression pool source. Refer to LCO 3.5.3 for RCIC Applicability Bases.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

5. Manual Initiation

The Manual Initiation push button switch introduces a signal into the RCIC System initiation logic that is redundant to the automatic protective instrumentation and provides manual initiation capability. There is one push button for the RCIC System.

The Manual Initiation Function is not assumed in any accident or transient analyses in the FSAR. However, the Function is retained for overall redundancy and diversity of the RCIC function as required by the NRC in the plant licensing basis.

There is no Allowable Value for this Function since the channel is mechanically actuated based solely on the position of the push button. One channel of Manual Initiation is required to be OPERABLE when RCIC is required to be OPERABLE.

ACTIONS

----------------------------------REVIEWER'S NOTE----------------------------------
Certain LCO Completion Times are based on approved topical reports. In order for a licensee to use the times, the licensee must justify the Completion Times as required by the staff Safety Evaluation Report (SER) for the topical report.

A Note has been provided to modify the ACTIONS related to RCIC System instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition discovered to be inoperable or not within limits will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable RCIC System instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable RCIC System instrumentation channel.

A.1

Required Action A.1 directs entry into the appropriate Condition referenced in Table 3.3.5.3~~2~~-1. The applicable Condition referenced in the Table is Function dependent. Each time a channel is discovered to be inoperable, Condition A is entered for that channel and provides for transfer to the appropriate subsequent Condition.

BASES

ACTIONS (continued)

B.1 and B.2

Required Action B.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same Function result in a complete loss of automatic initiation capability for the RCIC System. In this case, automatic initiation capability is lost if two Function 1 channels in the same trip system are inoperable and untripped. In this situation (loss of automatic initiation capability), the 24 hour allowance of Required Action B.2 is not appropriate, and the RCIC System must be declared inoperable within 1 hour after discovery of loss of RCIC initiation capability.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action B.1, the Completion Time only begins upon discovery that the RCIC System cannot be automatically initiated due to two inoperable, untripped Reactor Vessel Water Level - Low Low, Level 2 channels in the same trip system. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

Because of the redundancy of sensors available to provide initiation signals and the fact that the RCIC System is not assumed in any accident or transient analysis, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 2) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action B.2. Placing the inoperable channel in trip would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. Alternately, if it is not desired to place the channel in trip (e.g., as in the case where placing the inoperable channel in trip would result in an initiation), Condition E must be entered and its Required Action taken.

C.1

A risk based analysis was performed and determined that an allowable out of service time of 24 hours (Ref. 2) is acceptable to permit restoration of any inoperable channel to OPERABLE status (Required Action C.1). A Required Action (similar to Required Action B.1) limiting the allowable out of service time, if a loss of automatic RCIC initiation capability exists, is not required. This Condition applies to the Reactor Vessel Water Level -

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BASES

ACTIONS (continued)

High, Level 8 Function whose logic is arranged such that any inoperable channel will result in a loss of automatic RCIC initiation capability. As stated above, this loss of automatic RCIC initiation capability was analyzed and determined to be acceptable. This Condition also applies to the Manual Initiation Function. Since this Function is not assumed in any accident or transient analysis, a total loss of manual initiation capability (Required Action C.1) for 24 hours is allowed. The Required Action does not allow placing a channel in trip since this action would not necessarily result in a safe state for the channel in all events.

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

Required Action D.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same Function result in automatic component initiation capability being lost for the feature(s). For Required Action D.1, the RCIC System is the only associated feature. In this case, automatic initiation capability is lost if two Function 3 channels or two Function 4 channels are inoperable and untripped. In this situation (loss of automatic suction swap), the 24 hour allowance of Required Actions D.2.1 and D.2.2 is not appropriate, and the RCIC System must be declared inoperable within 1 hour from discovery of loss of RCIC initiation capability. As noted, Required Action D.1 is only applicable if the RCIC pump suction is not aligned to the suppression pool since, if aligned, the Function is already performed.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action D.1, the Completion Time only begins upon discovery that the RCIC System cannot be automatically aligned to the suppression pool due to two inoperable, untripped channels in the same Function. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

Because of the redundancy of sensors available to provide initiation signals and the fact that the RCIC System is not assumed in any accident or transient analysis, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 2) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action D.2.1, which performs the intended function of the channel (shifting the suction source to the suppression pool).

BASES

ACTIONS (continued)

Alternatively, Required Action D.2.2 allows the manual alignment of the RCIC suction to the suppression pool, which also performs the intended function. If Required Action D.2.1 or D.2.2 is performed, measures should be taken to ensure that the RCIC System piping remains filled with water. If it is not desired to perform Required Actions D.2.1 and D.2.2 (e.g., as in the case where shifting the suction source could drain down the RCIC suction piping), Condition E must be entered and its Required Action taken.

E.1

With any Required Action and associated Completion Time not met, the RCIC System may be incapable of performing the intended function, and the RCIC System must be declared inoperable immediately.

SURVEILLANCE REQUIREMENTS

-----------------------------------REVIEWER'S NOTE-----------------------------------
Certain Frequencies are based on approved topical reports. In order for a licensee to use these Frequencies, the licensee must justify the Frequencies as required by the staff SER for the topical report.

As noted in the beginning of the SRs, the SRs for each RCIC System instrument Function are found in the SRs column of Table 3.3.5.*3*~~2~~-1.

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours for Functions 2 and 5; and (b) for up to 6 hours for Functions 1, 3, and 4, provided the associated Function maintains trip capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Ref. 2) assumption of the average time required to perform channel surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that the RCIC will initiate when necessary.

SR 3.3.5.*3*~~2~~.1

Performance of the CHANNEL CHECK ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a parameter on other similar channels. It is based on the assumption that instrument

BASES

SURVEILLANCE REQUIREMENTS (continued)

channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined by the plant staff based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

[The Frequency of 12 hours is based upon operating experience that demonstrates channel failure is rare.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]

The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.5.~~3~~2.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions.

BASES

SURVEILLANCE REQUIREMENTS (continued)

Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

[The Frequency of 92 days is based on the reliability analysis of Reference 2.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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SR 3.3.5.3~~2~~.3

The calibration of trip units provides a check of the actual trip setpoints. The channel must be declared inoperable if the trip setting is discovered to be less conservative than the Allowable Value specified in the SCP. The test is performed in accordance with the SCP. If the actual setting of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE but degraded. The degraded condition of the channel will be further evaluated during performance of the SR. This evaluation will consist of resetting the channel setpoint to the [Nominal Trip Setpoint (NTSP)] (within the allowed tolerance), and evaluating the channel response. If the channel is functioning as required and is expected to pass the next surveillance, then the channel is OPERABLE and can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel as-found condition will be entered into the Corrective Action Program for further evaluation.

[The Frequency of 92 days is based on the reliability analysis of Reference 2.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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SR 3.3.5.~~3~~2.4 and SR 3.3.5.~~3~~2.5

A CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies the channel responds to the measured parameter within the necessary range and accuracy. The test is performed in accordance with the SCP. If the actual setting of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE but degraded. The degraded condition of the channel will be further evaluated during performance of the SR. This evaluation will consist of resetting the channel setpoint to the [NTSP] (within the allowed tolerance), and evaluating the channel response. If the channel is functioning as required and is expected to pass the next surveillance, then the channel is OPERABLE and can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel as-found condition will be entered into the Corrective Action Program for further evaluation.

[The Frequency of SR 3.3.5.~~3~~2.4 is based upon the assumption of a 92 day calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

The Frequency of SR 3.3.5.~~3~~2.5 is based upon the assumption of an 18 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.5.~~3~~2.6

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required initiation logic for a specific channel. The system functional testing performed in LCO 3.5.3 overlaps this Surveillance to provide complete testing of the safety function.

[The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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REFERENCES

1. Regulatory Guide 1,105, "Setpoints for Safety-Related Instrumentation," Revision 3.

2. NEDE-770-06-2, "Addendum to Bases for Changes to Surveillance Test Intervals and Allowed Out-of-Service Times for Selected Instrumentation Technical Specifications," February 1991.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Shutdown Cooling System Isolation

6.a. Reactor Steam Dome Pressure – High

The Reactor Steam Dome Pressure - High Function is provided to isolate the shutdown cooling portion of the Residual Heat Removal (RHR) System. This interlock is provided only for equipment protection to prevent an intersystem LOCA scenario, and credit for the interlock is not assumed in the accident or transient analysis in the FSAR.

The Reactor Steam Dome Pressure - High signals are initiated from two transmitters that are connected to different taps on the RPV. Two channels of Reactor Steam Dome Pressure - High Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function. The Function is only required to be OPERABLE in MODES 1, 2, and 3, since these are the only MODES in which the reactor can be pressurized; thus, equipment protection is needed. The Allowable Value was chosen to be low enough to protect the system equipment from overpressurization.

This Function isolates the Group 11 valves.

6.b. Reactor Vessel Water Level - Low, Level 3

Low RPV water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, isolation of some reactor vessel interfaces occurs to begin isolating the potential sources of a break. The Reactor Vessel Water Level - Low, Level 3 Function associated with RHR Shutdown Cooling System isolation is not directly assumed in safety analyses because a break of the RHR Shutdown Cooling System is bounded by breaks of the recirculation and MSL. The RHR Shutdown Cooling System isolation on Level 3 supports actions to ensure that the RPV water level does not drop below the top of the active fuel during a vessel draindown event caused by a leak (e.g., pipe break or inadvertent valve opening) in the RHR Shutdown Cooling System.

Reactor Vessel Water Level - Low, Level 3 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels (two channels per trip system) of the Reactor Vessel Water Level - Low, Level 3 Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function. ~~As noted (footnote (c) to Table 3.3.6.1-1), only two channels of~~

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

~~the Reactor Vessel Water Level - Low, Level 3 Function are required to be OPERABLE in MODES 4 and 5 (and must input into the same trip system), provided the RHR Shutdown Cooling System integrity is maintained. System integrity is maintained provided the piping is intact and no maintenance is being performed that has the potential for draining the reactor vessel through the system.~~

The Reactor Vessel Water Level - Low, Level 3 Allowable Value was chosen to be the same as the RPS Reactor Vessel Water Level - Low, Level 3 Allowable Value (LCO 3.3.1.1), since the capability to cool the fuel may be threatened.

The Reactor Vessel Water Level - Low, Level 3 Function is only required to be OPERABLE in MODE~~S~~ 3~~, 4, and 5~~ to prevent this potential flow path from lowering the reactor vessel level to the top of the fuel. In MODES 1 and 2, another isolation (i.e., Reactor Steam Dome Pressure - High) and administrative controls ensure that this flow path remains isolated to prevent unexpected loss of inventory via this flow path.

This Function isolates the Group 11 valves.

<u>Traversing Incore Probe System Isolation</u>

<u>7.a. Reactor Vessel Water Level - Low, Level 3</u>

Low RPV water level indicates that the capability to cool the fuel may be threatened. The valves whose penetrations communicate with the primary containment are isolated to limit the release of fission products. The isolation of the primary containment on Level 3 supports actions to ensure that offsite dose limits of 10 CFR 100 are not exceeded. The Reactor Vessel Water Level - Low, Level 3 Function associated with isolation is implicitly assumed in the FSAR analysis as these leakage paths are assumed to be isolated post LOCA.

Reactor Vessel Water Level - Low, Level 3 signals are initiated from level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Two channels of Reactor Vessel Water Level - Low, Level 3 Function are available and are required to be OPERABLE to ensure that no single instrument failure can initiate an inadvertent isolation actuation. The isolation function is ensured by the manual shear valve in each penetration.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Shutdown Cooling System Isolation

6.a. Reactor Steam Dome Pressure – High

The Reactor Steam Dome Pressure - High Function is provided to isolate the shutdown cooling portion of the Residual Heat Removal (RHR) System. This interlock is provided only for equipment protection to prevent an intersystem LOCA scenario, and credit for the interlock is not assumed in the accident or transient analysis in the FSAR.

The Reactor Steam Dome Pressure - High signals are initiated from two transmitters that are connected to different taps on the RPV. Two channels of Reactor Steam Dome Pressure - High Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function. The Function is only required to be OPERABLE in MODES 1, 2, and 3, since these are the only MODES in which the reactor can be pressurized; thus, equipment protection is needed. The Allowable Value was chosen to be low enough to protect the system equipment from overpressurization.

This Function isolates the Group 11 valves.

6.b. Reactor Vessel Water Level - Low, Level 3

Low RPV water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, isolation of some reactor vessel interfaces occurs to begin isolating the potential sources of a break. The Reactor Vessel Water Level - Low, Level 3 Function associated with RHR Shutdown Cooling System isolation is not directly assumed in safety analyses because a break of the RHR Shutdown Cooling System is bounded by breaks of the recirculation and MSL. The RHR Shutdown Cooling System isolation on Level 3 supports actions to ensure that the RPV water level does not drop below the top of the active fuel during a vessel draindown event caused by a leak (e.g., pipe break or inadvertent valve opening) in the RHR Shutdown Cooling System.

Reactor Vessel Water Level - Low, Level 3 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels (two channels per trip system) of the Reactor Vessel Water Level - Low, Level 3 Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function. ~~As noted (footnote (c) to Table 3.3.6.1-1), only two channels of~~

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

~~the Reactor Vessel Water Level - Low, Level 3 Function are required to be OPERABLE in MODES 4 and 5 (and must input into the same trip system), provided the RHR Shutdown Cooling System integrity is maintained. System integrity is maintained provided the piping is intact and no maintenance is being performed that has the potential for draining the reactor vessel through the system.~~

The Reactor Vessel Water Level - Low, Level 3 Allowable Value was chosen to be the same as the RPS Reactor Vessel Water Level - Low, Level 3 Allowable Value (LCO 3.3.1.1), since the capability to cool the fuel may be threatened.

The Reactor Vessel Water Level - Low, Level 3 Function is only required to be OPERABLE in MODE~~S~~ 3~~, 4, and 5~~ to prevent this potential flow path from lowering the reactor vessel level to the top of the fuel. In MODES 1 and 2, another isolation (i.e., Reactor Steam Dome Pressure - High) and administrative controls ensure that this flow path remains isolated to prevent unexpected loss of inventory via this flow path.

This Function isolates the Group 11 valves.

Traversing Incore Probe System Isolation

7.a. Reactor Vessel Water Level - Low, Level 3

Low RPV water level indicates that the capability to cool the fuel may be threatened. The valves whose penetrations communicate with the primary containment are isolated to limit the release of fission products. The isolation of the primary containment on Level 3 supports actions to ensure that offsite dose limits of 10 CFR 100 are not exceeded. The Reactor Vessel Water Level - Low, Level 3 Function associated with isolation is implicitly assumed in the FSAR analysis as these leakage paths are assumed to be isolated post LOCA.

Reactor Vessel Water Level - Low, Level 3 signals are initiated from level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Two channels of Reactor Vessel Water Level - Low, Level 3 Function are available and are required to be OPERABLE to ensure that no single instrument failure can initiate an inadvertent isolation actuation. The isolation function is ensured by the manual shear valve in each penetration.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

1. Reactor Vessel Water Level - Low Low, Level 2

Low reactor pressure vessel (RPV) water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. An isolation of the secondary containment and actuation of the SGT System are initiated in order to minimize the potential of an offsite dose release. The Reactor Vessel Water Level - Low Low, Level 2 Function is one of the Functions assumed to be OPERABLE and capable of providing isolation and initiation signals. The isolation and initiation systems on Reactor Vessel Water Level - Low Low, Level 2 support actions to ensure that any offsite releases are within the limits calculated in the safety analysis.

Reactor Vessel Water Level - Low Low, Level 2 signals are initiated from level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels of Reactor Vessel Water Level - Low Low, Level 2 Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Reactor Vessel Water Level - Low Low, Level 2 Allowable Value was chosen to be the same at the High Pressure Coolant Injection/Reactor Core Isolation Cooling (HPCI/RCIC) Reactor Vessel Water Level - Low Low, Level 2 Allowable Value (LCO 3.3.5.1 and LCO 3.3.5.3~~2~~), since this could indicate that the capability to cool the fuel is being threatened.

The Reactor Vessel Water Level - Low Low, Level 2 Function is required to be OPERABLE in MODES 1, 2, and 3 where considerable energy exists in the Reactor Coolant System (RCS); thus, there is a probability of pipe breaks resulting in significant releases of radioactive steam and gas. In MODES 4 and 5, the probability and consequences of these events are low due to the RCS pressure and temperature limitations of these MODES; thus, this Function is not required. ~~In addition, the Function is also required to be OPERABLE during operations with a potential for draining the reactor vessel (OPDRVs) because the capability of isolating potential sources of leakage must be provided to ensure that offsite dose limits are not exceeded if core damage occurs.~~

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

1. Reactor Vessel Water Level - Low Low, Level 2

Low reactor pressure vessel (RPV) water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. An isolation of the secondary containment and actuation of the SGT System are initiated in order to minimize the potential of an offsite dose release. The Reactor Vessel Water Level - Low Low, Level 2 Function is one of the Functions assumed to be OPERABLE and capable of providing isolation and initiation signals. The isolation and initiation systems on Reactor Vessel Water Level - Low Low, Level 2 support actions to ensure that any offsite releases are within the limits calculated in the safety analysis.

Reactor Vessel Water Level - Low Low, Level 2 signals are initiated from level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels of Reactor Vessel Water Level - Low Low, Level 2 Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Reactor Vessel Water Level - Low Low, Level 2 Allowable Value was chosen to be the same at the High Pressure Coolant Injection/Reactor Core Isolation Cooling (HPCI/RCIC) Reactor Vessel Water Level - Low Low, Level 2 Allowable Value (LCO 3.3.5.1 and LCO 3.3.5.*3*~~2~~), since this could indicate that the capability to cool the fuel is being threatened.

The Reactor Vessel Water Level - Low Low, Level 2 Function is required to be OPERABLE in MODES 1, 2, and 3 where considerable energy exists in the Reactor Coolant System (RCS); thus, there is a probability of pipe breaks resulting in significant releases of radioactive steam and gas. In MODES 4 and 5, the probability and consequences of these events are low due to the RCS pressure and temperature limitations of these MODES; thus, this Function is not required. ~~In addition, the Function is also required to be OPERABLE during operations with a potential for draining the reactor vessel (OPDRVs) because the capability of isolating potential sources of leakage must be provided to ensure that offsite dose limits are not exceeded if core damage occurs.~~

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Reactor Vessel Water Level - Low Low Low, Level 1 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels of Reactor Vessel Water Level - Low Low Low, Level 1 Function are available (two channels per trip system) and are required to be OPERABLE to ensure that a single instrument failure can preclude [MCREC] System initiation. The Reactor Vessel Water Level - Low Low Low, Level 1 Allowable Value was chosen to be the same as the ECCS Reactor Vessel Water Level - Low Low Low, Level 1 Allowable Value (LCO 3.3.5.1, "ECCS Instrumentation").

The Reactor Vessel Water Level - Low Low Low, Level 1 Function is required to be OPERABLE in MODES 1, 2, and 3~~, and during operations with a potential for draining the reactor vessel (OPDRVs)~~ to ensure that the control room personnel are protected during a LOCA. In MODES 4 and 5~~ at times other than OPDRVs, the probability of a vessel draindown event resulting in a release of radioactive material into the environment is minimal. In addition~~, adequate protection is performed by the Control Room Air Inlet Radiation - High Function. Therefore, this Function is not required in other MODES and specified conditions.

2. Drywell Pressure - High

High pressure in the drywell could indicate a break in the reactor coolant pressure boundary. A high drywell pressure signal could indicate a LOCA and will automatically initiate the [MCREC] System, since this could be a precursor to a potential radiation release and subsequent radiation exposure to control room personnel.

Drywell Pressure - High signals are initiated from four pressure transmitters that sense drywell pressure. Four channels of Drywell Pressure - High Function are available (two channels per trip system) and are required to be OPERABLE to ensure that no single instrument failure can preclude [MCREC] System initiation. The Drywell Pressure - High Allowable Value was chosen to be the same as the ECCS Drywell Pressure - High Allowable Value (LCO 3.3.5.1).

The Drywell Pressure - High Function is required to be OPERABLE in MODES 1, 2, and 3 to ensure that control room personnel are protected in the event of a LOCA. In MODES 4 and 5, the Drywell Pressure - High Function is not required since there is insufficient energy in the reactor to pressurize the drywell to the Drywell Pressure - High setpoint.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

3. Main Steam Line Flow - High

High main steam line (MSL) flow could indicate a break in the MSL and will automatically initiate the [MCREC] System, since this could be a precursor to a potential radiation release and subsequent radiation exposure to control room personnel.

The Main Steam Line Flow - High signals are initiated from 16 transmitters that are connected to the four MSLs. Four channels of Main Steam Line Flow - High Function for each MSL (two channels per trip system) are available and required to be OPERABLE so that no single instrument failure will preclude [MCREC] System initiation.

The Allowable Value was chosen to be the same as the Primary Containment Isolation Main Steam Line Flow - High Allowable Value (LCO 3.3.6.1, "Primary Containment Isolation Instrumentation").

The Main Steam Line Flow - High Function is required to be OPERABLE in MODES 1, 2, and 3 to ensure that control room personnel are protected during a main steam line break (MSLB) accident. In MODES 4 and 5, the reactor is depressurized; thus, MSLB protection is not required.

4. Refueling Floor Area Radiation - High

High radiation in the refueling floor area could be the result of a fuel handling accident. A refueling floor high radiation signal will automatically initiate the [MCREC] System, since this radiation release could result in radiation exposure to control room personnel.

The refueling floor area radiation equipment consists of two independent monitors and channels located in the refueling floor area. Two channels of Refueling Floor Area Radiation - High Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude [MCREC] System initiation. The Allowable Value was selected to ensure that the Function will promptly detect high activity that could threaten exposure to control room personnel.

The Refueling Floor Area Radiation - High Function is required to be OPERABLE in MODES 1, 2, and 3 and during movement of [recently] irradiated fuel assemblies in the secondary containment~~ and operations with a potential for draining the reactor vessel (OPDRVs)~~, to ensure that control room personnel are protected during a LOCA *or*~~,~~ fuel handling event~~, or vessel draindown event~~. During MODES 4 and 5, ~~when these specified conditions are not in progress (e.g., OPDRVs), ~~the probability of a LOCA is low; thus, the Function is not required. [Also due to radioactive

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

decay, this Function is only required to initiate the [MCREC] System during fuel handling accidents involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [x] days).]

5. Control Room Air Inlet Radiation - High

The control room air inlet radiation monitors measure radiation levels exterior to the inlet ducting of the MCR. A high radiation level may pose a threat to MCR personnel; thus, automatically initiating the [MCREC] System.

The Control Room Air Inlet Radiation - High Function consists of two independent monitors. Two channels of Control Room Air Inlet Radiation - High are available and are required to be OPERABLE to ensure that no single instrument failure can preclude [MCREC] System initiation. The Allowable Value was selected to ensure protection of the control room personnel.

The Control Room Air Inlet Radiation - High Function is required to be OPERABLE in MODES 1, 2, and 3 and during ~~OPDRVs and~~ movement of [recently] irradiated fuel assemblies in the secondary containment, to ensure that control room personnel are protected during a LOCA *or*~~,~~ fuel handling event~~, or vessel draindown event~~. During MODES 4 and 5, ~~when these specified conditions are not in progress (e.g., OPDRVs),~~ the probability of a LOCA is low; thus, the Function is not required. [Also due to radioactive decay, this Function is only required to initiate the [MCREC] System during fuel handling accidents involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [x] days).]

ACTIONS

----------------------------------REVIEWER'S NOTE----------------------------------
Certain LCO Completion Times are based on approved topical reports. In order for a licensee to use the times, the licensee must justify the Completion Times as required by the staff Safety Evaluation Report (SER) for the topical report.

A Note has been provided to modify the ACTIONS related to [MCREC] System instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure, with

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Reactor Vessel Water Level - Low Low Low, Level 1 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels of Reactor Vessel Water Level - Low Low Low, Level 1 Function are available (two channels per trip system) and are required to be OPERABLE to ensure that a single instrument failure can preclude [MCREC] System initiation. The Reactor Vessel Water Level - Low Low Low, Level 1 Allowable Value was chosen to be the same as the ECCS Reactor Vessel Water Level - Low Low Low, Level 1 Allowable Value (LCO 3.3.5.1, "ECCS Instrumentation").

The Reactor Vessel Water Level - Low Low Low, Level 1 Function is required to be OPERABLE in MODES 1, 2, and 3~~, and during operations with a potential for draining the reactor vessel (OPDRVs)~~ to ensure that the control room personnel are protected during a LOCA. In MODES 4 and 5~~ at times other than OPDRVs, the probability of a vessel draindown event resulting in a release of radioactive material into the environment is minimal. In addition~~, adequate protection is performed by the Control Room Air Inlet Radiation - High Function. Therefore, this Function is not required in other MODES and specified conditions.

2. Drywell Pressure - High

High pressure in the drywell could indicate a break in the reactor coolant pressure boundary. A high drywell pressure signal could indicate a LOCA and will automatically initiate the [MCREC] System, since this could be a precursor to a potential radiation release and subsequent radiation exposure to control room personnel.

Drywell Pressure - High signals are initiated from four pressure transmitters that sense drywell pressure. Four channels of Drywell Pressure - High Function are available (two channels per trip system) and are required to be OPERABLE to ensure that no single instrument failure can preclude [MCREC] System initiation. The Drywell Pressure - High Allowable Value was chosen to be the same as the ECCS Drywell Pressure - High Allowable Value (LCO 3.3.5.1).

The Drywell Pressure - High Function is required to be OPERABLE in MODES 1, 2, and 3 to ensure that control room personnel are protected in the event of a LOCA. In MODES 4 and 5, the Drywell Pressure - High Function is not required since there is insufficient energy in the reactor to pressurize the drywell to the Drywell Pressure - High setpoint.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

3. Main Steam Line Flow - High

High main steam line (MSL) flow could indicate a break in the MSL and will automatically initiate the [MCREC] System, since this could be a precursor to a potential radiation release and subsequent radiation exposure to control room personnel.

The Main Steam Line Flow - High signals are initiated from 16 transmitters that are connected to the four MSLs. Four channels of Main Steam Line Flow - High Function for each MSL (two channels per trip system) are available and required to be OPERABLE so that no single instrument failure will preclude [MCREC] System initiation.

The Allowable Value was chosen to be the same as the Primary Containment Isolation Main Steam Line Flow - High Allowable Value (LCO 3.3.6.1, "Primary Containment Isolation Instrumentation").

The Main Steam Line Flow - High Function is required to be OPERABLE in MODES 1, 2, and 3 to ensure that control room personnel are protected during a main steam line break (MSLB) accident. In MODES 4 and 5, the reactor is depressurized; thus, MSLB protection is not required.

4. Refueling Floor Area Radiation - High

High radiation in the refueling floor area could be the result of a fuel handling accident. A refueling floor high radiation signal will automatically initiate the [MCREC] System, since this radiation release could result in radiation exposure to control room personnel.

The refueling floor area radiation equipment consists of two independent monitors and channels located in the refueling floor area. Two channels of Refueling Floor Area Radiation - High Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude [MCREC] System initiation. The Allowable Value was selected to ensure that the Function will promptly detect high activity that could threaten exposure to control room personnel.

The Refueling Floor Area Radiation - High Function is required to be OPERABLE in MODES 1, 2, and 3 and during movement of [recently] irradiated fuel assemblies in the secondary containment~~ and operations with a potential for draining the reactor vessel (OPDRVs)~~, to ensure that control room personnel are protected during a LOCA *or*~~,~~ fuel handling event~~, or vessel draindown event~~. During MODES 4 and 5, ~~when these specified conditions are not in progress (e.g., OPDRVs)~~, the probability of a LOCA is low; thus, the Function is not required. [Also due to radioactive

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

decay, this Function is only required to initiate the [MCREC] System during fuel handling accidents involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [x] days).]

5. Control Room Air Inlet Radiation - High

The control room air inlet radiation monitors measure radiation levels exterior to the inlet ducting of the MCR. A high radiation level may pose a threat to MCR personnel; thus, automatically initiating the [MCREC] System.

The Control Room Air Inlet Radiation - High Function consists of two independent monitors. Two channels of Control Room Air Inlet Radiation - High are available and are required to be OPERABLE to ensure that no single instrument failure can preclude [MCREC] System initiation. The Allowable Value was selected to ensure protection of the control room personnel.

The Control Room Air Inlet Radiation - High Function is required to be OPERABLE in MODES 1, 2, and 3 and during ~~OPDRVs and~~ movement of [recently] irradiated fuel assemblies in the secondary containment, to ensure that control room personnel are protected during a LOCA *or*~~,~~ fuel handling event~~, or vessel draindown event~~. During MODES 4 and 5, ~~when these specified conditions are not in progress (e.g., OPDRVs),~~ the probability of a LOCA is low; thus, the Function is not required. [Also due to radioactive decay, this Function is only required to initiate the [MCREC] System during fuel handling accidents involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [x] days).]

ACTIONS

-----------------------------------REVIEWER'S NOTE-----------------------------------
Certain LCO Completion Times are based on approved topical reports. In order for a licensee to use the times, the licensee must justify the Completion Times as required by the staff Safety Evaluation Report (SER) for the topical report.

A Note has been provided to modify the ACTIONS related to [MCREC] System instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure, with

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS), *RPV WATER INVENTORY CONTROL, AND* ~~AND~~ REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM ~~, AND RPV WATER INVENTORY CONTROL~~

B 3.5.1 ECCS - Operating

BASES

BACKGROUND

The ECCS is designed, in conjunction with the primary and secondary containment, to limit the release of radioactive materials to the environment following a loss of coolant accident (LOCA). The ECCS uses two independent methods (flooding and spraying) to cool the core during a LOCA. The ECCS network consists of the High Pressure Coolant Injection (HPCI) System, the Core Spray (CS) System, the low pressure coolant injection (LPCI) mode of the Residual Heat Removal (RHR) System, and the Automatic Depressurization System (ADS). The suppression pool provides the required source of water for the ECCS. Although no credit is taken in the safety analyses for the condensate storage tank (CST), it is capable of providing a source of water for the HPCI and CS systems.

On receipt of an initiation signal, ECCS pumps automatically start; simultaneously, the system aligns and the pumps inject water, taken either from the CST or suppression pool, into the Reactor Coolant System (RCS) as RCS pressure is overcome by the discharge pressure of the ECCS pumps. Although the system is initiated, ADS action is delayed, allowing the operator to interrupt the timed sequence if the system is not needed. The HPCI pump discharge pressure almost immediately exceeds that of the RCS, and the pump injects coolant into the vessel to cool the core. If the break is small, the HPCI System will maintain coolant inventory as well as vessel level while the RCS is still pressurized. If HPCI fails, it is backed up by ADS in combination with LPCI and CS. In this event, the ADS timed sequence would be allowed to time out and open the selected safety/relief valves (S/RVs) depressurizing the RCS, thus allowing the LPCI and CS to overcome RCS pressure and inject coolant into the vessel. If the break is large, RCS pressure initially drops rapidly and the LPCI and CS cool the core.

Water from the break returns to the suppression pool where it is used again and again. Water in the suppression pool is circulated through a heat exchanger cooled by the RHR Service Water System. Depending on the location and size of the break, portions of the ECCS may be ineffective; however, the overall design is effective in cooling the core regardless of the size or location of the piping break. Although no credit is taken in the safety analysis for the RCIC System, it performs a similar function as HPCI, but has reduced makeup capability. Nevertheless, it will maintain inventory and cool the core while the RCS is still pressurized following a reactor pressure vessel (RPV) isolation.

LCO (continued)

realigned (remote or local) to the LPCI mode and not otherwise inoperable. Alignment and operation for decay heat removal includes when the required RHR pump is not operating or when the system is realigned from or to the RHR shutdown cooling mode. This allowance is necessary since the RHR System may be required to operate in the shutdown cooling mode to remove decay heat and sensible heat from the reactor. At these low pressures and decay heat levels, a reduced complement of ECCS subsystems should provide the required core cooling, thereby allowing operation of RHR shutdown cooling when necessary.

APPLICABILITY

All ECCS subsystems are required to be OPERABLE during MODES 1, 2, and 3, when there is considerable energy in the reactor core and core cooling would be required to prevent fuel damage in the event of a break in the primary system piping. In MODES 2 and 3, when reactor steam dome pressure is ≤ 150 psig, ADS and HPCI are not required to be OPERABLE because the low pressure ECCS subsystems can provide sufficient flow below this pressure. ~~ECCS r~~*R*equirements for MODES 4 and 5 are specified in LCO 3.5.2, "*RPV Water Inventory Control*~~ECCS - Shutdown~~."

ACTIONS

A Note prohibits the application of LCO 3.0.4.b to an inoperable HPCI subsystem 2. There is an increased risk associated with entering a MODE or other specified condition in the Applicability with an inoperable HPCI subsystem and the provisions of LCO 3.0.4.b, which allow entry into a MODE or other specified condition in the Applicability with the LCO not met after performance of a risk assessment addressing inoperable systems and components, should not be applied in this circumstance.

A.1

If any one low pressure ECCS injection/spray subsystem is inoperable, or if one LPCI pump in both LPCI subsystems is inoperable, the inoperable subsystem(s) must be restored to OPERABLE status within 7 days. In this Condition, the remaining OPERABLE subsystems provide adequate core cooling during a LOCA. However, overall ECCS reliability is reduced, because a single failure in one of the remaining OPERABLE subsystems, concurrent with a LOCA, may result in the ECCS not being able to perform its intended safety function. The 7 day Completion Time is based on a reliability study (Ref. 12) that evaluated the impact on ECCS availability, assuming various components and subsystems were taken out of service. The results were used to calculate the average availability of ECCS equipment needed to mitigate the consequences of a LOCA as a function of allowed outage times (i.e., Completion Times).

B 3.5 *EMERGENCY CORE COOLING SYSTEMS (ECCS), RPV WATER INVENTORY CONTROL, AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM* ~~*(RCIC)*EMERGENCY CORE COOLING SYSTEMS (ECCS), AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM,~~

B 3.5.2 *Reactor Pressure Vessel (RPV) Water Inventory Control* ~~ECCS - Shutdown~~

BASES

BACKGROUND

The RPV contains penetrations below the top of the active fuel (TAF) that have the potential to drain the reactor coolant inventory to below the TAF. If the water level should drop below the TAF, the ability to remove decay heat is reduced, which could lead to elevated cladding temperatures and clad perforation. Safety Limit 2.1.1.3 requires the RPV water level to be above the top of the active irradiated fuel at all times to prevent such elevated cladding temperatures.~~A description of the Core Spray (CS) System and the low pressure coolant injection (LPCI) mode of the Residual Heat Removal (RHR) System is provided in the Bases for LCO 3.5.1, "ECCS - Operating."~~

APPLICABLE SAFETY ANALYSES

With the unit in MODE 4 or 5, RPV water inventory control is not ~~The ECCS performance is evaluated for the entire spectrum of break~~ *required to mitigate any events or accidents evaluated in the safety* ~~sizes for a postulated loss of coolant accident (LOCA). The long term~~ *analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material to the environment should an unexpected draining event occur.*

A double-ended guillotine break of the Reactor Coolant System (RCS) is not postulated in MODES 4 and 5 due to the reduced RCS pressure, reduced piping stresses, and ductile piping systems. Instead, an event is considered in which single operator error or initiating event allows draining of the RPV water inventory through a single penetration flow path with the highest flow rate, or the sum of the drain rates through multiple penetration flow paths susceptible to a common mode failure (e.g., seismic event, loss of normal power, single human error). ~~cooling analysis following a design basis LOCA (Ref. 1) demonstrates that only one low pressure ECCS injection/spray subsystem is required, post LOCA, to maintain adequate reactor vessel water level in the event of an inadvertent vessel draindown.~~ It is ~~reasonable to~~ assume*d*, based on engineering ~~judgement~~*judgment*, that while in MODES 4 and 5, one low pressure ECCS injection/spray subsystem can maintain adequate reactor vessel water level. ~~To provide redundancy, a minimum of two low pressure ECCS injection/spray subsystems are required to be OPERABLE in MODES 4 and 5.~~

As discussed in References 1, 2, 3, 4, and 5, operating experience has shown RPV water inventory to be significant to public health and safety.

Therefore, RPV Water Inventory Control satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii). ~~The low pressure ECCS subsystems satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).~~

LCO

The RPV water level must be controlled in MODES 4 and 5 to ensure that if an unexpected draining event should occur, the reactor coolant water level remains above the top of the active irradiated fuel as required by Safety Limit 2.1.1.3.

BASES

LCO *(continued)*

The Limiting Condition for Operation (LCO) requires the DRAIN TIME of RPV water inventory to the TAF to be ≥ 36 hours. A DRAIN TIME of 36 hours is considered reasonable to identify and initiate action to mitigate unexpected draining of reactor coolant. An event that could cause loss of RPV water inventory and result in the RPV water level reaching the TAF in greater than 36 hours does not represent a significant challenge to Safety Limit 2.1.1.3 and can be managed as part of normal plant operation.

~~Two~~ *One* low pressure ECCS injection/spray subsystem *i*s ~~are~~ required to be OPERABLE *and capable of being manually started to provide defense-in- depth should an unexpected draining event occur*. *A*~~The~~ low pressure ECCS injection/spray subsystem~~s~~ consist*s* of *either* ~~two~~ *one* C*ore* S*pray (*CS*)* subsystem~~s~~ *or* ~~and~~ one *Low Pressure Coolant Injection (*LPCI*)* subsystem. Each CS subsystem consists of one motor driven pump, piping, and valves to transfer water from the suppression pool or condensate storage tank (CST) to the ~~reactor pressure vessel (~~RPV~~)~~. Each LPCI subsystem consists of one motor driven pump, piping, *and valves* ~~and valves~~ to transfer water from the suppression pool to the RPV. ~~Only a single LPCI subsystem is required because of the larger injection capacity in relation to a CS subsystem.~~ In MODES 4 and 5, the RHR System cross tie valve is not required to be closed.

The LCO is modified by a Note which allows a required ~~As noted, one~~ LPCI subsystem *to* ~~may~~ be considered OPERABLE during alignment and operation for decay heat removal if capable of being manually realigned (remote or local) to the LPCI mode and is not otherwise inoperable. Alignment and operation for decay heat removal includes when the required RHR pump is not operating or when the system is realigned from or to the RHR shutdown cooling mode. This allowance is necessary since the RHR System may be required to operate in the shutdown cooling mode to remove decay heat and sensible heat from the reactor. Because of *the restrictions on DRAIN TIME, sufficient time will be available following an unexpected draining event to manually align and initiate LPCI subsystem operation to maintain RPV water inventory prior to the RPV water level reaching the TAF.*~~low pressure and low temperature~~

~~BASES~~

~~LCO (continued)~~

~~conditions in MODES 4 and 5, sufficient time will be available to manually align and initiate LPCI subsystem operation to provide core cooling prior to postulated fuel uncovery.~~

APPLICABILITY

RPV water inventory control is required in MODES 4 and 5. Requirements on water inventory control in other MODES are contained in LCOs in Section 3.3, Instrumentation, and other LCOs in Section 3.5, ECCS, RCIC, and RPV Water Inventory Control. RPV water inventory control is required to protect Safety Limit 2.1.1.3 which is applicable whenever irradiated fuel is in the reactor vessel.

~~OPERABILITY of the low pressure ECCS injection/spray subsystems is required in MODES 4 and 5 to ensure adequate coolant inventory and sufficient heat removal capability for the irradiated fuel in the core in case of an inadvertent draindown of the vessel. Requirements for ECCS OPERABILITY during MODES 1, 2, and 3 are discussed in the Applicability section of the Bases for LCO 3.5.1. ECCS subsystems are not required to be OPERABLE during MODE 5 with the spent fuel storage pool gates removed and the water level maintained at ≥ 23 ft above the RPV flange. This provides sufficient coolant inventory to allow operator action to terminate the inventory loss prior to fuel uncovery in case of an inadvertent draindown.~~

~~The Automatic Depressurization System is not required to be OPERABLE during MODES 4 and 5 because the RPV pressure is ≤ 150 psig, and the CS System and the LPCI subsystems can provide core cooling without any depressurization of the primary system.~~

~~The High Pressure Coolant Injection System is not required to be OPERABLE during MODES 4 and 5 since the low pressure ECCS injection/spray subsystems can provide sufficient flow to the vessel.~~

BASES

ACTIONS

A.1 and B.*1*~~1~~

If ~~any~~ *the* ~~one~~ required low pressure ECCS injection/spray subsystem is inoperable, *it* ~~the inoperable subsystem~~ must be restored to OPERABLE status *with*in 4 hours. In this Condition, *the LCO controls on DRAIN TIME minimize the possibility that an unexpected draining event could necessitate the use of the ECCS injection/spray subsystem, however the defense-in-depth provided by the ECCS injection/spray subsystem is lost.* ~~the remaining OPERABLE subsystem can provide sufficient vessel flooding capability to recover from an inadvertent vessel draindown. However, overall system reliability is reduced because a single failure in the remaining OPERABLE subsystem concurrent with a vessel draindown could result in the ECCS not being able to perform its intended function.~~ The 4 hour Completion Time for restoring the required low pressure ECCS injection/spray subsystem to

OPERABLE status is based on engineering judgment that consider*s the LCO controls on DRAIN TIME* ~~ed the remaining available subsystem~~ and the low probability of *an unexpected draining* ~~vessel draindown~~ event *that would result in loss of RPV water inventory*.

~~With~~ *If* the inoperable *ECCS injection/spray* subsystem *is* not restored to OPERABLE status *with*in the required Completion Time, action must be *initiated* immediately ~~initiated~~ to *establish a method of water injection capable of operating without offsite electrical power. The method of water injection includes the necessary instrumentation and controls, water sources, and pumps and valves needed to add water to the RPV or refueling cavity should an unexpected draining event occur. The method of water injection may be manually initiated and may consist of one or more systems or subsystems, and must be able to access water inventory capable of maintaining the RPV water level above the TAF for ≥ 36 hours. If recirculation of injected water would occur, it may be credited in determining the necessary water volume.*~~suspend operations with a potential for draining the reactor vessel (OPDRVs) to minimize the probability of a vessel draindown and the subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.~~

~~BASES~~

~~ACTIONS (continued)~~

C.1, C.2, and C.3

With the DRAIN TIME less than 36 hours but greater than or equal to 8 hours, compensatory measures should be taken to ensure the ability to implement mitigating actions should an unexpected draining event occur. Should a draining event lower the reactor coolant level to below the TAF, there is potential for damage to the reactor fuel cladding and release of radioactive material. Additional actions are taken to ensure that radioactive material will be contained, diluted, and processed prior to being released to the environment.

The [secondary] containment provides a controlled volume in which fission products can be contained, diluted, and processed prior to release to the environment. Required Action C.1 requires verification of the capability to establish the [secondary] containment boundary in less than the DRAIN TIME. The required verification confirms actions to establish the [secondary] containment boundary are preplanned and necessary materials are available. The [secondary] containment boundary is considered established when one Standby Gas Treatment (SGT) subsystem is capable of maintaining a negative pressure in the [secondary] containment with respect to the environment. Verification that the [secondary] containment boundary can be established must be performed within 4 hours. The required verification is an administrative activity and does not require manipulation or testing of equipment.

BASES

ACTIONS (continued)

[Secondary] containment penetration flow paths form a part of the [secondary] containment boundary. Required Action C.2 requires verification of the capability to isolate each [secondary] containment penetration flow path in less than the DRAIN TIME. The required verification confirms actions to isolate the [secondary] containment penetration flow paths are preplanned and necessary materials are available. Power operated valves are not required to receive automatic isolation signals if they can be closed manually within the required time. Verification that the [secondary] containment penetration flow paths can be isolated must be performed within 4 hours. The required verification is an administrative activity and does not require manipulation or testing of equipment.

One SGT subsystem is capable of maintaining the [secondary] containment at a negative pressure with respect to the environment and filter gaseous releases. Required Action C.3 requires verification of the capability to place one SGT subsystem in operation in less than the DRAIN TIME. The required verification confirms actions to place a SGT subsystem in operation are preplanned and necessary materials are available. Verification that a SGT subsystem can be placed in operation must be performed within 4 hours. The required verification is an administrative activity and does not require manipulation or testing of equipment.

<u>D.1, D.2, D.3, and D.4</u>

With the DRAIN TIME less than 8 hours, mitigating actions are implemented in case an unexpected draining event should occur. Note that if the DRAIN TIME is less than 1 hour, Required Action E.1 is also applicable.

Required Action D.1 requires immediate action to establish an additional method of water injection augmenting the ECCS injection/spray subsystem required by the LCO. The additional method of water injection includes the necessary instrumentation and controls, water sources, and pumps and valves needed to add water to the RPV or refueling cavity should an unexpected draining event occur. The Note to Required Action D.1 states that either the ECCS injection/spray subsystem or the additional method of water injection must be capable of operating without offsite electrical power. The additional method of water injection may be manually initiated and may consist of one or more systems or subsystems. The additional method of water injection must be able to access water inventory capable of being injected to maintain the RPV water level above the TAF for ≥ 36 hours. The additional method of water ~~injection and the ECCS~~

BASES

ACTIONS (continued)

injection and the ECCS injection/spray subsystem may share all or part of the same water sources. If recirculation of injected water would occur, it may be credited in determining the required water volume.

Should a draining event lower the reactor coolant level to below the TAF, there is potential for damage to the reactor fuel cladding and release of radioactive material. Additional actions are taken to ensure that radioactive material will be contained, diluted, and processed prior to being released to the environment.

The [secondary] containment provides a control volume in~~to~~ which fission products can be contained, diluted, and processed prior to release to the environment. Required Action D.2 requires that actions be immediately initiated to establish the [secondary] containment boundary. With the [secondary] containment boundary established, one SGT subsystem is capable of maintaining a negative pressure in the [secondary] containment with respect to the environment.

The [secondary] containment penetrations form a part of the [secondary] containment boundary. Required Action D.3 requires that actions be immediately initiated to verify that each [secondary] containment penetration flow path is isolated or to verify that it can be manually isolated from the control room.

One SGT subsystem is capable of maintaining the [secondary] containment at a negative pressure with respect to the environment and filter gaseous releases. Required Action D.4 requires that actions be immediately initiated to verify that at least one SGT subsystem is capable of being placed in operation. The required verification is an administrative activity and does not require manipulation or testing of equipment.

E.1

If the Required Actions and associated Completion times of Conditions C or D are not met or if the DRAIN TIME is less than 1 hour, actions must be initiated immediately to restore the DRAIN TIME to ≥ 36 hours. In this condition, there may be insufficient time to respond to an unexpected draining event to prevent the RPV water inventory from reaching the TAF. Note that Required Actions D.1, D.2, D.3, and D.4 are also applicable when DRAIN TIME is less than 1 hour.

BASES

~~*ACTIONS (continued)*~~

~~C.1, C.2, D.1, D.2, and D.3~~

~~With both of the required ECCS injection/spray subsystems inoperable, all coolant inventory makeup capability may be unavailable. Therefore, actions must immediately be initiated to suspend OPDRVs to minimize the probability of a vessel draindown and the subsequent potential for fission product release. Actions must continue until OPDRVs are suspended. One ECCS injection/spray subsystem must also be restored to OPERABLE status within 4 hours.~~

~~If at least one low pressure ECCS injection/spray subsystem is not restored to OPERABLE status within the 4 hour Completion Time, additional actions are required to minimize any potential fission product release to the environment. This includes ensuring secondary containment is OPERABLE; one standby gas treatment subsystem is OPERABLE; and secondary containment isolation capability (i.e., one isolation valve and associated instrumentation are OPERABLE or other acceptable administrative controls to assure isolation capability) in each associated penetration flow path not isolated that is assumed to be isolated to mitigate radioactivity releases. OPERABILITY may be verified by an administrative check, or by examining logs or other information, to determine whether the components are out of service for maintenance or other reasons. It is not necessary to perform the Surveillances needed to demonstrate the OPERABILITY of the components. If, however, any required component is inoperable, then it must be restored to OPERABLE status. In this case, the Surveillance may need to be performed to restore the component to OPERABLE status. Actions must continue until all required components are OPERABLE.~~

~~The 4 hour Completion Time to restore at least one low pressure ECCS injection/spray subsystem to OPERABLE status ensures that prompt action will be taken to provide the required cooling capacity or to initiate actions to place the plant in a condition that minimizes any potential fission product release to the environment.~~

SURVEILLANCE REQUIREMENTS

SR 3.5.2.1~~ and SR 3.5.2.2~~

This Surveillance verifies that the DRAIN TIME of RPV water inventory to the TAF is ≥ 36 hours. The period of 36 hours is considered reasonable to identify and initiate action to mitigate draining of reactor coolant. Loss of RPV water inventory that would result in the RPV water level reaching the TAF in greater than 36 hours does not represent a significant challenge to Safety Limit 2.1.1.3 and can be managed as part of normal plant operation.

The definition of DRAIN TIME states that realistic cross-sectional areas and drain rates are used in the calculation. A realistic drain rate may be determined using a single, step-wise, or integrated calculation considering the changing RPV water level during a draining event. For a Control Rod RPV penetration flow path with the Control Rod Drive Mechanism removed and not replaced with a blank flange, the realistic cross-sectional area is based on the control rod blade seated in the control rod guide tube. If the control rod blade will be raised from the penetration to adjust or verify seating of the blade, the exposed cross-sectional area of the RPV penetration flow path is used.

The definition of DRAIN TIME excludes from the calculation those penetration flow paths connected to an intact closed system, or isolated by manual or automatic valves that are locked, sealed, or otherwise secured in the closed position, blank flanges, or other devices that prevent flow of reactor coolant through the penetration flow paths. A blank flange or other bolted device must be connected with a sufficient number of bolts to prevent draining in the event of an Operating Basis Earthquake. Normal or expected leakage from closed systems or past isolation devices is permitted. Determination that a system is intact and closed or isolated must consider the status of branch lines and ongoing plant maintenance and testing activities.

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Residual Heat Removal (RHR) Shutdown Cooling System is only considered an intact closed system when misalignment issues (Reference 6) have been precluded by functional valve interlocks or by isolation devices, such that redirection of RPV water out of an RHR subsystem is precluded. Further, RHR Shutdown Cooling System is only considered an intact closed system if its controls have not been transferred to Remote Shutdown, which disables the interlocks and isolation signals.

The exclusion of penetration flow paths from the determination of DRAIN TIME must consider the potential effects of a single operator error or initiating event on items supporting maintenance and testing (rigging, scaffolding, temporary shielding, piping plugs, snubber removal, freeze seals, etc.). If failure of such items could result and would cause a draining event from a closed system or between the RPV and the isolation device, the penetration flow path may not be excluded from the DRAIN TIME calculation.

Surveillance Requirement 3.0.1 requires SRs to be met between performances. Therefore, any changes in plant conditions that would change the DRAIN TIME requires that a new DRAIN TIME be determined.

[The Frequency of 12 hours is sufficient in view of indications of RPV water level available to the operator .

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

SR 3.5.2.2 and SR 3.5.2.3

The minimum water level of [12 ft 2 inches] required for the suppression pool is periodically verified to ensure that the suppression pool will provide adequate net positive suction head (NPSH) for the CS *subsystem* ~~System and~~ *or* LPCI subsystem pump~~s~~, recirculation volume, and vortex

prevention. With the suppression pool water level less than the required limit, ~~all~~ *the* ~~*required*~~ ~~ECCS injection/spray subsystems~~ *is* ~~are inoperable unless they are aligned to an OPERABLE CST.~~

BASES

SURVEILLANCE REQUIREMENTS (continued)

required ECCS injection/spray subsystem is inoperable unless aligned to an OPERABLE CST.

~~the as a water sourceWhen suppression pool level is < [12 ft 2 inches],~~ *T*~~t~~he *required* CS System is ~~considered~~ OPERABLE only if it can take suction from the CST, and the CST water level is sufficient to provide the required NPSH for the CS pump. Therefore, a verification that either the suppression pool water level is ≥ [12 ft 2 inches] or that ~~one~~ *a required* CS subsystem is aligned to take suction from the CST and the CST contains ≥ [150,000] gallons of water, equivalent to *[*12*]* ft, ensures that the CS subsystem can supply at least [50,000] gallons of makeup water to the RPV. The CS suction is uncovered at the [100,000] gallon level. ~~However, as noted, only one required CS subsystem may take credit for the CST option during OPDRVs. During OPDRVs, the volume in the CST may not provide adequate makeup if the RPV were completely drained. Therefore, only one CS subsystem is allowed to use the CST. This ensures the other required ECCS subsystem has adequate makeup volume.~~

[The 12 hour Frequency of these SRs was developed considering operating experience related to suppression pool and CST water level variations ~~and instrument drift during the applicable MODES~~. Furthermore, the 12 hour Frequency is considered adequate in view of other indications available in the control room, including alarms, to alert the operator to an abnormal suppression pool or CST water level condition.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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SR 3.5.2.4

The flow path piping has the potential to develop voids and pockets of entrained air. Maintaining the pump discharge lines of the required ECCS injection/spray subsystems full of water ensures that the ECCS subsystem will perform properly. This may also prevent a water hammer

following an ECCS initiation signal. One acceptable method of ensuring that the lines are full is to vent at the high points. [The 31 day Frequency is based on the gradual nature of void buildup in the ECCS piping, the procedural controls governing system operation, and operating experience.

OR

~~*The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.*~~

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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SR 3.5.2.*5*~~4~~

Verifying the correct alignment for manual, power operated, and automatic valves in the *required* ECCS *subsystem* flow path~~s~~ provides assurance that the *proper* flow paths will *be available* ~~exist~~ for ECCS operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these valves were verified to be in the correct position prior to locking, sealing, or securing. A valve that receives an initiation signal is allowed to be in a nonaccident position provided the valve will automatically reposition in the proper stroke time. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of potentially being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves. [The 31 day Frequency is appropriate because the valves are operated under procedural control and the probability of their being mispositioned during this time period is low.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.2.6

Verifying that the required ECCS injection/spray subsystem can be manually started and operate for at least 10 minutes demonstrates that the subsystem is available to mitigate a draining event. Testing the ECCS injection/spray subsystem through the recirculation line is necessary to avoid overfilling the refueling cavity. The minimum operating time of 10 minutes was based on engineering judgement. [The performance frequency of 92 days is consistent with similar at-power testing required by SR 3.5.1.7.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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SR 3.5.2.7

Verifying that each valve credited for automatically isolating a penetration flow path actuates to the isolation position on an actual or simulated RPV water level isolation signal is required to prevent RPV water inventory from dropping below the TAF should an unexpected draining event occur. [The [18] month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown these components usually pass the Surveillance when performed at the [18] month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency

description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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SR 3.5.2.8

The required ECCS subsystem is required to actuate on a manual initiation signal. This Surveillance verifies that a manual initiation signal will cause the required CS subsystems or LPCI subsystem to start and operate as designed, including pump startup and actuation of all automatic valves to their required positions.

[The [18] month Frequency is based on the need to perform the Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power.

Operating experience has shown that these components usually pass the SR when performed at the [18] month Frequency, which is based on the refueling cycle. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

~~SR 3.5.2.3, SR 3.5.2.5, and SR 3.5.2.6~~

~~The Bases provided for SR 3.5.1.1, SR 3.5.1.7, and SR 3.5.1.10 are applicable to SR 3.5.2.3, SR 3.5.2.5, and SR 3.5.2.6, respectively.~~

BASES

SURVEILLANCE REQUIREMENTS (continued)

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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This SR is modified by a Note that excludes vessel injection/spray during the Surveillance. Since all active components are testable and full flow can be demonstrated by recirculation through the test line, coolant injection into the RPV is not required during the Surveillance.

REFERENCES

1. ~~FSAR, Section [6.3.2].~~*Information Notice 84-81 "Inadvertent Reduction in Primary Coolant Inventory in Boiling Water Reactors During Shutdown and Startup," November 1984.*

2. *Information Notice 86-74, "Reduction of Reactor Coolant Inventory Because of Misalignment of RHR Valves," August 1986.*

3. *Generic Letter 92-04, "Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs Pursuant to 10 CFR 50.54(F), " August 1992.*

4. *NRC Bulletin 93-03, "Resolution of Issues Related to Reactor Vessel Water Level Instrumentation in BWRs," May 1993.*

5. *Information Notice 94-52, "Inadvertent Containment Spray and Reactor Vessel Draindown at Millstone 1," July 1994.*

6. *General Electric Service Information Letter No. 388, "RHR Valve Misalignment During Shutdown Cooling Operation for BWR 3/4/5/6," February 1983.*

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS), RPV WATER INVENTORY CONTROL, AND ~~AND~~ REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM~~, AND RPV WATER INVENTORY CONTROL~~

B 3.5.3 RCIC System

BASES

BACKGROUND

The RCIC System is not part of the ECCS; however, the RCIC System is included with the ECCS section because of their similar functions.

The RCIC System is designed to operate either automatically or manually following reactor pressure vessel (RPV) isolation accompanied by a loss of coolant flow from the feedwater system to provide adequate core cooling and control of the RPV water level. Under these conditions, the High Pressure Coolant Injection (HPCI) and RCIC systems perform similar functions. The RCIC System design requirements ensure that the criteria of Reference 1 are satisfied.

The RCIC System (Ref. 2) consists of a steam driven turbine pump unit, piping, and valves to provide steam to the turbine, as well as piping and valves to transfer water from the suction source to the core via the feedwater system line, where the coolant is distributed within the RPV through the feedwater sparger. Suction piping is provided from the condensate storage tank (CST) and the suppression pool. Pump suction is normally aligned to the CST to minimize injection of suppression pool water into the RPV. However, if the CST water supply is low, or the suppression pool level is high, an automatic transfer to the suppression pool water source ensures a water supply for continuous operation of the RCIC System. The steam supply to the turbine is piped from a main steam line upstream of the associated inboard main steam line isolation valve.

The RCIC System is designed to provide core cooling for a wide range of reactor pressures [165 psig to 1155 psig]. Upon receipt of an initiation signal, the RCIC turbine accelerates to a specified speed. As the RCIC flow increases, the turbine control valve is automatically adjusted to maintain design flow. Exhaust steam from the RCIC turbine is discharged to the suppression pool. A full flow test line is provided to route water from and to the CST to allow testing of the RCIC System during normal operation without injecting water into the RPV.

The RCIC pump is provided with a minimum flow bypass line, which discharges to the suppression pool. The valve in this line automatically open to prevent pump damage due to overheating when other discharge line valves are closed. To ensure rapid delivery of water to the RPV and to minimize water hammer effects, the RCIC System discharge piping is kept full of water. The RCIC System is normally aligned to the CST. The height of water in the CST is sufficient to maintain the piping full of water

BASES

BACKGROUND (continued)

up to the first isolation valve. The relative height of the feedwater line connection for RCIC is such that the water in the feedwater lines keeps the remaining portion of the RCIC discharge line full of water. Therefore, RCIC does not require a "keep fill" system.

APPLICABLE SAFETY ANALYSES

The function of the RCIC System is to respond to transient events by providing makeup coolant to the reactor. The RCIC System is not an Engineered Safety Feature System and no credit is taken in the safety analyses for RCIC System operation. The RCIC System satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).

LCO

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

APPLICABILITY

The RCIC System is required to be OPERABLE during MODE 1, and MODES 2 and 3 with reactor steam dome pressure > 150 psig, since RCIC is the primary non-ECCS water source for core cooling when the reactor is isolated and pressurized. In MODES 2 and 3 with reactor steam dome pressure ≤ 150 psig, *the low pressure ECCS injection/spray subsystems can provide sufficient flow to the RPV. In*~~and in~~ MODES 4 and 5, RCIC is not required to be OPERABLE since *RPV water inventory control is required by LCO 3.5.2, "RPV Water Level Inventory Control."*~~. "the low pressure ECCS injection/spray subsystems can provide sufficient flow to the RPV~~.

ACTIONS

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

A.1 and A.2

If the RCIC System is inoperable during MODE 1, or MODE 2 or 3 with reactor steam dome pressure > [150] psig, and the HPCI System is verified to be OPERABLE, the RCIC System must be restored to OPERABLE status within 14 days. In this Condition, loss of the RCIC System will not affect the overall plant capability to provide makeup inventory at high reactor pressure since the HPCI System is the only high pressure system assumed to function during a loss of coolant accident

APPLICABLE SAFETY ANALYSES (continued)

purge valve due to failure in the control circuit associated with each valve. The primary containment purge valve design precludes a single failure from compromising the primary containment boundary as long as the system is operated in accordance with this LCO.]

PCIVs satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

PCIVs form a part of the primary containment boundary. The PCIV safety function is related to minimizing the loss of reactor coolant inventory and establishing the primary containment boundary during a DBA.

The power operated, automatic isolation valves are required to have isolation times within limits and actuate on an automatic isolation signal. The [18] inch purge valves must be maintained sealed closed [or blocked to prevent full opening]. While the reactor building-to-suppression chamber vacuum breakers isolate primary containment penetrations, they are excluded from this Specification. Controls on their isolation function are adequately addressed in LCO 3.6.1.7, "Reactor Building-to-Suppression Chamber Vacuum Breakers." The valves covered by this LCO are listed with their associated stroke times in Reference 2.

The normally closed PCIVs are considered OPERABLE when manual valves are closed or open in accordance with appropriate administrative controls, automatic valves are de-activated and secured in their closed position, blind flanges are in place, and closed systems are intact. These passive isolation valves and devices are those listed in Reference 2.

Purge valves with resilient seals, secondary bypass valves, MSIVs, and hydrostatically tested valves must meet additional leakage rate requirements. Other PCIV leakage rates are addressed by LCO 3.6.1.1, "Primary Containment," as Type B or C testing.

This LCO provides assurance that the PCIVs will perform their designed safety functions to minimize the loss of reactor coolant inventory and establish the primary containment boundary during accidents.

APPLICABILITY

In MODES 1, 2, and 3, a DBA could cause a release of radioactive material to primary containment. In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODES. Therefore, ~~most~~ PCIVs are not required to be OPERABLE and the primary containment purge valves are not required to be sealed closed in MODES 4 and 5. Certain valves, however, are required to be OPERABLE *when* ~~to prevent inadvertent reactor vessel draindown. These valves are those whose~~ *the* associated

BASES

ACTIONS (continued)

[G.1~~, H.1, ~~and H.1~~2~~

If any Required Action and associated Completion Time cannot be met, the unit must be placed in a condition in which the LCO does not apply. If applicable, movement of [recently] irradiated fuel assemblies must be immediately suspended. Suspension of these activities shall not preclude completion of movement of a component to a safe condition. Also, if applicable, action must be immediately initiated ~~to suspend operations with a potential for draining the reactor vessel (OPDRVs) to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until OPDRVs are suspended and valve(s) are restored to OPERABLE status. If suspending an OPDRV would result in closing the residual heat removal (RHR) shutdown cooling isolation valves, an alternative Required Action is provided to immediately initiate action~~ to restore the valve(s) to OPERABLE status. This allows RHR to remain in service while actions are being taken to restore the valve.]

SURVEILLANCE REQUIREMENTS

[SR 3.6.1.3.1

Each [18] inch primary containment purge valve is required to be verified sealed closed. This SR is designed to ensure that a gross breach of primary containment is not caused by an inadvertent or spurious opening of a primary containment purge valve. Detailed analysis of the purge valves failed to conclusively demonstrate their ability to close during a LOCA in time to limit offsite doses. Primary containment purge valves that are sealed closed must have motive power to the valve operator removed. This can be accomplished by de-energizing the source of electric power or removing the air supply to the valve operator. In this application, the term "sealed" has no connotation of leak tightness. [The 31 day Frequency is a result of an NRC initiative, Generic Issue B-24 (Ref. 5) related to primary containment purge valve use during unit operations.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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BASES

LCO

A limit that suppression pool water level be ≥ [12 ft 2 inches] and ≤ [12 ft 6 inches] is required to ensure that the primary containment conditions assumed for the safety analyses are met. Either the high or low water level limits were used in the safety analyses, depending upon which is more conservative for a particular calculation.

APPLICABILITY

In MODES 1, 2, and 3, a DBA would cause significant loads on the primary containment. In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations in these MODES. The requirements for maintaining suppression pool water level within limits in MODE 4 or 5 is addressed in LCO 3.5.2, "*RPV Water Inventory Control*~~ECCS-Shutdown~~."

ACTIONS

A.1

With suppression pool water level outside the limits, the conditions assumed for the safety analyses are not met. If water level is below the minimum level, the pressure suppression function still exists as long as main vents are covered, HPCI and RCIC turbine exhausts are covered, and S/RV quenchers are covered. If suppression pool water level is above the maximum level, protection against overpressurization still exists due to the margin in the peak containment pressure analysis and the capability of the Drywell Spray System. Therefore, continued operation for a limited time is allowed. The 2 hour Completion Time is sufficient to restore suppression pool water level to within limits. Also, it takes into account the low probability of an event impacting the suppression pool water level occurring during this interval.

B.1 and B.2

If suppression pool water level cannot be restored to within limits within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 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.

BASES

LCO

An OPERABLE [secondary] containment provides a control volume into which fission products that bypass or leak from primary containment, or are released from the reactor coolant pressure boundary components located in [secondary] containment, can be diluted and processed prior to release to the environment. For the [secondary] containment to be considered OPERABLE, it must have adequate leak tightness to ensure that the required vacuum can be established and maintained.

APPLICABILITY

In MODES 1, 2, and 3, a LOCA could lead to a fission product release to primary containment that leaks to [secondary] containment. Therefore, [secondary] containment OPERABILITY is required during the same operating conditions that require primary containment OPERABILITY.

In MODES 4 and 5, the probability and consequences of the LOCA are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining [secondary] containment OPERABLE is not required in MODE 4 or 5 to ensure a control volume, except for other situations for which significant releases of radioactive material can be postulated, such as during ~~operations with a potential for draining the reactor vessel (OPDRVs) or during~~ movement of [recently] irradiated fuel assemblies in the [secondary] containment. [Due to radioactive decay, secondary containment is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days).]

----------------------------------REVIEWER'S NOTE----------------------------------
The addition of the term "recently" associated with handling irradiated fuel in all of the containment function Technical Specification requirements is only applicable to those licensees who have demonstrated by analysis that after sufficient radioactive decay has occurred, off-site doses resulting from a fuel handling accident remain below the Standard Review Plan limits (well within 10 CFR 100).

Additionally, licensees adding the term "recently" must make the following commitment which is consistent with NUMARC 93-01, Revision 4, Section 11.3.6.5, "Safety Assessment for Removal of Equipment from Service During Shutdown Conditions," subheading "Containment - Secondary (BWR)."

"The following guidelines are included in the assessment of systems removed from service during movement of irradiated fuel:

BASES

ACTIONS (continued)

If [secondary] containment cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which overall plant risk is minimized. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours.

Remaining in the Applicability of the LCO is acceptable because the plant risk in MODE 3 is similar to or lower than the risk in MODE 4 (Ref. 3), because the time spent in MODE 3 to perform the necessary repairs to restore the system to OPERABLE status will be short. However, voluntary entry into MODE 4 may be made as it is also an acceptable low-risk state.

Required Action B.1 is modified by a Note that states that LCO 3.0.4.a is not applicable when entering MODE 3. This Note prohibits the use of LCO 3.0.4.a to enter MODE 3 during startup with the LCO not met. However, there is no restriction on the use of LCO 3.0.4.b, if applicable, because LCO 3.0.4.b requires performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering MODE 3, and establishment of risk management actions, if appropriate. LCO 3.0.4 is not applicable to, and the Note does not preclude, changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS or that are part of a shutdown of the unit.

The allowed Completion Time is reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

C.1 ~~and C.2~~

Movement of [recently] irradiated fuel assemblies in the [secondary] containment ~~and OPDRVs~~ can be postulated to cause significant fission product release to the [secondary] containment. In such cases, the [secondary] containment is the only barrier to release of fission products to the environment. Therefore, movement of [recently] irradiated fuel assemblies must be immediately suspended if the [secondary] containment is inoperable.

Suspension of these activities shall not preclude completing an action that involves moving a component to a safe position. ~~Also, action must be immediately initiated to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.~~

BASES

LCO

SCIVs form a part of the [secondary] containment boundary. The SCIV safety function is related to control of offsite radiation releases resulting from DBAs.

The power operated, automatic isolation valves are considered OPERABLE when their isolation times are within limits and the valves actuate on an automatic isolation signal. The valves covered by this LCO, along with their associated stroke times, are listed in Reference 3.

The normally closed isolation valves or blind flanges are considered OPERABLE when manual valves are closed or open in accordance with appropriate administrative controls, automatic SCIVs are de-activated and secured in their closed position, and blind flanges are in place. These passive isolation valves or devices are listed in Reference 3.

APPLICABILITY

In MODES 1, 2, and 3, a DBA could lead to a fission product release to the primary containment that leaks to the [secondary] containment. Therefore, the OPERABILITY of SCIVs is required.

In MODES 4 and 5, the probability and consequences of these events are reduced due to pressure and temperature limitations in these MODES. Therefore, maintaining SCIVs OPERABLE is not required in MODE 4 or 5, except for other situations under which significant radioactive releases can be postulated, such as ~~during operations with a potential for draining the reactor vessel (OPDRVs) or~~ during movement of [recently] irradiated fuel assemblies in the [secondary] containment. Moving [recently] irradiated fuel assemblies in the [secondary] containment may also occur in MODES 1, 2, and 3. [Due to radioactive decay, SCIVs are only required to be OPERABLE during fuel handling involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days).]

ACTIONS

The ACTIONS are modified by three Notes. The first Note allows penetration flow paths to be unisolated intermittently under administrative controls. These controls consist of stationing a dedicated operator, who is in continuous communication with the control room, at the controls of the isolation device. In this way, the penetration can be rapidly isolated when a need for [secondary] containment isolation is indicated.

The second Note provides clarification that for the purpose of this LCO separate Condition entry is allowed for each penetration flow path. This is acceptable, since the Required Actions for each Condition provide appropriate compensatory actions for each inoperable SCIV. Complying with the Required Actions may allow for continued operation, and subsequent inoperable SCIVs are governed by subsequent Condition entry and application of associated Required Actions.

BASES

ACTIONS (continued)

B.1

With two SCIVs in one or more penetration flow paths inoperable, the affected penetration flow path must be isolated within 4 hours. The method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and de-activated automatic valve, a closed manual valve, and a blind flange. The 4 hour Completion Time is reasonable considering the time required to isolate the penetration and the probability of a DBA, which requires the SCIVs to close, occurring during this short time, is very low.

The Condition has been modified by a Note stating that Condition B is only applicable to penetration flow paths with two isolation valves. This clarifies that only Condition A is entered if one SCIV is inoperable in each of two penetrations.

C.1 and C.2

If any Required Action and associated Completion Time cannot be met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 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.

D.1 ~~and D.2~~

If any Required Action and associated Completion Time are not met, the plant must be placed in a condition in which the LCO does not apply. If applicable, the movement of [recently] irradiated fuel assemblies in the [secondary] containment must be immediately suspended. Suspension of these activities shall not preclude completion of movement of a component to a safe position~~. Also, if applicable, actions must be immediately initiated to suspend OPDRVs in order to minimize the probability of a vessel draindown and the subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.~~

Required Action D.1 has been modified by a Note stating that LCO 3.0.3 is not applicable. If moving [recently] irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving fuel

BACKGROUND (continued)

The SGT System automatically starts and operates in response to actuation signals indicative of conditions or an accident that could require operation of the system. Following initiation, both charcoal filter train fans start. Upon verification that both subsystems are operating, the redundant subsystem is normally shut down.

APPLICABLE SAFETY ANALYSES

The design basis for the SGT System is to mitigate the consequences of a loss of coolant accident and fuel handling accidents [involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days)] (Ref. 2). For all events analyzed, the SGT System is shown to be automatically initiated to reduce, via filtration and adsorption, the radioactive material released to the environment.

The SGT System satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Following a DBA, a minimum of one SGT subsystem is required to maintain the [secondary] containment at a negative pressure with respect to the environment and to process gaseous releases. Meeting the LCO requirements for two OPERABLE subsystems ensures operation of at least one SGT subsystem in the event of a single active failure.

APPLICABILITY

In MODES 1, 2, and 3, a DBA could lead to a fission product release to primary containment that leaks to secondary containment. Therefore, SGT System OPERABILITY is required during these MODES.

In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining the SGT System in OPERABLE status is not required in MODE 4 or 5, except for other situations under which significant releases of radioactive material can be postulated, such as ~~during operations with a potential for draining the reactor vessel (OPDRVs) or~~ during movement of [recently] irradiated fuel assemblies in the [secondary] containment. [Due to radioactive decay, the SGT System is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days).]

ACTIONS

A.1

With one SGT subsystem inoperable, the inoperable subsystem must be restored to OPERABLE status in 7 days. In this Condition, the remaining OPERABLE SGT subsystem is adequate to perform the required radioactivity release control function. However, the overall system reliability is reduced because a single failure in the OPERABLE

ACTIONS (continued)

The allowed Completion Time is reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

C.1 *and*~~,~~ C.2~~.1, and C.2.2~~

During movement of [recently] irradiated fuel assemblies, in the [secondary] containment ~~or during OPDRVs~~, when Required Action A.1 cannot be completed within the required Completion Time, the OPERABLE SGT subsystem should immediately be placed in operation. This action ensures that the remaining subsystem is OPERABLE, that no failures that could prevent automatic actuation have occurred, and that any other failure would be readily detected.

An alternative to Required Action C.1 is to immediately suspend activities that represent a potential for releasing a significant amount of radioactive material to the [secondary] containment, thus placing the plant in a condition that minimizes risk. If applicable, movement of [recently] irradiated fuel assemblies must immediately be suspended. Suspension of these activities must not preclude completion of movement of a component to a safe position. ~~Also, if applicable, actions must immediately be initiated to suspend OPDRVs in order to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.~~

The Required Actions of Condition C have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving [recently] irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving [recently] irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of [recently] irradiated fuel assemblies would not be a sufficient reason to require a reactor shutdown.

D.1

-----------------------------------REVIEWER'S NOTE -----------------------------------
Adoption of a MODE 3 end state requires the licensee to make the following commitments:

1. [LICENSEE] will follow the guidance established in Section 11 of NUMARC 93-01, "Industry Guidance for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Nuclear Management and Resource Council, Revision 3, July 2000.

BASES

ACTIONS (continued)

2. [LICENSEE] will follow the guidance established in TSTF-IG-05-02, Implementation Guidance for TSTF-423, Revision 2, "Technical Specifications End States, NEDC-32988-A," November 2009.

If both SGTS subsystems are inoperable in MODE 1, 2, or 3, the SGT system may not be capable of supporting the required radioactivity release control function. Therefore, the plant must be brought to a MODE in which overall plant risk is minimized. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours.

Remaining in the Applicability of the LCO is acceptable because the plant risk in MODE 3 is similar to or lower than the risk in MODE 4 (Ref. 3) and because the time spent in MODE 3 to perform the necessary repairs to restore the system to OPERABLE status will be short. However, voluntary entry into MODE 4 may be made as it is also an acceptable low-risk state.

Required Action D.1 is modified by a Note that states that LCO 3.0.4.a is not applicable when entering MODE 3. This Note prohibits the use of LCO 3.0.4.a to enter MODE 3 during startup with the LCO not met. However, there is no restriction on the use of LCO 3.0.4.b, if applicable, because LCO 3.0.4.b requires performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering MODE 3, and establishment of risk management actions, if appropriate. LCO 3.0.4 is not applicable to, and the Note does not preclude, changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS or that are part of a shutdown of the unit.

The allowed Completion Time is reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

E.1 ~~and E.2~~

When two SGT subsystems are inoperable, if applicable, movement of [recently] irradiated fuel assemblies in [secondary] containment must immediately be suspended. Suspension of these activities shall not preclude completion of movement of a component to a safe position. ~~Also, if applicable, actions must immediately be initiated to suspend OPDRVs in order to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.~~

BASES

LCO (continued)

b. HEPA filter and charcoal adsorbers are not excessively restricting flow and are capable of performing their filtration functions, and

c. Heater, demister, ductwork, valves, and dampers are OPERABLE, and air circulation can be maintained.

In order for the [MCREC] subsystems to be considered OPERABLE, the CRE boundary must be maintained such that the CRE occupant dose from a large radioactive release does not exceed the calculated dose in the licensing basis consequence analyses for DBAs, and that CRE occupants are protected from hazardous chemicals and smoke.

The LCO is modified by a Note allowing the CRE boundary to be opened intermittently under administrative controls. This Note only applies to openings in the CRE boundary that can be rapidly restored to the design condition, such as doors, hatches, floor plugs, and access panels. For entry and exit through doors, the administrative control of the opening is performed by the person(s) entering or exiting the area. For other openings, these controls should be proceduralized and consist of stationing a dedicated individual at the opening who is in continuous communication with the operators in the CRE. This individual will have a method to rapidly close the opening and to restore the CRE boundary to a condition equivalent to the design condition when a need for CRE isolation is indicated.

APPLICABILITY

In MODES 1, 2, and 3, the [MCREC] System must be OPERABLE to ensure that the CRE will remain habitable during and following a DBA, since the DBA could lead to a fission product release.

In MODES 4 and 5, the probability and consequences of a DBA are reduced because of the pressure and temperature limitations in these MODES. Therefore, maintaining the [MCREC] System OPERABLE is not required in MODE 4 or 5, except ~~for the following situations under which significant radioactive releases can be postulated:~~

~~a. During operations with a potential for draining the reactor vessel (OPDRVs) and~~

~~b.~~ *d*~~D~~uring movement of [recently] irradiated fuel assemblies in the [secondary] containment. [Due to radioactive decay, the MCREC System is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days).]

BASES

ACTIONS (continued)

D.1~~,~~ *and* D.2~~.1 and D.2.2~~

The Required Actions of Condition D are modified by a Note indicating that LCO 3.0.3 does not apply. If moving [recently] irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, inability to suspend movement of [recently] irradiated fuel assemblies is not sufficient reason to require a reactor shutdown.

During movement of [recently] irradiated fuel assemblies in the [secondary] containment~~ or during OPDRVs~~, if the inoperable [MCREC] subsystem cannot be restored to OPERABLE status within the required Completion Time, the OPERABLE [MCREC] subsystem may be placed in the pressurization mode. This action ensures that the remaining subsystem is OPERABLE, that no failures that would prevent automatic actuation will occur, and that any active failure will be readily detected.

[Required Action D.1 is modified by a Note alerting the operator to [place the system in the toxic gas protection mode if the toxic gas protection mode automatic transfer capability is inoperable.]

An alternative to Required Action D.1 is to immediately suspend activities that present a potential for releasing radioactivity that might require isolation of the CRE. This places the unit in a condition that minimizes the accident risk.

If applicable, movement of [recently] irradiated fuel assemblies in the [secondary] containment must be suspended immediately. Suspension of these activities shall not preclude completion of movement of a component to a safe position. ~~Also, if applicable, actions must be initiated immediately to suspend OPDRVs to minimize the probability of a vessel draindown and the subsequent potential for fission product release. Actions must continue until the OPDRVs are suspended.~~

E.1

-----------------------------------REVIEWER'S NOTE-----------------------------------
Adoption of a MODE 3 end state requires the licensee to make the following commitments:

1. [Licensee] will follow the guidance established in Section 11 of NUMARC 93-01, "Industry Guidance for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Nuclear Management and Resource Council, Revision 3, July 2000.

ACTIONS (continued)

2. [Licensee] will follow the guidance established in TSTF-IG-05-02, Implementation Guidance for TSTF-423, Revision 2, "Technical Specifications End States, NEDC-32988-A," November 2009.

If both [MCREC] subsystems are inoperable in MODE 1, 2, or 3 for reasons other than an inoperable CRE boundary (i.e., Condition B), the [MCREC] System may not be capable of performing the intended function. Therefore, the plant must be brought to a MODE in which overall plant risk is minimized. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours.

Remaining in the Applicability of the LCO is acceptable because the plant risk in MODE 3 is similar to or lower than the risk in MODE 4 (Ref. 7) and because the time spent in MODE 3 to perform the necessary repairs to restore the system to OPERABLE status will be short. However, voluntary entry into MODE 4 may be made as it is also an acceptable low-risk state.

Required Action E.1 is modified by a Note that states that LCO 3.0.4.a is not applicable when entering MODE 3. This Note prohibits the use of LCO 3.0.4.a to enter MODE 3 during startup with the LCO not met. However, there is no restriction on the use of LCO 3.0.4.b, if applicable, because LCO 3.0.4.b requires performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering MODE 3, and establishment of risk management actions, if appropriate. LCO 3.0.4 is not applicable to, and the Note does not preclude, changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS or that are part of a shutdown of the unit.

The allowed Completion Time is reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

<u>F.1 ~~and F.2~~</u>

The Required Actions of Condition F are modified by a Note indicating that LCO 3.0.3 does not apply. If moving [recently] irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, inability to suspend movement of [recently] irradiated fuel assemblies is not sufficient reason to require a reactor shutdown.

BASES

ACTIONS (continued)

During movement of [recently] irradiated fuel assemblies in the [secondary] containment~~ or during OPDRVs~~, with two [MCREC] subsystems inoperable or with one or more [MCREC] subsystems inoperable due to an inoperable CRE boundary, action must be taken immediately to suspend activities that present a potential for releasing radioactivity that might require isolation of the CRE. This places the unit in a condition that minimizes the accident risk.

If applicable, movement of [recently] irradiated fuel assemblies in the [secondary] containment must be suspended immediately. Suspension of these activities shall not preclude completion of movement of a component to a safe position. ~~If applicable, actions must be initiated immediately to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until the OPDRVs are suspended.~~

SURVEILLANCE REQUIREMENTS

SR 3.7.4.1

This SR verifies that a subsystem in a standby mode starts on demand and continues to operate. Standby systems should be checked periodically to ensure that they start and function properly. As the environmental and normal operating conditions of this system are not severe, testing each subsystem once every month provides an adequate check on this system. Monthly heater operation dries out any moisture that has accumulated in the charcoal as a result of humidity in the ambient air. [Systems with heaters must be operated for ≥ 10 continuous hours with the heaters energized. Systems without heaters need only be operated for ≥ 15 minutes to demonstrate the function of the system.] [Furthermore, the 31 day Frequency is based on the known reliability of the equipment and the two subsystem redundancy available.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]

BASES

LCO (continued)

The [Control Room AC] System is considered OPERABLE when the individual components necessary to maintain the control room temperature are OPERABLE in both subsystems. These components include the cooling coils, fans, chillers, compressors, ductwork, dampers, and associated instrumentation and controls.

APPLICABILITY

In MODE 1, 2, or 3, the [Control Room AC] System must be OPERABLE to ensure that the control room temperature will not exceed equipment OPERABILITY limits following control room isolation.

In MODES 4 and 5, the probability and consequences of a Design Basis Accident are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining the [Control Room AC] System OPERABLE is not required in MODE 4 or 5, except ~~for the following situations under which significant radioactive releases can be postulated:~~

~~a. During operations with a potential for draining the reactor vessel (OPDRVs) and~~

~~b. D~~*d*uring movement of [recently] irradiated fuel assemblies in the [secondary] containment. [Due to radioactive decay, the Control Room AC System is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days).]

ACTIONS

A.1

With one [control room AC] subsystem inoperable, the inoperable [control room AC] subsystem must be restored to OPERABLE status within 30 days. With the unit in this condition, the remaining OPERABLE [control room AC] subsystem is adequate to perform the control room air conditioning function. However, the overall reliability is reduced because a single failure in the OPERABLE subsystem could result in loss of the control room air conditioning function. The 30 day Completion Time is based on the low probability of an event occurring requiring control room isolation, the consideration that the remaining subsystem can provide the required protection, and the availability of alternate safety and nonsafety cooling methods.

B.1 and B.2

If both [control room AC] subsystems are inoperable, the [Control Room AC] System may not be capable of performing its intended function. Therefore, the control room area temperature is required to be monitored to ensure that temperature is being maintained low enough that

ACTIONS (continued)

other specified conditions in the Applicability that are required to comply with ACTIONS or that are part of a shutdown of the unit.

The allowed Completion Time is reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

D.1~~,~~ *and*D.2~~.1, and D.2.2~~

The Required Actions of Condition D are modified by a Note indicating that LCO 3.0.3 does not apply. If moving [recently] irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, inability to suspend movement of [recently] irradiated fuel assemblies is not sufficient reason to require a reactor shutdown.

During movement of [recently] irradiated fuel assemblies in the [secondary] containment~~ or during OPDRVs~~, if Required Action A.1 cannot be completed within the required Completion Time, the OPERABLE [control room AC] subsystem may be placed immediately in operation. This action ensures that the remaining subsystem is OPERABLE, that no failures that would prevent actuation will occur, and that any active failure will be readily detected.

An alternative to Required Action D.1 is to immediately suspend activities that present a potential for releasing radioactivity that might require isolation of the control room. This places the unit in a condition that minimizes risk.

If applicable, movement of [recently] irradiated fuel assemblies in the [secondary] containment must be suspended immediately. Suspension of these activities shall not preclude completion of movement of a component to a safe position. ~~Also, if applicable, actions must be initiated immediately to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until the OPDRVs are suspended.~~

E.1 ~~and E.2~~

The Required Actions of Condition E are modified by a Note indicating that LCO 3.0.3 does not apply. If moving [recently] irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, inability to suspend movement of

BASES

ACTIONS (continued)

[recently] irradiated fuel assemblies is not a sufficient reason to require a reactor shutdown.

During movement of [recently] irradiated fuel assemblies in the [secondary] containment~~ or during OPDRVs~~, if Required Actions B.1 and B.2 cannot be met within the required Completion Times, action must be taken to immediately suspend activities that present a potential for releasing radioactivity that might require isolation of the control room. This places the unit in a condition that minimizes risk.

If applicable, handling of [recently] irradiated fuel in the [secondary] containment must be suspended immediately. Suspension of these activities shall not preclude completion of movement of a component to a safe position. ~~Also, if applicable, actions must be initiated immediately to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until the OPDRVs are suspended.~~

SURVEILLANCE REQUIREMENTS

SR 3.7.5.1

This SR verifies that the heat removal capability of the system is sufficient to remove the control room heat load assumed in the [safety analyses]. The SR consists of a combination of testing and calculation. [The [18] month Frequency is appropriate since significant degradation of the [Control Room AC] System is not expected over this time period.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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REFERENCES

1. FSAR, Section [6.4].

2. NEDC-32988-A, Revision 2, Technical Justification to Support Risk-Informed Modification to Selected Required End States for BWR Plants, December 2002.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.2 AC Sources - Shutdown

BASES

BACKGROUND	A description of the AC sources is provided in the Bases for LCO 3.8.1, "AC Sources - Operating."

APPLICABLE SAFETY ANALYSES

The OPERABILITY of the minimum AC sources during MODES 4 and 5 and during movement of [recently] irradiated fuel assemblies ensures that:

a. The facility can be maintained in the shutdown or refueling condition for extended periods,

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status, and

c. Adequate AC electrical power is provided to mitigate events postulated during shutdown, such as ~~an inadvertent draindown of the vessel or~~ a fuel handling accident [involving handling recently irradiated fuel. Due to radioactive decay, AC electrical power is only required to mitigate fuel handling accidents involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days)].

In general, when the unit is shut down the Technical Specifications requirements ensure that the unit has the capability to mitigate the consequences of postulated accidents. However, assuming a single failure and concurrent loss of all offsite or loss of all onsite power is not required. The rationale for this is based on the fact that many Design Basis Accidents (DBAs) that are analyzed in MODES 1, 2, and 3 have no specific analyses in MODES 4 and 5. Worst case bounding events are deemed not credible in MODES 4 and 5 because the energy contained within the reactor pressure boundary, reactor coolant temperature and pressure, and corresponding stresses result in the probabilities of occurrences significantly reduced or eliminated, and minimal consequences. These deviations from DBA analysis assumptions and design requirements during shutdown conditions are allowed by the LCO for required systems.

During MODES 1, 2, and 3, various deviations from the analysis assumptions and design requirements are allowed within the ACTIONS. This allowance is in recognition that certain testing and

BASES

APPLICABLE SAFETY ANALYSES (continued)

maintenance activities must be conducted, provided an acceptable level of risk is not exceeded. During MODES 4 and 5, performance of a significant number of required testing and maintenance activities is also required. In MODES 4 and 5, the activities are generally planned and administratively controlled. Relaxations from typical MODES 1, 2, and 3 LCO requirements are acceptable during shutdown MODES, based on:

a. The fact that time in an outage is limited. This is a risk prudent goal as well as a utility economic consideration.

b. Requiring appropriate compensatory measures for certain conditions. These may include administrative controls, reliance on systems that do not necessarily meet typical design requirements applied to systems credited in operation MODE analyses, or both.

c. Prudent utility consideration of the risk associated with multiple activities that could affect multiple systems.

d. Maintaining, to the extent practical, the ability to perform required functions (even if not meeting MODES 1, 2, and 3 OPERABILITY requirements) with systems assumed to function during an event.

In the event of an accident during shutdown, this LCO ensures the capability of supporting systems necessary for avoiding immediate difficulty, assuming either a loss of all offsite power or a loss of all onsite (diesel generator (DG)) power.

The AC sources satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

One offsite circuit capable of supplying the onsite Class 1E power distribution subsystem(s) of LCO 3.8.10, "Distribution Systems - Shutdown," ensures that all required loads are powered from offsite power. An OPERABLE DG, associated with a Distribution System Engineered Safety Feature (ESF) bus required OPERABLE by LCO 3.8.10, ensures that a diverse power source is available for providing electrical power support assuming a loss of the offsite circuit. Together, OPERABILITY of the required offsite circuit and DG ensures the availability of sufficient AC sources to operate the plant in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents [involving handling recently irradiated fuel] ~~and reactor vessel draindown~~). Automatic initiation of the required DG during shutdown conditions is specified in ~~LCO 3.3.5.1, “ECCS Instrumentation,” and~~ LCO 3.3.8.1, “LOP Instrumentation.”

BASES

LCO (continued)

The qualified offsite circuit(s) must be capable of maintaining rated frequency and voltage while connected to their respective ESF bus(es), and of accepting required loads during an accident. Qualified offsite circuits are those that are described in the FSAR and are part of the licensing basis for the unit. [The offsite circuit consists of incoming breaker and disconnect to the 2C or 2D startup auxiliary transformer (SAT), associated 2C or 2D SAT, and the respective circuit path including feeder breakers to all 4.16 kV ESF buses required by LCO 3.8.10.]

The required DG must be capable of starting, accelerating to rated speed and voltage, connecting to its respective ESF bus on detection of bus undervoltage, and accepting required loads. This sequence must be accomplished within [12] seconds. Each DG must also be capable of accepting required loads within the assumed loading sequence intervals, and must continue to operate until offsite power can be restored to the ESF buses. These capabilities are required to be met from a variety of initial conditions such as DG in standby with engine hot and DG in standby with engine at ambient conditions. Additional DG capabilities must be demonstrated to meet required Surveillances, e.g., capability of the DG to revert to standby status on an ECCS signal while operating in parallel test mode.

Proper sequencing of loads, including tripping of nonessential loads, is a required function for DG OPERABILITY. [In addition, proper sequence operation is an integral part of offsite circuit OPERABILITY since its inoperability impacts the ability to start and maintain energized loads required OPERABLE by LCO 3.8.10.]

It is acceptable for divisions to be cross tied during shutdown conditions, permitting a single offsite power circuit to supply all required divisions. No fast transfer capability is required for offsite circuits to be considered OPERABLE.

APPLICABILITY

The AC sources are required to be OPERABLE in MODES 4 and 5 and during movement of [recently] irradiated fuel assemblies in the secondary containment to provide assurance that:

a. Systems *that provide core cooling* ~~providing adequate coolant inventory makeup~~ are available ~~for the irradiated fuel assemblies in the core in case of an inadvertent draindown of the reactor vessel~~,

b. Systems needed to mitigate a fuel handling accident [involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days)] are available,

BASES

APPLICABILITY (continued)

c. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available, and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

AC power requirements for MODES 1, 2, and 3 are covered in LCO 3.8.1.

ACTIONS

LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Entering LCO 3.0.3, while in MODE 1, 2, or 3 would require the unit to be shutdown unnecessarily.

A.1

An offsite circuit is considered inoperable if it is not available to one required ESF division. If two or more ESF 4.16 kV buses are required per LCO 3.8.10, one division with offsite power available may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS, *and* [recently] irradiated fuel movement~~, and operations with a potential for draining the reactor vessel~~. By the allowance of the option to declare required features inoperable with no offsite power available, appropriate restrictions can be implemented in accordance with the affected required feature(s) LCOs' ACTIONS.

A.2.1, A.2.2, A.2.3, ~~A.2.4,~~ B.1, B.2, ~~B.3,~~ and B.~~3~~4

With the offsite circuit not available to all required divisions, the option still exists to declare all required features inoperable. Since this option may involve undesired administrative efforts, the allowance for sufficiently conservative actions is made. With the required DG inoperable, the minimum required diversity of AC power sources is not available. It is, therefore, required to suspend CORE ALTERATIONS, *and* movement of [recently] irradiated fuel assemblies in the [secondary] containment~~, and activities that could result in inadvertent draining of the reactor vessel~~.

BASES

ACTIONS (continued)

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required AC sources and to continue this action until restoration is accomplished in order to provide the necessary AC power to the plant safety systems.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required AC electrical power sources should be completed as quickly as possible in order to minimize the time during which the plant safety systems may be without sufficient power.

Pursuant to LCO 3.0.6, the Distribution System ACTIONS would not be entered even if all AC sources to it are inoperable, resulting in de-energization. Therefore, the Required Actions of Condition A have been modified by a Note to indicate that when Condition A is entered with no AC power to any required ESF bus, ACTIONS for LCO 3.8.10 must be immediately entered. This Note allows Condition A to provide requirements for the loss of the offsite circuit whether or not a division is de-energized. LCO 3.8.10 provides the appropriate restrictions for the situation involving a de-energized division.

SURVEILLANCE REQUIREMENTS

SR 3.8.2.1

SR 3.8.2.1 requires the SRs from LCO 3.8.1 that are necessary for ensuring the OPERABILITY of the AC sources in other than MODES 1, 2, and 3. SR 3.8.1.8 is not required to be met since only one offsite circuit is required to be OPERABLE. SR 3.8.1.17 is not required to be met because the required OPERABLE DG(s) is not required to undergo periods of being synchronized to the offsite circuit. SR 3.8.1.20 is excepted because starting independence is not required with the DG(s) that is not required to be OPERABLE. Refer to the corresponding Bases for LCO 3.8.1 for a discussion of each SR.

This SR is modified by two Notes. The reason for Note 1 is to preclude requiring the OPERABLE DG(s) from being paralleled with the offsite power network or otherwise rendered inoperable during the performance of SRs, and to preclude deenergizing a required 4160 V ESF bus or disconnecting a required offsite circuit during performance of SRs. With limited AC sources available, a single event could compromise both the required circuit and the DG. It is the intent that these SRs must still be capable of being met, but actual performance is not required during

BASES

SURVEILLANCE REQUIREMENTS (continued)

periods when the DG and offsite circuit is required to be OPERABLE. Note 2 states that SRs 3.8.1.12 and 3.8.1.19 are not required to be met when its associated ECCS subsystem(s) are not required to be OPERABLE. These SRs demonstrate the DG response to an ECCS signal (ether alone or in conjunction with a loss-of-power signal). This is consistent with the ECCS instrumentation requirements that do not require the ECCS signals when the ECCS System is not required to be OPERABLE ~~per LCO 3.5.2, "ECCS-Shutdown~~.~~"~~

REFERENCES None.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.5 DC Sources - Shutdown

BASES

BACKGROUND

A description of the DC sources is provided in the Bases for LCO 3.8.4, "DC Sources - Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident and transient analyses in the FSAR, Chapter [6] (Ref. 1) and Chapter [15] (Ref. 2), assume that Engineered Safety Feature systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the diesel generators (DGs), emergency auxiliaries, and control and switching during all MODES of operation.

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the minimum DC electrical power sources during MODES 4 and 5 and during movement of [recently] irradiated fuel assemblies ensures that:

a. The facility can be maintained in the shutdown or refueling condition for extended periods,

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status, and

c. Adequate DC electrical power is provided to mitigate events postulated during shutdown, such as ~~an inadvertent draindown of the vessel or~~ a fuel handling accident [involving handling recently irradiated fuel. Due to radioactive decay, DC electrical power is only required to mitigate fuel handling accidents involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days)].

In general, when the unit is shut down, the Technical Specifications requirements ensure that the unit has the capability to mitigate the consequences of postulated accidents. However, assuming a single failure and concurrent loss of all offsite or all onsite power is not required. The rationale for this is based on the fact that many Design Basis Accidents (DBAs) that are analyzed in MODES 1, 2, and 3 have no specific analyses in MODES 4 and 5. Worst case bounding events are deemed not credible in MODES 4 and 5 because the energy contained within the reactor pressure boundary, reactor coolant temperature and pressure, and the corresponding stresses result in the probabilities of occurrence being significantly reduced or eliminated, and in minimal

BASES

APPLICABLE SAFETY ANALYSES (continued)

consequences. These deviations from DBA analysis assumptions and design requirements during shutdown conditions are allowed by the LCO for required systems.

The shutdown Technical Specification requirements are designed to ensure that the unit has the capability to mitigate the consequences of certain postulated accidents. Worst case DBAs which are analyzed for operating MODES are generally viewed not to be a significant concern during shutdown MODES due to the lower energies involved. The Technical Specifications therefore require a lesser complement of electrical equipment to be available during shutdown than is required during operating MODES. More recent work completed on the potential risks associated with shutdown, however, have found significant risk associated with certain shutdown evolutions. As a result, in addition to the requirements established in the Technical Specifications, the industry has adopted NUMARC 91-06, "Guidelines for Industry Actions to Assess Shutdown Management," as an Industry initiative to manage shutdown tasks and associated electrical support to maintain risk at an acceptable low level. This may require the availability of additional equipment beyond that required by the shutdown Technical Specifications.

The DC sources satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The DC electrical power subsystems - with: 1) [each required] [the required] station service DC subsystem consisting of two 125 V batteries in series, two battery chargers, and the corresponding control equipment and interconnecting cabling; and 2) [each required] [the required] DG DC subsystem consisting of one battery bank, one battery charger, and the corresponding control equipment and interconnecting cabling - [are] [is] required to be OPERABLE to support [required] [one] DC distribution subsystem[s] [required OPERABLE by LCO 3.8.10, "Distribution Systems - Shutdown."] This requirement ensures the availability of sufficient DC electrical power sources to operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents [involving handling recently irradiated fuel] ~~and inadvertent reactor vessel draindown~~).

APPLICABILITY

The DC electrical power sources required to be OPERABLE in MODES 4 and 5 and during movement of [recently] irradiated fuel assemblies in the secondary containment provide assurance that:

a. Required features to provide *core cooling* ~~adequate coolant inventory makeup~~ are available ~~for the irradiated fuel assemblies in the core in case of an inadvertent draindown of the reactor vessel~~,

BASES

ACTIONS (continued)

Required Action A.2 requires that the battery float current be verified as less than or equal to [2] amps. This indicates that, if the battery had been discharged as the result of the inoperable battery charger, it has now been fully recharged. If at the expiration of the initial [12] hour period the battery float current is not less than or equal to [2] amps this indicates there may be additional battery problems and the battery must be declared inoperable.

----------------------------------REVIEWER'S NOTE-----------------------------------
Any licensee wishing to adopt a Completion Time greater than 72 hours for Required Action A.3 will need to demonstrate that the Completion Time is appropriate for the plant in accordance with the guidance in Regulatory Guide (RG) 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications." Otherwise, the 72 hour Completion Time must be adopted.

Required Action A.3 limits the restoration time for the inoperable battery charger to [72] hours. This action is applicable if an alternate means of restoring battery terminal voltage to greater than or equal to the minimum established float voltage has been used (e.g., balance of plant non-Class 1E battery charger). The [72] hour Completion Time reflects a reasonable time to effect restoration of the qualified battery charger to OPERABLE status.

<u>B.1, B.2.1, B.2.2, ~~B.2.3,~~ and B.2.~~3~~*4*</u>

[If more than one DC distribution subsystem is required according to LCO 3.8.10, the DC subsystems remaining OPERABLE with one or more DC power sources inoperable may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS, *and* [recently] irradiated fuel movement~~, and operations with a potential for draining the reactor vessel.~~] By allowance of the option to declare required features inoperable with associated DC power sources inoperable, appropriate restrictions are implemented in accordance with the affected system LCOs' ACTIONS. In many instances, this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made (i.e., to suspend CORE ALTERATIONS *and*~~,~~ movement of [recently] irradiated fuel assemblies~~, and any activities that could result in inadvertent draining of the reactor vessel~~).

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.8 Inverters - Shutdown

BASES

BACKGROUND

A description of the inverters is provided in the Bases for LCO 3.8.7, "Inverters - Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapter [6] (Ref. 1) and Chapter [15] (Ref. 2), assume Engineered Safety Feature systems are OPERABLE. The DC to AC inverters are designed to provide the required capacity, capability, redundancy, and reliability to ensure the availability of necessary power to the Reactor Protection System and Emergency Core Cooling Systems instrumentation and controls so that the fuel, Reactor Coolant System, and containment design limits are not exceeded.

The OPERABILITY of the inverters is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the minimum inverters to each AC vital bus during MODES 4 and 5 ensures that:

a. The facility can be maintained in the shutdown or refueling condition for extended periods,

b. Sufficient instrumentation and control capability are available for monitoring and maintaining the unit status, and

c. Adequate power is available to mitigate events postulated during shutdown, such as ~~an inadvertent draindown of the vessel or~~ a fuel handling accident [involving handling recently irradiated fuel. Due to radioactive decay, the AC and DC inverters are only required to mitigate fuel handling accidents involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days)].

In general, when the unit is shut down, the Technical Specifications requirements ensure that the unit has the capability to mitigate the consequences of postulated accidents. However, assuming a single failure and concurrent loss of all offsite or all onsite power is not required. The rationale for this is based on the fact that many Design Basis

BASES

APPLICABLE SAFETY ANALYSES (continued)

Accidents (DBAs) that are analyzed in MODES 1, 2, and 3 have no specific analyses in MODES 4 and 5. Worst case bounding events are deemed not credible in MODES 4 and 5 because the energy contained within the reactor pressure boundary, reactor coolant temperature and pressure, and the corresponding stresses result in the probabilities of occurrence being significantly reduced or eliminated, and in minimal consequences. These deviations from DBA analysis assumptions and design requirements during shutdown conditions are allowed by the LCO for required systems.

The shutdown Technical Specification requirements are designed to ensure that the unit has the capability to mitigate the consequences of certain postulated accidents. Worst case DBA which are analyzed for operating MODES are generally viewed not to be a significant concern during shutdown MODES due to the lower energies involved. The Technical Specifications therefore require a lesser complement of electrical equipment to be available during shutdown than is required during operating MODES. More recent work completed on the potential risks associated with shutdown, however, have found significant risk associated with certain shutdown evolutions. As a result, in addition to the requirements established in the Technical Specifications, the industry has adopted NUMARC 91-06, "Guidelines for Industry Actions to Assess Shutdown Management," as an Industry initiative to manage shutdown tasks and associated electrical support to maintain risk at an acceptable low level. This may require the availability of additional equipment beyond that required by the shutdown Technical Specifications.

The inverters were previously identified as part of the Distribution System and, as such, satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The inverter[s] ensure the availability of electrical power for the instrumentation for systems required to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence or postulated DBA. The battery powered inverter[s] provide[s] uninterruptible supply of AC electrical power to the AC vital bus[es] even if the 4.16 kV safety buses are de-energized. OPERABLE inverter[s] require the AC vital bus be powered by the inverter through inverted DC voltage. This ensures the availability of sufficient inverter power sources to operate the plant in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents [involving handling recently irradiated fuel] ~~and inadvertent reactor vessel draindown~~).

BASES

APPLICABILITY

The inverter[s] required to be OPERABLE in MODES 4 and 5 and also any time during movement of [recently] irradiated fuel assemblies in the [primary or secondary] containment provide assurance that:

a. Systems *that provide core cooling* ~~to provide adequate coolant inventory makeup~~ are available ~~for the irradiated fuel in the core in case of an inadvertent draindown of the reactor vessel~~,

b. Systems needed to mitigate a fuel handling accident [involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days)] are available,

c. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available, and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

Inverter requirements for MODES 1, 2, and 3 are covered in LCO 3.8.7.

ACTIONS

LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Entering LCO 3.0.3, while in MODE 1, 2, or 3 would require the unit to be shutdown unnecessarily.

A.1, A.2.1, A.2.2, ~~A.2.3,~~ and A.2.~~3~~*4*

[If two divisions are required by LCO 3.8.10, "Distribution Systems - Shutdown," the remaining OPERABLE inverters may be capable of supporting sufficient required feature(s) to allow continuation of CORE ALTERATIONS *and*~~,~~ [recently] irradiated fuel movement~~, and operations with a potential for draining the reactor vessel~~.] By the allowance of the option to declare required feature(s) inoperable with the associated inverter(s) inoperable, appropriate restrictions are implemented in accordance with the affected required feature(s) of the LCOs' ACTIONS. In many instances, this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made (i.e., to suspend CORE ALTERATIONS *and*~~,~~ movement of [recently] irradiated fuel assemblies in the [primary or secondary] containment~~, and any activities that could result in inadvertent draining of the reactor vessel~~).

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.10 Distribution Systems - Shutdown

BASES

BACKGROUND

A description of the AC, DC, and AC vital bus electrical power distribution system is provided in the Bases for LCO 3.8.9, "Distribution Systems - Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident and transient analyses in the FSAR, Chapter [6] (Ref. 1) and Chapter [15] (Ref. 2), assume Engineered Safety Feature (ESF) systems are OPERABLE. The AC, DC, and AC vital bus electrical power distribution systems are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System, and containment design limits are not exceeded.

The OPERABILITY of the AC, DC, and AC vital bus electrical power distribution system is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the minimum AC, DC, and AC vital bus electrical power sources and associated power distribution subsystems during MODES 4 and 5, and during movement of [recently] irradiated fuel assemblies in the secondary containment ensures that:

a. The facility can be maintained in the shutdown or refueling condition for extended periods,

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status, and

c. Adequate power is provided to mitigate events postulated during shutdown, such as ~~an inadvertent draindown of the vessel or~~ a fuel handling accident [involving handling recently irradiated fuel. Due to radioactive decay, AC and DC electrical power is only required to mitigate fuel handling accidents involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days)].

The AC and DC electrical power distribution systems satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

BASES

LCO

Various combinations of subsystems, equipment, and components are required OPERABLE by other LCOs, depending on the specific plant condition. Implicit in those requirements is the required OPERABILITY of necessary support required features. This LCO explicitly requires energization of the portions of the electrical distribution system necessary to support OPERABILITY of Technical Specifications required systems, equipment, and components - both specifically addressed by their own LCO, and implicitly required by the definition of OPERABILITY.

Maintaining these portions of the distribution system energized ensures the availability of sufficient power to operate the plant in a safe manner to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents [involving handling recently irradiated fuel] ~~and inadvertent reactor vessel draindown~~).

APPLICABILITY

The AC and DC electrical power distribution subsystems required to be OPERABLE in MODES 4 and 5 and during movement of [recently] irradiated fuel assemblies in the [secondary] containment provide assurance that:

a. Systems *that provide core cooling* ~~to provide adequate coolant inventory makeup~~ are available ~~for the irradiated fuel in the core in case of an inadvertent draindown of the reactor vessel~~,

b. Systems needed to mitigate a fuel handling accident [involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days)] are available,

c. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available, and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

The AC, DC, and AC vital bus electrical power distribution subsystem requirements for MODES 1, 2, and 3 are covered in LCO 3.8.9.

ACTIONS

LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Entering LCO 3.0.3, while in MODE 1, 2, or 3 would require the unit to be shutdown unnecessarily.

BASES

ACTIONS (continued)

A.1, A.2.1, A.2.2, A.2.3, ~~A.2.4,~~ and A.2.~~4~~5

Although redundant required features may require redundant divisions of electrical power distribution subsystems to be OPERABLE, one OPERABLE distribution subsystem division may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS *and*~~,~~ [recently] irradiated fuel movement~~, and operations with a potential for draining the reactor vessel~~. By allowing the option to declare required features associated with an inoperable distribution subsystem inoperable, appropriate restrictions are implemented in accordance with the affected distribution subsystem LCO's Required Actions. In many instances this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made, (i.e., to suspend CORE ALTERATIONS *and*~~,~~ movement of [recently] irradiated fuel assemblies in the [secondary] containment~~, and any activities that could result in inadvertent draining of the reactor vessel~~).

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required AC and DC electrical power distribution subsystems and to continue this action until restoration is accomplished in order to provide the necessary power to the plant safety systems.

Notwithstanding performance of the above conservative Required Actions, a required residual heat removal-shutdown cooling (RHR-SDC) subsystem may be inoperable. In this case, Required Actions A.2.1 through A.2.4 do not adequately address the concerns relating to coolant circulation and heat removal. Pursuant to LCO 3.0.6, the RHR-SDC ACTIONS would not be entered. Therefore, Required Action A.2.5 is provided to direct declaring RHR-SDC inoperable, which results in taking the appropriate RHR-SDC ACTIONS.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required distribution subsystems should be completed as quickly as possible in order to minimize the time the plant safety systems may be without power.

BASES

BACKGROUND (continued)

The hydrostatic [and/or RCS System leakage] tests requires increasing pressure to approximately [ ] psig. Scram time testing required by SR 3.1.4.1 and SR 3.1.4.4 requires reactor pressure > [800] psig.

Other testing may be performed in conjunction with the allowances for inservice leak or hydrostatic tests and control rod scram time tests.

APPLICABLE SAFETY ANALYSES

Allowing the reactor to be considered in MODE 4 when the reactor coolant temperature is > 200°F, during, or as a consequence of, hydrostatic or leak testing, or as a consequence of control rod scram time testing initiated in conjunction with an inservice leak or hydrostatic test, effectively provides an exception to MODE 3 requirements, including OPERABILITY of primary containment and the full complement of redundant Emergency Core Cooling Systems. Since the tests are performed nearly water solid, at low decay heat values, and near MODE 4 conditions, the stored energy in the reactor core will be very low. Under these conditions, the potential for failed fuel and a subsequent increase in coolant activity above the LCO 3.4.7, "RCS Specific Activity," limits are minimized. In addition, the secondary containment will be OPERABLE, in accordance with this Special Operations LCO, and will be capable of handling any airborne radioactivity or steam leaks that could occur during the performance of hydrostatic or leak testing. The required pressure testing conditions provide adequate assurance that the consequences of a steam leak will be conservatively bounded by the consequences of the postulated main steam line break outside of primary containment described in Reference 2. Therefore, these requirements will conservatively limit radiation releases to the environment.

In the *unlikely* event of ~~a large~~ *any* primary system leak *that could result in draining of the RPV*, the reactor vessel would rapidly depressurize~~, allowing the low pressure core cooling systems to operate~~. The *make-up* capability ~~of the low pressure coolant injection and core spray subsystems, as~~ required in MODE 4 by LCO 3.5.2, "*RPV WIC*~~ECCS - Shutdown~~," would be more than adequate to keep the *RPV water level above the TAF* ~~core flooded~~ under this low decay heat load condition. Small system leaks would be detected by leakage inspections before significant inventory loss occurred.

For the purposes of this test, the protection provided by normally required MODE 4 applicable LCOs, in addition to the secondary containment requirements required to be met by this Special Operations LCO, will ensure acceptable consequences during normal hydrostatic test conditions and during postulated accident conditions.

Enclosure 8

BWR/6 Technical Specifications and Bases Markup

TABLE OF CONTENTS / REVISION SUMMARY

1.1 Definitions

CORE ALTERATION	CORE ALTERATION shall be the movement of any fuel, sources, or reactivity control components, within the reactor vessel with the vessel head removed and fuel in the vessel. The following exceptions are not considered to be CORE ALTERATIONS: a. Movement of source range monitors, local power range monitors, intermediate range monitors, traversing incore probes, or special movable detectors (including undervessel replacement), and b. Control rod movement, provided there are no fuel assemblies in the associated core cell. Suspension of CORE ALTERATIONS shall not preclude completion of movement of a component to a safe position.
CORE OPERATING LIMITS REPORT (COLR)	The COLR is the unit specific document that provides cycle specific parameter limits for the current reload cycle. These cycle specific limits shall be determined for each reload cycle in accordance with Specification 5.6.3. Plant operation within these limits is addressed in individual Specifications.
DOSE EQUIVALENT I-131	DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcuries/gram) that alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in [Table III of TID-14844, AEC, 1962, "Calculation of Distance Factors for Power and Test Reactor Sites" or those listed in Table E-7 of Regulatory Guide 1.109, Rev. 1, NRC, 1977, or ICRP 30, Supplement to Part 1, page 192-212, Table titled, "Committed Dose Equivalent in Target Organs or Tissues per Intake of Unit Activity"].
DRAIN TIME	*The DRAIN TIME is the time it would take for the water inventory in and above the Reactor Pressure Vessel (RPV) to drain to the top of the active fuel (TAF) seated in the RPV assuming:* *a) The water inventory above the TAF is divided by the limiting drain rate;* *b) The limiting drain rate is the larger of the drain rate through a single penetration flow path with the highest flow rate, or the sum of the drain rates through multiple penetration flow paths susceptible to a common mode failure (e.g., seismic event, loss of normal power, single*

human error), for all penetration flow paths below the TAF except:

1. *Penetration flow paths connected to an intact closed system, or isolated by manual or automatic valves that are locked, sealed, or otherwise secured in the closed position, blank flanges, or other devices that prevent flow of reactor coolant through the penetration flow paths;*

2. *Penetration flow paths capable of being isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the TAF when actuated by RPV water level isolation instrumentation; or*

3. *Penetration flow paths with isolation devices that can be closed prior to the RPV water level being equal to the TAF by a dedicated operator trained in the task, who is in continuous communication with the control room, is stationed at the controls, and is capable of closing the penetration flow path isolation devices without offsite power.*

c) *The penetration flow paths required to be evaluated per paragraph b) are assumed to open instantaneously and are not subsequently isolated, and no water is assumed to be subsequently added to the RPV water inventory;*

d) *No additional draining events occur; and*

e) *Realistic cross-sectional areas and drain rates are used.*

A bounding DRAIN TIME may be used in lieu of a calculated value.

EMERGENCY CORE COOLING SYSTEM (ECCS) RESPONSE TIME

The ECCS RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its ECCS initiation setpoint at the channel sensor until the ECCS 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.

3.3 INSTRUMENTATION

3.3.5.1A Emergency Core Cooling System (ECCS) Instrumentation (Without Setpoint Control Program)

LCO 3.3.5.1A The ECCS instrumentation for each Function in Table 3.3.5.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.5.1-1.

ACTIONS

--NOTE--
Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more channels inoperable.	A.1 Enter the Condition referenced in Table 3.3.5.1-1 for the channel.	Immediately
B. As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	B.1 --------------NOTE~~S~~------------- ~~1. Only applicable in MODES 1, 2, and 3.~~ ~~2.~~ Only applicable for Functions 1.a, 1.b, 2.a and 2.b. ------------------------------------- Declare supported feature(s) inoperable when its redundant feature ECCS initiation capability is inoperable. AND	1 hour from discovery of loss of initiation capability for feature(s) in both divisions

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	B.2 --------------NOTE~~S~~------------- ~~1. Only applicable in MODES 1, 2, and 3.~~ ~~2.~~ Only applicable for Functions 3.a and 3.b. ------------------------------------- Declare High Pressure Core Spray (HPCS) System inoperable.	1 hour from discovery of loss of HPCS initiation capability
	AND	
	B.3 Place channel in trip.	24 hours
C. As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	C.1 --------------NOTE~~S~~------------- ~~1. Only applicable in MODES 1, 2, and 3.~~ ~~2.~~ Only applicable for Functions 1.c, 1.d, 2.c, and 2.d. ------------------------------------- Declare supported feature(s) inoperable when its redundant feature ECCS initiation capability is inoperable.	1 hour from discovery of loss of initiation capability for feature(s) in both divisions
	AND	
	C.2 Restore channel to OPERABLE status.	24 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	D.1 ---------------NOTE-------------- Only applicable if HPCS pump suction is not aligned to the suppression pool. -------------------------------------	
	Declare HPCS System inoperable.	1 hour from discovery of loss of HPCS initiation capability
	AND	
	D.2.1 Place channel in trip.	24 hours
	OR	
	D.2.2 Align the HPCS pump suction to the suppression pool.	24 hours
E. As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	E.1 --------------NOTE~~S~~------------- ~~1. Only applicable in MODES 1, 2, and 3.~~ ~~2.~~ Only applicable for Functions 1.e, 1.f, and 2.e. -------------------------------------	
	Declare supported feature(s) inoperable when its redundant feature ECCS initiation capability is inoperable.	1 hour from discovery of loss of initiation capability for feature(s) in both divisions
	AND	
	E.2 Restore channel to OPERABLE status.	7 days

Table 3.3.5.1-1 (page 1 of 8)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core Spray (LPCS) Subsystems					
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2, 3~~, 4(a), 5(a)~~	[2][(a~~b~~)]	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3][(b~~c~~)(c~~d~~)] SR 3.3.5.1.5[(b~~c~~)(c~~d~~)] SR 3.3.5.1.6 SR 3.3.5.1.7	≥ [-152.5] inches
b. Drywell Pressure - High	1, 2, 3	[2][(a~~b~~)]	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3][(b~~c~~)(c~~d~~)] SR 3.3.5.1.5[(b~~c~~)(c~~d~~)] SR 3.3.5.1.6 SR 3.3.5.1.7	≤ [1.44] psig
c. LPCI Pump A Start - Time Delay Relay	1, 2, 3~~, 4(a), 5(a)~~	[1]	C	SR 3.3.5.1.2 [SR 3.3.5.1.4] SR 3.3.5.1.6	≥ [ ] seconds and ≤ [5.25] seconds

~~(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2, "ECCS - Shutdown."~~

(a~~b~~) Also required to initiate the associated [Technical Specifications (TS) required functions].

(b~~c~~) If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

(c~~d~~) The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Limiting Trip Setpoint (LTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures [Nominal Trip Setpoint] to confirm channel performance. The LTSP and the methodologies used to determine the as-found and as-left tolerances are specified in [insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference].

Table 3.3.5.1-1 (page 2 of 8)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. LPCI and LPCS Subsystems					
d. Reactor Steam Dome Pressure - Low (Injection Permissive)	1, 2, 3	[3]	C	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7	≥ [452] psig and ≤ [534] psig
	~~4(a), 5(a)~~	~~[3]~~	~~B~~	~~SR 3.3.5.1.1~~ ~~SR 3.3.5.1.2~~ ~~[SR 3.3.5.1.3]~~ ~~SR 3.3.5.1.5~~ ~~SR 3.3.5.1.6~~ ~~SR 3.3.5.1.7~~	~~≥ [452] psig and ≤ [534] psig~~
e. [LPCS Pump Discharge Flow - Low (Bypass)]	1, 2, 3~~, 4(a), 5(a)~~	[1]	E	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [ ] gpm and ≤ [ ] gpm
f. [LPCI Pump A Discharge Flow - Low (Bypass)]	1, 2, 3~~, 4(a), 5(a)~~	[1]	E	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [ ] gpm and ≤ [ ] gpm
[g. Manual Initiation	1, 2, 3~~, 4(a), 5(a)~~	[1]	C	SR 3.3.5.1.6	NA]

~~(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2, "ECCS - Shutdown."~~

Table 3.3.5.1-1 (page 3 of 8)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2. LPCI B and LPCI C Subsystems					
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2, 3~~,~~ 4~~(a), 5(a)~~	[2](a~~b~~)	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3](b~~c~~)(c~~d~~) SR 3.3.5.1.5(b~~c~~)(c~~d~~) SR 3.3.5.1.6 SR 3.3.5.1.7	≥ [-152.5] inches
b. Drywell Pressure - High	1, 2, 3	[2](a~~b~~)	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3](b~~c~~)(c~~d~~) SR 3.3.5.1.5(b~~c~~)(c~~d~~) SR 3.3.5.1.6 SR 3.3.5.1.7	≤ [1.44] psig
c. LPCI Pump B Start - Time Delay Relay	1, 2, 3~~,~~ 4~~(a), 5(a)~~	[1]	C	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6	≥ [ ] seconds and ≤ [5.25] seconds
d. Reactor Steam Dome Pressure - Low (Injection Permissive)	1, 2, 3	[3]	C	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7	≥ [452] psig and ≤ [534] psig

~~(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2, "ECCS - Shutdown."~~

(a~~b~~) Also required to initiate the associated [Technical Specifications (TS) required functions].

(b~~c~~) If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

(c~~d~~) The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Limiting Trip Setpoint (LTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures [Nominal Trip Setpoint] to confirm channel performance. The LTSP and the methodologies used to determine the as-found and as-left tolerances are specified in [insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference].

Table 3.3.5.1-1 (page 4 of 8)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2. LPCI B and LPCI C Subsystems					
e. [LPCI Pump B and LPCI Pump C Discharge Flow - Low (Bypass)]	1, 2, 3~~, 4(a), 5(a)~~	[2] [1 per pump]	E	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [ ] gpm and ≤ [ ] gpm
[f. Manual Initiation	1, 2, 3~~, 4(a), 5(a)~~	[1]	C	SR 3.3.5.1.6	NA]
3. High Pressure Core Spray (HPCS) System					
a. Reactor Vessel Water Level - Low Low, Level 2	1, 2, 3~~, 4(a), 5(a)~~	[4][(a~~b~~)]	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3][(b~~c~~)(c~~d~~)] SR 3.3.5.1.5[(b~~c~~)(c~~d~~)] SR 3.3.5.1.6 SR 3.3.5.1.7	≥ [-43.8] inches
b. Drywell Pressure - High	1, 2, 3	[4][(a~~b~~)]	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3][(b~~c~~)(c~~d~~)] SR 3.3.5.1.5[(b~~c~~)(c~~d~~)] SR 3.3.5.1.6 SR 3.3.5.1.7	≤ [1.44] psig

~~(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2, "ECCS - Shutdown."~~

(a~~b~~) Also required to initiate the associated [TS required functions].

(b~~c~~) If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

(c~~d~~) The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Limiting Trip Setpoint (LTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures [Nominal Trip Setpoint] to confirm channel performance. The LTSP and the methodologies used to determine the as-found and as-left tolerances are specified in [insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference].

Table 3.3.5.1-1 (page 5 of 8)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
3. HPCS System					
c. Reactor Vessel Water Level - High, Level 8	1, 2, 3~~,~~ 4~~(a), 5(a)~~	[2]	C	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3][(b~~c~~)(c~~d~~)] SR 3.3.5.1.5[(b~~c~~)(c~~d~~)] SR 3.3.5.1.6	≤ [55.7] inches
d. Condensate Storage Tank Level - Low	1, 2, 3~~,~~ 4~~(e), 5(e)~~	[2]	D	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3][(b~~c~~)(c~~d~~)] SR 3.3.5.1.5[(b~~c~~)(c~~d~~)] SR 3.3.5.1.6	≥ [-3] inches
e. Suppression Pool Water Level - High	1, 2, 3	[2]	D	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3][(b~~c~~)(c~~d~~)] SR 3.3.5.1.5[(b~~c~~)(c~~d~~)] SR 3.3.5.1.6	≤ [7.0] inches
f. [HPCS Pump Discharge Pressure - High (Bypass)]	1, 2, 3~~,~~ 4~~(a), 5(a)~~	[1]	E	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3][(b~~c~~)(c~~d~~)] SR 3.3.5.1.5[(b~~c~~)(c~~d~~)] SR 3.3.5.1.6	≥ [ ] psig
g. [HPCS System Flow Rate - Low (Bypass)]	1, 2, 3~~,~~ 4~~(a), 5(a)~~	[1]	E	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3][(b~~c~~)(c~~d~~)] SR 3.3.5.1.5[(b~~c~~)(c~~d~~)] SR 3.3.5.1.6	≥ [ ] gpm and ≤ [ ] gpm

~~(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2, "ECCS - Shutdown."~~

(b~~c~~) If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

(c~~d~~) The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Limiting Trip Setpoint (LTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable.

Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures [Nominal Trip Setpoint] to confirm channel performance. The LTSP and the methodologies used to determine the as-found and as-left tolerances are specified in [insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference].

~~(e) When HPCS is OPERABLE for compliance with LCO 3.5.2, "ECCS - Shutdown," and aligned to the condensate storage tank while tank water level is not within the limit of SR 3.5.2.2.~~

Table 3.3.5.1-1 (page 6 of 8)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
3. HPCS System					
[h. Manual Initiation	1, 2, 3~~,~~ ~~4(a), 5(a)~~	[1]	C	SR 3.3.5.1.6	NA]
4. ADS Trip System A					
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2(e~~f~~), 3(f)	[2]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3](b~~c~~)(c~~d~~) SR 3.3.5.1.5(b~~c~~)(c~~d~~) SR 3.3.5.1.6	≥ [-152.5] inches
b. Drywell Pressure - High	1, 2(e~~f~~), 3(e~~f~~)	[2]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3](b~~c~~)(c~~d~~) SR 3.3.5.1.5(b~~c~~)(c~~d~~) SR 3.3.5.1.6	≤ [1.44] psig
c. ADS Initiation Timer	1, 2(e~~f~~), 3(e~~f~~)	[1]	G	SR 3.3.5.1.2 [SR 3.3.5.1.4] SR 3.3.5.1.6	≤ [117] seconds
d. Reactor Vessel Water Level - Low, Level 3 (Confirmatory)	1, 2(e~~f~~), 3(e~~f~~)	[1]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3](b~~c~~)(c~~d~~) SR 3.3.5.1.5(b~~c~~)(c~~d~~) SR 3.3.5.1.6	≥ [10.8] inches
e. LPCS Pump Discharge Pressure - High	1, 2(e~~f~~), 3(e~~f~~)	[2]	G	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3](b~~c~~)(c~~d~~) SR 3.3.5.1.5(b~~c~~)(c~~d~~) SR 3.3.5.1.6	≥ [125] psig and ≤ [165] psig

~~(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2, "ECCS - Shutdown."~~

(b~~c~~) If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

(c~~d~~) The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Limiting Trip Setpoint (LTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable.

Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures [Nominal Trip Setpoint] to confirm channel performance. The LTSP and the methodologies used to determine the as-found and as-left tolerances are specified in [insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference].

(e~~f~~) With reactor steam dome pressure > [150] psig.

Table 3.3.5.1-1 (page 7 of 8)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
4. ADS Trip System A					
f. LPCI Pump A Discharge Pressure - High	1, 2(e~~f~~), 3(e~~f~~)	[2]	G	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [115] psig and ≤ [135] psig
g. [ADS Bypass Timer (High Drywell Pressure)]	1, 2(e~~f~~), 3(e~~f~~)	[2]	G	SR 3.3.5.1.2 [SR 3.3.5.1.4] SR 3.3.5.1.6	≤ [9.4] minutes
[h. Manual Initiation	1, 2(e~~f~~), 3(e~~f~~)	[2]	G	SR 3.3.5.1.6	NA]
5. ADS Trip System B					
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2(e~~f~~), 3(e~~f~~)	[2]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3](b~~c~~)(c~~d~~) SR 3.3.5.1.5(b~~c~~)(c~~d~~) SR 3.3.5.1.6	≥ [-152.5] inches
b. Drywell Pressure - High	1, 2(e~~f~~), 3(e~~f~~)	[2]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3](b~~c~~)(c~~d~~) SR 3.3.5.1.5(b~~c~~)(c~~d~~) SR 3.3.5.1.6	≤ [1.44] psig
c. ADS Initiation Timer	1, 2(e~~f~~), 3(e~~f~~)	[1]	G	SR 3.3.5.1.2 [SR 3.3.5.1.4] SR 3.3.5.1.6	≤ [117] seconds

(b~~c~~) If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

(c~~d~~) The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Limiting Trip Setpoint (LTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures [Nominal Trip Setpoint] to confirm channel performance. The LTSP and the methodologies used to determine the as-found and as-left tolerances are specified in [insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference].

(e~~f~~) With reactor steam dome pressure > [150] psig.

Table 3.3.5.1-1 (page 8 of 8)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
5. ADS Trip System B					
d. Reactor Vessel Water Level - Low, Level 3 (Confirmatory)	1, 2(e~~f~~), 3(e~~f~~)	[1]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3](b~~c~~)(c~~d~~) SR 3.3.5.1.5(b~~c~~)(c~~d~~) SR 3.3.5.1.6	≥ [10.8] inches
e. LPCI Pumps B & C Discharge Pressure - High	1, 2(e~~f~~), 3(e~~f~~)	[4] [2 per pump]	G	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6	≥ [115] psig and ≤ [135] psig
f. [ADS Bypass Timer (High Drywell Pressure)]	1, 2(e~~f~~), 3(e~~f~~)	[2]	G	SR 3.3.5.1.2 [SR 3.3.5.1.4] SR 3.3.5.1.6	≤ [9.4] minutes
[g. Manual Initiation	1, 2(e~~f~~), 3(e~~f~~)	[2]	G	SR 3.3.5.1.6	NA]

(*b*~~c~~) If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

(*c*~~d~~) The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Limiting Trip Setpoint (LTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures [Nominal Trip Setpoint] to confirm channel performance. The LTSP and the methodologies used to determine the as-found and as-left tolerances are specified in [insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference].

(*e*~~f~~) With reactor steam dome pressure > [150] psig.

3.3 INSTRUMENTATION

3.3.5.1B Emergency Core Cooling System (ECCS) Instrumentation (With Setpoint Control Program)

LCO 3.3.5.1B The ECCS instrumentation for each Function in Table 3.3.5.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.5.1-1.

ACTIONS

---NOTE---

Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more channels inoperable.	A.1 Enter the Condition referenced in Table 3.3.5.1-1 for the channel.	Immediately
B. As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	B.1 --------------NOTE~~S~~------------- ~~1. Only applicable in MODES 1, 2, and 3.~~ ~~2.~~ Only applicable for Functions 1.a, 1.b, 2.a and 2.b. ------------------------------------- Declare supported feature(s) inoperable when its redundant feature ECCS initiation capability is inoperable. AND	1 hour from discovery of loss of initiation capability for feature(s) in both divisions

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
	B.2	--------------NOTE~~S~~------------- ~~1. Only applicable in MODES 1, 2, and 3.~~ ~~2.~~ Only applicable for Functions 3.a and 3.b. ------------------------------------- Declare High Pressure Core Spray (HPCS) System inoperable.	1 hour from discovery of loss of HPCS initiation capability
	<u>AND</u>		
	B.3	Place channel in trip.	24 hours
C. As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	C.1	--------------NOTE~~S~~------------- ~~1. Only applicable in MODES 1, 2, and 3.~~ ~~2.~~ Only applicable for Functions 1.c, 1.d, 2.c, and 2.d. ------------------------------------- Declare supported feature(s) inoperable when its redundant feature ECCS initiation capability is inoperable.	1 hour from discovery of loss of initiation capability for feature(s) in both divisions
	<u>AND</u>		
	C.2	Restore channel to OPERABLE status.	24 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	D.1 ---------------NOTE-------------- Only applicable if HPCS pump suction is not aligned to the suppression pool. ------------------------------------- Declare HPCS System inoperable.	1 hour from discovery of loss of HPCS initiation capability
	AND	
	D.2.1 Place channel in trip.	24 hours
	OR	
	D.2.2 Align the HPCS pump suction to the suppression pool.	24 hours
E. As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	E.1 --------------NOTE~~S~~------------- 1~~. Only applicable in MODES 1, 2, and 3.~~ ~~2.~~ Only applicable for Functions 1.e, 1.f, and 2.e. ------------------------------------- Declare supported feature(s) inoperable when its redundant feature ECCS initiation capability is inoperable.	1 hour from discovery of loss of initiation capability for feature(s) in both divisions
	AND	
	E.2 Restore channel to OPERABLE status.	7 days

Table 3.3.5.1-1 (page 1 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
1. Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core Spray (LPCS) Subsystems				
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2, 3~~, 4[a], 5[a]~~	[2][a~~b~~]	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7
b. Drywell Pressure - High	1, 2, 3	[2][a~~b~~]	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7
c. LPCI Pump A Start - Time Delay Relay	1, 2, 3~~, 4[a], 5[a]~~	[1]	C	SR 3.3.5.1.2 [SR 3.3.5.1.4] SR 3.3.5.1.6
d. Reactor Steam Dome Pressure - Low (Injection Permissive)	1, 2, 3	[3]	C	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7
	~~4[a], 5[a]~~	~~[3]~~	~~B~~	~~SR 3.3.5.1.1~~ ~~SR 3.3.5.1.2~~ ~~[SR 3.3.5.1.3]~~ ~~SR 3.3.5.1.5~~ ~~SR 3.3.5.1.6~~ ~~SR 3.3.5.1.7~~
e. [LPCS Pump Discharge Flow - Low (Bypass)]	1, 2, 3~~, 4[a], 5[a]~~	[1]	E	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6

~~(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2, "ECCS - Shutdown."~~

(a~~b~~) Also required to initiate the associated [Technical Specifications (TS) required functions].

Table 3.3.5.1-1 (page 2 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
1. LPCI and LPCS Subsystems				
f. [LPCI Pump A Discharge Flow - Low (Bypass)]	1, 2, 3~~, 4(a), 5(a)~~	[1]	E	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
[g. Manual Initiation	1, 2, 3~~, 4(a), 5(a)~~	[1]	C	SR 3.3.5.1.6]
2. LPCI B and LPCI C Subsystems				
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2, 3~~, 4(a), 5(a)~~	[2](a~~b~~)	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7
b. Drywell Pressure - High	1, 2, 3	[2](a~~b~~)	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7
c. LPCI Pump B Start - Time Delay Relay	1, 2, 3~~, 4(a), 5(a)~~	[1]	C	SR 3.3.5.1.2 SR 3.3.5.1.4 SR 3.3.5.1.6
d. Reactor Steam Dome Pressure - Low (Injection Permissive)	1, 2, 3	[3]	C	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7

~~(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2, "ECCS - Shutdown."~~

(a~~b~~) Also required to initiate the associated [TS required functions].

Table 3.3.5.1-1 (page 3 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
2. LPCI B and LPCI C Subsystems				
e. [LPCI Pump B and LPCI Pump C Discharge Flow - Low (Bypass)]	1, 2, 3~~, 4(a), 5(a)~~	[2] [1 per pump]	E	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
[f. Manual Initiation	1, 2, 3~~, 4(a), 5(a)~~	[1]	C	SR 3.3.5.1.6]
3. High Pressure Core Spray (HPCS) System				
a. Reactor Vessel Water Level - Low Low, Level 2	1, 2, 3~~, 4(a), 5(a)~~	[4](*a*~~b~~)	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7
b. Drywell Pressure - High	1, 2, 3	[4](*a*~~b~~)	B	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6 SR 3.3.5.1.7
c. Reactor Vessel Water Level - High, Level 8	1, 2, 3~~, 4(a), 5(a)~~	[2]	C	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
d. Condensate Storage Tank Level - Low	1, 2, 3~~, 4(c), 5(c)~~	[2]	D	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6

~~(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2, “ECCS - Shutdown.”~~

(*a*~~b~~) Also required to initiate the associated [TS required functions].

~~(c) When HPCS is OPERABLE for compliance with LCO 3.5.2, "ECCS - Shutdown," and aligned to the condensate storage tank while tank water level is not within the limit of SR 3.5.2.2.~~

Table 3.3.5.1-1 (page 4 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
3. HPCS System				
e. Suppression Pool Water Level - High	1, 2, 3	[2]	D	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
f. [HPCS Pump Discharge Pressure - High (Bypass)]	1, 2, 3~~,~~ ~~4(a), 5(a)~~	[1]	E	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
g. [HPCS System Flow Rate - Low (Bypass)]	1, 2, 3~~,~~ ~~4(a), 5(a)~~	[1]	E	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
[h. Manual Initiation	1, 2, 3~~,~~ ~~4(a), 5(a)~~	[1]	C	SR 3.3.5.1.6]
4. Automatic Depressurization System (ADS) Trip System A				
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2(c~~d~~), 3(c~~d~~)	[2]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
b. Drywell Pressure - High	1, 2(c~~d~~), 3(c~~d~~)	[2]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
c. ADS Initiation Timer	1, 2(c~~d~~), 3(c~~d~~)	[1]	G	SR 3.3.5.1.2 [SR 3.3.5.1.4] SR 3.3.5.1.6

~~(a) When associated ECCS subsystem(s) are required to be OPERABLE per LCO 3.5.2, "ECCS - Shutdown."~~

(c~~d~~) With reactor steam dome pressure > [150] psig.

Table 3.3.5.1-1 (page 5 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
4. ADS Trip System A				
d. Reactor Vessel Water Level - Low, Level 3 (Confirmatory)	1, 2(c~~d~~), 3(c~~d~~)	[1]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
e. LPCS Pump Discharge Pressure - High	1, 2(c~~d~~), 3(c~~d~~)	[2]	G	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
f. LPCI Pump A Discharge Pressure - High	1, 2(c~~d~~), 3(c~~d~~)	[2]	G	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
g. [ADS Bypass Timer (High Drywell Pressure)]	1, 2(c~~d~~), 3(c~~d~~)	[2]	G	SR 3.3.5.1.2 [SR 3.3.5.1.4] SR 3.3.5.1.6
[h. Manual Initiation	1, 2(c~~d~~), 3(c~~d~~)	[2]	G	SR 3.3.5.1.6]
5. ADS Trip System B				
a. Reactor Vessel Water Level - Low Low Low, Level 1	1, 2(c~~d~~), 3(c~~d~~)	[2]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
b. Drywell Pressure - High	1, 2(c~~d~~), 3(c~~d~~)	[2]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
c. ADS Initiation Timer	1, 2(c~~d~~), 3(c~~d~~)	[1]	G	SR 3.3.5.1.2 [SR 3.3.5.1.4] SR 3.3.5.1.6

(c~~d~~) With reactor steam dome pressure > [150] psig.

Table 3.3.5.1-1 (page 6 of 6)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
5. ADS Trip System B				
d. Reactor Vessel Water Level - Low, Level 3 (Confirmatory)	1, 2$^{(c\cancel{d})}$, 3$^{(c\cancel{d})}$	[1]	F	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
e. LPCI Pumps B & C Discharge Pressure - High	1, 2$^{(c\cancel{d})}$, 3$^{(c\cancel{d})}$	[4] [2 per pump]	G	SR 3.3.5.1.1 SR 3.3.5.1.2 [SR 3.3.5.1.3] SR 3.3.5.1.5 SR 3.3.5.1.6
f. [ADS Bypass Timer (High Drywell Pressure)]	1, 2$^{(c\cancel{d})}$, 3$^{(c\cancel{d})}$	[2]	G	SR 3.3.5.1.2 [SR 3.3.5.1.4] SR 3.3.5.1.6
[g. Manual Initiation	1, 2$^{(c\cancel{d})}$, 3$^{(c\cancel{d})}$	[2]	G	SR 3.3.5.1.6]

(c~~d~~) With reactor steam dome pressure > [150] psig.

3.3 INSTRUMENTATION

3.3.5.2A Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation (Without Setpoint Control Program)

LCO 3.3.5.2A The RPV Water Inventory Control instrumentation for each Function in Table 3.3.5.2-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.5.2-1.

ACTIONS

---NOTE---
Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more channels inoperable.	A.1 Enter the Condition referenced in Table 3.3.5.2-1 for the channel.	Immediately
B. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	B.1 Declare associated penetration flow path(s) incapable of automatic isolation.	Immediately
	<u>AND</u>	
	B.2 Calculate DRAIN TIME.	Immediately
C. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	C.1 Place channel in trip.	1 hour

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	D.1 Declare HPCS system inoperable. OR D.2 Align the HPCS pump suction to the suppression pool.	1 hour 1 hour
E. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	E.1 Declare HPCS system inoperable. AND E.2 Restore channel to OPERABLE status.	1 hour 24 hours
F. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	F.1 Restore channel to OPERABLE status.	24 hours
G. Required Action and associated Completion Time of Condition C, D, E, or F not met.	G.1 Declare associated ECCS injection/spray subsystem inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

---NOTE---

Refer to Table 3.3.5.2-1 to determine which SRs apply for each ECCS Function.

SURVEILLANCE		FREQUENCY
SR 3.3.5.2.1	Perform CHANNEL CHECK.	[12 hours <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.2.2	Perform CHANNEL FUNCTIONAL TEST.	[[92] days <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.2.3	Perform LOGIC SYSTEM FUNCTIONAL TEST.	[[18] months <u>OR</u> In accordance with the Surveillance Frequency Control Program]

Table 3.3.5.2-1 (page 1 of 2)
RPV Water Inventory Control Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core Spray (LPCS) Subsystems					
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[3(a)]	C	SR 3.3.5.2.1 SR 3.3.5.2.2	≤ [534] psig
b. [LPCS Pump Discharge Flow - Low (Bypass)]	4, 5	[1 per pump(a)]	F	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [ ] gpm and ≤ [ ] gpm
c. [LPCI Pump A Discharge Flow - Low (Bypass)]	4, 5	[1 per pump(a)]	F	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [ ] gpm and ≤ [ ] gpm
d. Manual Initiation	4, 5	[1 per subsystem (a)]	F	SR 3.3.5.2.3	NA
2. LPCI B and LPCI C Subsystems					
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[3(a)]	C	SR 3.3.5.2.1 SR 3.3.5.2.2	≤ [534] psig
b. [LPCI Pump B and LPCI Pump C Discharge Flow - Low (Bypass)]	4, 5	[1 per pump(a)]	F	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [ ] gpm and ≤ [ ] gpm
c. Manual Initiation	4, 5	[1 per subsystem (a)]	F	SR 3.3.5.2.3	NA

(a) Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, "Reactor Pressure Vessel Water Inventory Control."

Table 3.3.5.2-1 (page 2 of 2)
RPV Water Inventory Control Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
3. High Pressure Core Spray (HPCS) System					
a. Reactor Vessel Water Level - High, Level 8	4, 5	[1(a)]	E	SR 3.3.5.2.1 SR 3.3.5.2.2	≤ [55.7] inches
b. Condensate Storage Tank Level - Low	4(b), 5(b)	[1(a)]	D	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [-3] inches
c. [HPCS Pump Discharge Pressure - High (Bypass)]	4, 5	[1 per pump (a)]	F	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [ ] psig
d. [HPCS System Flow Rate - Low (Bypass)]	4, 5	[1 per pump (a)]	F	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [ ] gpm and ≤ [ ] gpm
e. Manual Initiation	4, 5	[1 per subsystem (a)]	F	SR 3.3.5.2.3	[NA]
4. RHR System Isolation					
a. Reactor Vessel Water Level - Low, Level 3	(c)	[2 in one trip system]	B	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [10.8] inches
5. Reactor Water Cleanup (RWCU) System Isolation					
a. Reactor Vessel Water Level - Low Low, Level 2	(c)	[2 in one trip system]	B	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [-43.8] inches

(a) Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, "Reactor Pressure Vessel Water Inventory Control."

(b) When HPCS is OPERABLE for compliance with LCO 3.5.2, "RPV Water Inventory Control," and aligned to the condensate storage tank.

(c) When automatic isolation of the associated penetration flow path(s) is credited in calculating DRAIN TIME.

3.3 INSTRUMENTATION

3.3.5.2B Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation (With Setpoint Control Program)

LCO 3.3.5.2B The RPV Water Inventory Control instrumentation for each Function in Table 3.3.5.2-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.5.2-1.

ACTIONS

---NOTE---

Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more channels inoperable.	A.1 Enter the Condition referenced in Table 3.3.5.2-1 for the channel.	Immediately
B. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	B.1 Declare associated penetration flow path(s) incapable of automatic isolation.	Immediately
	<u>AND</u>	
	B.2 Calculate DRAIN TIME.	Immediately
C. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	C.1 Place channel in trip.	1 hour

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	D.1 Declare HPCS system inoperable. OR D.2 Align the HPCS pump suction to the suppression pool.	1 hour 1 hour
E. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	E.1 Declare HPCS system inoperable. AND E.2 Restore channel to OPERABLE status.	1 hour 24 hours
F. As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	F.1 Restore channel to OPERABLE status.	24 hours
G. Required Action and associated Completion Time of Condition C, D, E, or F not met.	G.1 Declare associated ECCS injection/spray subsystem inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

--NOTE--
Refer to Table 3.3.5.2-1 to determine which SRs apply for each ECCS Function.

SURVEILLANCE		FREQUENCY
SR 3.3.5.2.1	Perform CHANNEL CHECK.	[12 hours <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.2.2	Perform CHANNEL FUNCTIONAL TEST.	[[92] days <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.1.3	Perform LOGIC SYSTEM FUNCTIONAL TEST.	[[18] months <u>OR</u> In accordance with the Surveillance Frequency Control Program]

Table 3.3.5.2-1 (page 1 of 2)
RPV Water Inventory Control Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
1. Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core Spray (LPCS) Subsystems				
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[3(a)]	C	SR 3.3.5.2.1 SR 3.3.5.2.2
b. [LPCS Pump Discharge Flow - Low (Bypass)]	4, 5	[1 per pump(a)]	F	SR 3.3.5.2.1 SR 3.3.5.2.2
c. [LPCI Pump A Discharge Flow - Low (Bypass)]	4, 5	[1 per pump(a)]	F	SR 3.3.5.2.1 SR 3.3.5.2.2
d. Manual Initiation	4, 5	[1 per subsystem (a)]	F	SR 3.3.5.2.3
2. LPCI B and LPCI C Subsystems				
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[3(a)]	C	SR 3.3.5.2.1 SR 3.3.5.2.2
b. [LPCI Pump B and LPCI Pump C Discharge Flow - Low (Bypass)]	4, 5	[1 per pump(a)]	F	SR 3.3.5.2.1 SR 3.3.5.21.2
c. Manual Initiation	4, 5	[11 per subsystem (a)]	F	SR 3.3.5.2.3

(a) Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, "Reactor Pressure Vessel Water Inventory Control."

Table 3.3.5.2-1 (page 2 of 2)
RPV Water Inventory Control Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
3. High Pressure Core Spray (HPCS) System				
a. Reactor Vessel Water Level - High, Level 8	4, 5	[1(a)]	E	SR 3.3.5.2.1 SR 3.3.5.2.2
b. Condensate Storage Tank Level - Low	4(b), 5(b)	[1(a)]	D	SR 3.3.5.2.1 SR 3.3.5.2.2
c. [HPCS Pump Discharge Pressure - High (Bypass)]	4, 5	[1 per pump (a)]	F	SR 3.3.5.2.1 SR 3.3.5.2.2
d. [HPCS System Flow Rate - Low (Bypass)]	4, 5	[1 per pump (a)]	F	SR 3.3.5.2.1 SR 3.3.5.2.2
e. Manual Initiation	4, 5	[1 per subsystem (a)]	F	SR 3.3.5.2.3
4. RHR System Isolation				
a. Reactor Vessel Water Level - Low, Level 3	(c)	[2 in one trip system]	B	SR 3.3.5.2.1 SR 3.3.5.2.2
5. Reactor Water Cleanup (RWCU) System Isolation				
a. Reactor Vessel Water Level - Low Low, Level 2	(c)	[2 in one trip system]	B	SR 3.3.5.2.1 SR 3.3.5.2.2

(a) Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, "Reactor Pressure Vessel Water Inventory Control."
(b) When HPCS is OPERABLE for compliance with LCO 3.5.2, "RPV Water Inventory Control," and aligned to the condensate storage tank.
(c) When automatic isolation of the associated penetration flow path(s) is credited in calculating DRAIN TIME.

3.3 INSTRUMENTATION

3.3.5.3~~2~~A Reactor Core Isolation Cooling (RCIC) System Instrumentation (Without Setpoint Control Program)

LCO 3.3.5.3~~2~~A — The RCIC System instrumentation for each Function in Table 3.3.5.3~~2~~-1 shall be OPERABLE.

APPLICABILITY: MODE 1,
MODES 2 and 3 with reactor steam dome pressure > [150] psig.

ACTIONS

--NOTE--
Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more channels inoperable.	A.1 Enter the Condition referenced in Table 3.3.5.3~~2~~-1 for the channel.	Immediately
B. As required by Required Action A.1 and referenced in Table 3.3.5.3~~2~~-1.	B.1 Declare RCIC System inoperable. <u>AND</u> B.2 Place channel in trip.	1 hour from discovery of loss of RCIC initiation capability 24 hours
C. As required by Required Action A.1 and referenced in Table 3.3.5.3~~2~~-1.	C.1 Restore channel to OPERABLE status.	24 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. As required by Required Action A.1 and referenced in Table 3.3.5.3~~2~~-1.	D.1 ---------------NOTE-------------- Only applicable if RCIC pump suction is not aligned to the suppression pool. ------------------------------------- Declare RCIC System inoperable.	 1 hour from discovery of loss of RCIC initiation capability
	<u>AND</u>	
	D.2.1 Place channel in trip.	24 hours
	<u>OR</u>	
	D.2.2 Align RCIC pump suction to the suppression pool.	24 hours
E. Required Action and associated Completion Time of Condition B, C, or D not met.	E.1 Declare RCIC System inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

---NOTES---

1. Refer to Table 3.3.5.3~~2~~-1 to determine which SRs apply for each RCIC Function.

2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours for Functions 2 and 5; and (b) for up to 6 hours for Functions 1, 3, and 4 provided the associated Function maintains RCIC initiation capability.

SURVEILLANCE		FREQUENCY
SR 3.3.5.3~~2~~.1	Perform CHANNEL CHECK.	[12 hours <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.3~~2~~.2	Perform CHANNEL FUNCTIONAL TEST.	[[92] days <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.3~~2~~.3	[Calibrate the trip units.	[[92] days <u>OR</u> In accordance with the Surveillance Frequency Control Program]]

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.5.3~~2~~.4	Perform CHANNEL CALIBRATION.	[18 months <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.3~~2~~.5	Perform LOGIC SYSTEM FUNCTIONAL TEST.	[[18] months <u>OR</u> In accordance with the Surveillance Frequency Control Program]

Table 3.3.5.3~~2~~-1 (page 1 of 1)
Reactor Core Isolation Cooling System Instrumentation

FUNCTION	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Reactor Vessel Water Level - Low Low, Level 2	[4]	B	SR 3.3.5.3~~2~~.1 SR 3.3.5.3~~2~~.2 [SR 3.3.5.3~~2~~.3](a)(b) SR 3.3.5.3~~2~~.4(a)(b) SR 3.3.5.3~~2~~.5	≥ [-43.8] inches
2. Reactor Vessel Water Level - High, Level 8	[2]	C	SR 3.3.5.3~~2~~.1 SR 3.3.5.3~~2~~.2 [SR 3.3.5.3~~2~~.3](a)(b) SR 3.3.5.3~~2~~.4(a)(b) SR 3.3.5.3~~2~~.5	≤ [55.7] inches
3. Condensate Storage Tank Level - Low	[2]	D	SR 3.3.5.3~~2~~.1 SR 3.3.5.3~~2~~.2 [SR 3.3.5.3~~2~~.3](a)(b) SR 3.3.5.3~~2~~.4(a)(b) SR 3.3.5.3~~2~~.5	≥ [-3] inches
[4. Suppression Pool Water Level - High	[2]	D	SR 3.3.5.3~~2~~.1 SR 3.3.5.3~~2~~.2 [SR 3.3.5.3~~2~~.3](a)(b) SR 3.3.5.3~~2~~.4(a)(b) SR 3.3.5.3~~2~~.5	≤ [7.0] inches]
[5. Manual Initiation	[1]	C	SR 3.3.5.3~~2~~.5	NA]

(a) If the as-found channel setpoint is outside its predefined as-found tolerance, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service.

(b) The instrument channel setpoint shall be reset to a value that is within the as-left tolerance around the Limiting Trip Setpoint (LTSP) at the completion of the surveillance; otherwise, the channel shall be declared inoperable. Setpoints more conservative than the LTSP are acceptable provided that the as-found and as-left tolerances apply to the actual setpoint implemented in the Surveillance procedures [Nominal Trip Setpoint] to confirm channel performance. The LTSP and the methodologies used to determine the as-found and as-left tolerances are specified in [insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference].

3.3 INSTRUMENTATION

3.3.5.3~~2~~B Reactor Core Isolation Cooling (RCIC) System Instrumentation (With Setpoint Control Program)

LCO 3.3.5.3~~2~~B The RCIC System instrumentation for each Function in Table 3.3.5.3~~2~~-1 shall be OPERABLE.

APPLICABILITY: MODE 1,
MODES 2 and 3 with reactor steam dome pressure > [150] psig.

ACTIONS

---NOTE---
Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more channels inoperable.	A.1 Enter the Condition referenced in Table 3.3.5.3~~2~~-1 for the channel.	Immediately
B. As required by Required Action A.1 and referenced in Table 3.3.5.3~~2~~-1.	B.1 Declare RCIC System inoperable. AND B.2 Place channel in trip.	1 hour from discovery of loss of RCIC initiation capability 24 hours
C. As required by Required Action A.1 and referenced in Table 3.3.5.3~~2~~-1.	C.1 Restore channel to OPERABLE status.	24 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. As required by Required Action A.1 and referenced in Table 3.3.5.3~~2~~-1.	D.1 ---------------NOTE-------------- Only applicable if RCIC pump suction is not aligned to the suppression pool. ------------------------------------- Declare RCIC System inoperable.	 1 hour from discovery of loss of RCIC initiation capability
	<u>AND</u>	
	D.2.1 Place channel in trip.	24 hours
	<u>OR</u>	
	D.2.2 Align RCIC pump suction to the suppression pool.	24 hours
E. Required Action and associated Completion Time of Condition B, C, or D not met.	E.1 Declare RCIC System inoperable.	Immediately

SURVEILLANCE REQUIREMENTS

---NOTES---

1. Refer to Table 3.3.5.3~~2~~-1 to determine which SRs apply for each RCIC Function.

2. When a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours for Functions 2 and 5; and (b) for up to 6 hours for Functions 1, 3, and 4 provided the associated Function maintains RCIC initiation capability.

SURVEILLANCE		FREQUENCY
SR 3.3.5.3~~2~~.1	Perform CHANNEL CHECK.	[12 hours <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.3~~2~~.2	Perform CHANNEL FUNCTIONAL TEST.	[[92] days <u>OR</u> In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.3~~2~~.3	[Calibrate the trip units in accordance with the Setpoint Control Program.	[[92] days <u>OR</u> In accordance with the Surveillance Frequency Control Program]]

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.5.~~3~~2.4	Perform CHANNEL CALIBRATION in accordance with the Setpoint Control Program.	[18 months OR In accordance with the Surveillance Frequency Control Program]
SR 3.3.5.~~3~~2.5	Perform LOGIC SYSTEM FUNCTIONAL TEST.	[[18] months OR In accordance with the Surveillance Frequency Control Program]

Table 3.3.5.3~~2~~-1 (page 1 of 1)
Reactor Core Isolation Cooling System Instrumentation

FUNCTION	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
1. Reactor Vessel Water Level - Low Low, Level 2	[4]	B	SR 3.3.5.3~~2~~.1 SR 3.3.5.3~~2~~.2 [SR 3.3.5.3~~2~~.3] SR 3.3.5.3~~2~~.4 SR 3.3.5.3~~2~~.5
2. Reactor Vessel Water Level - High, Level 8	[2]	C	SR 3.3.5.3~~2~~.1 SR 3.3.5.3~~2~~.2 [SR 3.3.5.3~~2~~.3] SR 3.3.5.3~~2~~.4 SR 3.3.5.3~~2~~.5
3. Condensate Storage Tank Level - Low	[2]	D	SR 3.3.5.3~~2~~.1 SR 3.3.5.3~~2~~.2 [SR 3.3.5.3~~2~~.3] SR 3.3.5.3~~2~~.4 SR 3.3.5.3~~2~~.5
[4. Suppression Pool Water Level - High	[2]	D	SR 3.3.5.3~~2~~.1 SR 3.3.5.3~~2~~.2 [SR 3.3.5.3~~2~~.3] SR 3.3.5.3~~2~~.4 SR 3.3.5.3~~2~~.5]
[5. Manual Initiation	[1]	C	SR 3.3.5.3~~2~~.5]

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
I. As required by Required Action C.1 and referenced in Table 3.3.6.1-1.	I.1 Declare associated standby liquid control subsystem inoperable.	1 hour
	OR	
	I.2 Isolate the Reactor Water Cleanup System.	1 hour
J. As required by Required Action C.1 and referenced in Table 3.3.6.1-1.	J.1 Initiate action to restore channel to OPERABLE status.	Immediately
	OR	
	J.2 Initiate action to isolate the Residual Heat Removal (RHR) Shutdown Cooling System.	Immediately
K. As required by Required Action C.1 and referenced in Table 3.3.6.1-1.	K.1 Isolate the affected penetration flow path(s).	Immediately
	OR	
	K.2~~.1~~ Suspend movement of [recently] irradiated fuel assemblies in the [primary and secondary containment].	Immediately
	~~AND~~	
	~~K.2.2 Initiate action to suspend operations with a potential for draining the reactor vessel.~~	~~Immediately~~

Table 3.3.6.1-1 (page 3 of 7)
Primary Containment Isolation Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
2. Primary Containment Isolation					
g. Containment and Drywell Ventilation Exhaust Radiation-High	1,2,3	[2]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.5 SR 3.3.6.1.6 SR 3.3.6.1.7	≤ [4.0] mR/hr
	[(b)]	[2]	K	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.5 SR 3.3.6.1.6 SR 3.3.6.1.7	≤ [4.0] mR/hr
[h. Manual Initiation	1,2,3	[2]	G	SR 3.3.6.1.6	NA]
3. Reactor Core Isolation Cooling (RCIC) System Isolation					
a. RCIC Steam Line Flow - High	1,2,3	[1]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 [SR 3.3.6.1.3] SR 3.3.6.1.5 SR 3.3.6.1.6 SR 3.3.6.1.7	≤ [64] inches water
[b. RCIC Steam Line Flow Time Delay	[1,2,3]	[1]	F	SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.6	≥ [3] seconds and ≤ [7] seconds]
c. RCIC Steam Supply Line Pressure - Low	1,2,3	[1]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 [SR 3.3.6.1.3] SR 3.3.6.1.5 SR 3.3.6.1.6 SR 3.3.6.1.7	≥ [53] psig
d. RCIC Turbine Exhaust Diaphragm Pressure - High	1,2,3	[2]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 [SR 3.3.6.1.3] SR 3.3.6.1.5 SR 3.3.6.1.6	≤ [20] psig

[(b) During movement of [recently] irradiated fuel assemblies in [primary or secondary containment]~~, or operations with a potential for draining the reactor vessel~~.]

Table 3.3.6.1-1 (page 6 of 7)
Primary Containment Isolation Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
4. RWCU System Isolation					
i. Main Steam Line Tunnel Ambient Temperature – High	1,2,3	[1]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.5 SR 3.3.6.1.6	≤ [191]°F
j. Main Steam Line Tunnel Differential Temperature - High	1,2,3	[1]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.5 SR 3.3.6.1.6	≤ [104]°F
k. Reactor Vessel Water Level - Low Low, Level 2	1,2,3	[2]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 [SR 3.3.6.1.3] SR 3.3.6.1.5 SR 3.3.6.1.6 SR 3.3.6.1.7	≥ [-43.8] inches
l. Standby Liquid Control System Initiation	1,2	[1]	I	SR 3.3.6.1.6	NA
[m. Manual Initiation	1,2,3	[2]	G	SR 3.3.6.1.6	NA]
5. Shutdown Cooling System Isolation					
a. RHR Equipment Room Ambient Temperature - High	2,3	[1 per room]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.5 SR 3.3.6.1.6	≤ [171]°F
b. RHR Equipment Room Differential Temperature - High	2,3	[1 per room]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.5 SR 3.3.6.1.6	≤ [102]°F
c. Reactor Vessel Water Level - Low, Level 3	3~~,4,5~~	[2]~~(c)~~	J	SR 3.3.6.1.1 SR 3.3.6.1.2 [SR 3.3.6.1.3] SR 3.3.6.1.5 SR 3.3.6.1.6 SR 3.3.6.1.7	≥ [10.8] inches

~~(c) Only one trip system required in MODES 4 and 5 with RHR Shutdown Cooling System integrity maintained.~~

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
I. As required by Required Action C.1 and referenced in Table 3.3.6.1-1.	I.1	Declare associated standby liquid control subsystem inoperable.	1 hour
	OR		
	I.2	Isolate the Reactor Water Cleanup System.	1 hour
J. As required by Required Action C.1 and referenced in Table 3.3.6.1-1.	J.1	Initiate action to restore channel to OPERABLE status.	Immediately
	OR		
	J.2	Initiate action to isolate the Residual Heat Removal (RHR) Shutdown Cooling System.	Immediately
K. As required by Required Action C.1 and referenced in Table 3.3.6.1-1.	K.1	Isolate the affected penetration flow path(s).	Immediately
	OR		
	K.2~~.1~~	Suspend movement of [recently] irradiated fuel assemblies in the [primary and secondary containment].	Immediately
	~~AND~~		
	~~K.2.2~~	~~Initiate action to suspend operations with a potential for draining the reactor vessel.~~	~~Immediately~~

Table 3.3.6.1-1 (page 3 of 7)
Primary Containment Isolation Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS
2. Primary Containment Isolation				
g. Containment and Drywell Ventilation Exhaust Radiation-High	1,2,3	[2]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.5 SR 3.3.6.1.6 SR 3.3.6.1.7
	[(b)]	[2]	K	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.5 SR 3.3.6.1.6 SR 3.3.6.1.7
[h. Manual Initiation	1,2,3	[2]	G	SR 3.3.6.1.6]
3. Reactor Core Isolation Cooling (RCIC) System Isolation				
a. RCIC Steam Line Flow - High	1,2,3	[1]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 [SR 3.3.6.1.3] SR 3.3.6.1.5 SR 3.3.6.1.6 SR 3.3.6.1.7
[b. RCIC Steam Line Flow Time Delay	[1,2,3]	[1]	F	SR 3.3.6.1.2 SR 3.3.6.1.4 SR 3.3.6.1.6]
c. RCIC Steam Supply Line Pressure - Low	1,2,3	[1]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 [SR 3.3.6.1.3] SR 3.3.6.1.5 SR 3.3.6.1.6 SR 3.3.6.1.7
d. RCIC Turbine Exhaust Diaphragm Pressure - High	1,2,3	[2]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 [SR 3.3.6.1.3] SR 3.3.6.1.5 SR 3.3.6.1.6

[(b) During movement of [recently] irradiated fuel assemblies in [primary or secondary containment]~~, or operations with a potential for draining the reactor vessel~~.]

Table 3.3.6.1-1 (page 6 of 7)
Primary Containment Isolation Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION C.1	SURVEILLANCE REQUIREMENTS
4. RWCU System Isolation				
i. Main Steam Line Tunnel Ambient Temperature – High	1,2,3	[1]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.5 SR 3.3.6.1.6
j. Main Steam Line Tunnel Differential Temperature - High	1,2,3	[1]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.5 SR 3.3.6.1.6
k. Reactor Vessel Water Level - Low Low, Level 2	1,2,3	[2]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 [SR 3.3.6.1.3] SR 3.3.6.1.5 SR 3.3.6.1.6 SR 3.3.6.1.7
l. Standby Liquid Control System Initiation	1,2	[1]	I	SR 3.3.6.1.6
[m. Manual Initiation	1,2,3	[2]	G	SR 3.3.6.1.6]
5. Shutdown Cooling System Isolation				
a. RHR Equipment Room Ambient Temperature - High	2,3	[1 per room]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.5 SR 3.3.6.1.6
b. RHR Equipment Room Differential Temperature - High	2,3	[1 per room]	F	SR 3.3.6.1.1 SR 3.3.6.1.2 SR 3.3.6.1.5 SR 3.3.6.1.6
c. Reactor Vessel Water Level - Low, Level 3	3~~,4,5~~	[2]~~(c)~~	J	SR 3.3.6.1.1 SR 3.3.6.1.2 [SR 3.3.6.1.3] SR 3.3.6.1.5 SR 3.3.6.1.6 SR 3.3.6.1.7

~~(c) Only one trip system required in MODES 4 and 5 with RHR Shutdown Cooling System integrity maintained.~~

Table 3.3.6.2-1 (page 1 of 1)
Secondary Containment Isolation Instrumentation

FUNCTION	APPLICABLE MODES AND OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Reactor Vessel Water Level - Low Low, Level 2	1,2,3~~,[(a)]~~	[2]	SR 3.3.6.2.1 SR 3.3.6.2.2 [SR 3.3.6.2.3] SR 3.3.6.2.4 SR 3.3.6.2.5 SR 3.3.6.2.6	≥ [-43.8] inches
2. Drywell Pressure - High	1,2,3	[2]	SR 3.3.6.2.1 SR 3.3.6.2.2 [SR 3.3.6.2.3] SR 3.3.6.2.4 SR 3.3.6.2.5 SR 3.3.6.2.6	≤ [1.43] psig
3. Fuel Handling Area Ventilation Exhaust Radiation - High High	1,2,3,[(a)~~,(b)~~]	[2]	SR 3.3.6.2.1 SR 3.3.6.2.2 SR 3.3.6.2.4 SR 3.3.6.2.5 SR 3.3.6.2.6	≤ [4.0] mR/hr
4. Fuel Handling Area Pool Sweep Exhaust Radiation - High High	1,2,3,[(a)~~,(b)~~]	[2]	SR 3.3.6.2.1 SR 3.3.6.2.2 SR 3.3.6.2.4 SR 3.3.6.2.5 SR 3.3.6.2.6	≤ [35] mR/hr
5. [Manual Initiation	1,2,3,[(a)~~,(b)~~]	[1 per group]	SR 3.3.6.2.5	NA]

~~(a) During operations with a potential for draining the reactor vessel.~~

(a~~b~~) During movement of [recently] irradiated fuel assemblies in the [primary or secondary containment].

Table 3.3.6.2-1 (page 1 of 1)
Secondary Containment Isolation Instrumentation

FUNCTION	APPLICABLE MODES AND OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	SURVEILLANCE REQUIREMENTS
1. Reactor Vessel Water Level - Low Low, Level 2	1,2,3~~,[(a)]~~	[2]	SR 3.3.6.2.1 SR 3.3.6.2.2 [SR 3.3.6.2.3] SR 3.3.6.2.4 SR 3.3.6.2.5 SR 3.3.6.2.6
2. Drywell Pressure - High	1,2,3	[2]	SR 3.3.6.2.1 SR 3.3.6.2.2 [SR 3.3.6.2.3] SR 3.3.6.2.4 SR 3.3.6.2.5 SR 3.3.6.2.6
3. Fuel Handling Area Ventilation Exhaust Radiation - High High	1,2,3,[(a)~~,(b)~~]	[2]	SR 3.3.6.2.1 SR 3.3.6.2.2 SR 3.3.6.2.4 SR 3.3.6.2.5 SR 3.3.6.2.6
4. Fuel Handling Area Pool Sweep Exhaust Radiation - High High	1,2,3,[(a)~~,(b)~~]	[2]	SR 3.3.6.2.1 SR 3.3.6.2.2 SR 3.3.6.2.4 SR 3.3.6.2.5 SR 3.3.6.2.6
5. [Manual Initiation	1,2,3,[(a)~~,(b)~~]	[1 per group]	SR 3.3.6.2.5]

~~(a) During operations with a potential for draining the reactor vessel.~~

(a~~b~~) During movement of [recently] irradiated fuel assemblies in the [primary or secondary containment].

Table 3.3.7.1-1 (page 1 of 1)
[Control Room Fresh Air] System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Reactor Vessel Water Level - Low Low, Level 2	1, 2, 3~~, [(a)]~~	[2]	B	SR 3.3.7.1.1 SR 3.3.7.1.2 [SR 3.3.7.1.3] SR 3.3.7.1.4 SR 3.3.7.1.5	≥ [-43.8] inches
2. Drywell Pressure - High	1, 2, 3	[2]	C	SR 3.3.7.1.1 SR 3.3.7.1.2 [SR 3.3.7.1.3] SR 3.3.7.1.4 SR 3.3.7.1.5	≤ [1.43] psig
3. Control Room Ventilation Radiation Monitors	1, 2, 3, (a)~~, (b)~~	[2]	D	SR 3.3.7.1.1 SR 3.3.7.1.2 SR 3.3.7.1.4 SR 3.3.7.1.5	≤ [5] mR/hr

~~(a) During operations with a potential for draining the reactor vessel.~~

(a~~b~~) During movement of [recently] irradiated fuel assemblies in the [primary or secondary containment]

Table 3.3.7.1-1 (page 1 of 1)
[Control Room Fresh Air] System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER TRIP SYSTEM	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
1. Reactor Vessel Water Level - Low Low, Level 2	1, 2, 3~~, [(a)]~~	[2]	B	SR 3.3.7.1.1 SR 3.3.7.1.2 [SR 3.3.7.1.3] SR 3.3.7.1.4 SR 3.3.7.1.5
2. Drywell Pressure - High	1, 2, 3	[2]	C	SR 3.3.7.1.1 SR 3.3.7.1.2 [SR 3.3.7.1.3] SR 3.3.7.1.4 SR 3.3.7.1.5
3. Control Room Ventilation Radiation Monitors	1, 2, 3, (a)~~,~~ ~~(b)~~	[2]	D	SR 3.3.7.1.1 SR 3.3.7.1.2 SR 3.3.7.1.4 SR 3.3.7.1.5

~~(a) During operations with a potential for draining the reactor vessel.~~

(a~~b~~) During movement of [recently] irradiated fuel assemblies in the [primary or secondary containment]

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)*, RPV WATER INVENTORY CONTROL, AND* ~~AND~~ REACTOR CORE ISOLATION COOLING *(RCIC)* SYSTEM ~~(RCIC), AND RPV WATER INVENTORY CONTROL~~

3.5.1 ECCS - Operating

LCO 3.5.1 Each ECCS injection/spray subsystem and the Automatic Depressurization System (ADS) function of [eight] safety/relief valves shall be OPERABLE.

---NOTE---
Low pressure coolant injection (LPCI) subsystems may be considered OPERABLE during alignment and operation for decay heat removal with reactor steam dome pressure less than [the residual heat removal cut in permissive pressure] in MODE 3, if capable of being manually realigned and not otherwise inoperable.

APPLICABILITY: MODE 1,
MODES 2 and 3, except ADS valves are not required to be OPERABLE with reactor steam dome pressure ≤ [150] psig.

ACTIONS

---NOTE---
LCO 3.0.4.b is not applicable to HPCS.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One low pressure ECCS injection/spray subsystem inoperable.	A.1 Restore low pressure ECCS injection/spray subsystem to OPERABLE status.	7 days
B. High Pressure Core Spray (HPCS) System inoperable.	B.1 Verify by administrative means RCIC System is OPERABLE when RCIC is required to be OPERABLE.	Immediately
	<u>AND</u>	
	B.2 Restore HPCS System to OPERABLE status.	14 days

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)*, RPV WATER INVENTORY CONTROL, AND* ~~AND~~ REACTOR CORE ISOLATION COOLING *(RCIC)* SYSTEM~~ (RCIC), AND RPV WATER INVENTORY CONTROL~~

3.5.2 *Reactor Pressure Vessel (RPV) Water Inventory Control* ~~ECCS - Shutdown~~

LCO 3.5.2

DRAIN TIME of RPV water inventory to the top of active fuel (TAF) shall be ≥ 36 hours.

AND

One~~Two~~ ECCS injection/spray subsystem~~s~~ shall be OPERABLE.

--NOTE---------------------------------------

A ~~One~~ ~~L~~*l*ow ~~P~~*p*ressure ~~C~~*c*oolant ~~I~~*i*njection (LPCI) subsystem may be considered OPERABLE during alignment and operation for decay heat removal, if capable of being manually realigned and not otherwise inoperable.

APPLICABILITY: MODE*S* 4 *and* ~~,~~
~~MODE~~ 5 ~~except with the upper containment [cavity to dryer] pool [gate] removed and water level ≥ [22 ft 8 inches] over the top of the reactor pressure vessel flange.~~

ACTIONS

~~--NOTE--~~

~~LCO 3.0.4.b is not applicable to RCIC.~~

~~--~~

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. ~~One R~~*r*equired ECCS injection/spray subsystem inoperable.	A.1	Restore required ECCS injection/spray subsystem to OPERABLE status.	4 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1	*Initiate action to establish a method of water injection capable of operating without offsite electrical power.* ~~Initiate action to suspend operations with a potential for draining the reactor vessel (OPDRVs).~~	Immediately

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~C. Two required ECCS injection/spray subsystems inoperable.~~	~~C.1 Initiate action to suspend OPDRVs.~~ ~~AND~~ ~~C.2 Restore one ECCS injection/spray subsystem to OPERABLE status.~~	~~Immediately~~ ~~4 hours~~
C. DRAIN TIME < 36 hours and ≥ 8 hours.	*C.1 Verify [secondary containment] boundary is capable of being established in less than the DRAIN TIME.* *AND* *C.2 Verify each [secondary containment] penetration flow path is capable of being isolated in less than the DRAIN TIME.* *AND* *C.3 [Verify one standby gas treatment subsystem is capable of being placed in operation in less than the DRAIN TIME.*	*4 hours* *4 hours* *4 hours]*
D. *DRAIN TIME < 8 hours.*~~Required Action C.2 and associated Completion Time not met.~~	*D.1 ----------- NOTE ---------------* *Required ECCS injection/spray subsystem or additional method of water injection shall be capable of operating without offsite electrical power.* *-----------------------------------* *Initiate action to establish* ~~Verify~~ *an additional method of water injection with water*	 Immediately

	sources capable of maintaining RPV water level > TAF for ≥ 36 hours. *AND* D.*2*~~1~~ Initiate action to ~~restore~~ *establish* [secondary containment] *boundary*~~to OPERABLE status~~. AND	 Immediately

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	D.3 *Initiate action to isolate each [secondary containment] penetration flow path or verify it can be manually isolated from the control room.* *AND* D.*4*~~2~~ [Initiate action to *verify* ~~restore~~ one standby gas treatment subsystem *is capable of being placed in operation*~~to OPERABLE status~~. ~~AND~~ ~~D.3 Initiate action to restore isolation capability in each required [secondary containment] penetration flow path not isolated.~~	Immediately ~~]~~ Immediately *]*
E. Required Action and associated Completion Time of Condition C or D not met. *OR* *DRAIN TIME < 1 hour.*	*E.1* *Initiate action to restore DRAIN TIME to ≥ 36 hours.*	*Immediately*

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.2.1	*Verify DRAIN TIME ≥ 36 hours.*	*[12 hours* *OR* *In accordance with the Surveillance Frequency Control Program]*
SR 3.5.2.*2*~~1~~	Verify, for ~~each~~ *a* required low pressure ECCS injection/spray subsystem, the suppression pool water level is ≥ [12.67 ft].	[12 hours OR In accordance with the Surveillance Frequency Control Program]

~~SURVEILLANCE REQUIREMENTS (continued)~~

~~SURVEILLANCE~~		~~FREQUENCY~~
SR 3.5.2.*3*~~2~~	Verify, for ~~the~~*a* required High Pressure Core Spray (HPCS) System, the: a. Suppression pool water level is ≥ [12.67 ft] or b. Condensate storage tank water level is ≥ [18 ft].	[12 hours <u>OR</u> In accordance with the Surveillance Frequency Control Program]

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		*FREQUENCY*
SR 3.5.2.*4*~~3~~	Verify, for ~~each~~ *the* required ECCS injection/spray subsystem, the piping is filled with water from the pump discharge valve to the injection valve.	[31 days OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.*5*~~4~~	Verify*,* ~~each~~ *for the* required ECCS injection/spray subsystem*, each* manual, power operated, and automatic valve in the flow path, that is not locked, sealed, or otherwise secured in position, is in the correct position.	[31 days OR In accordance with the Surveillance Frequency Control Program]

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.5.2.*6*~~5~~	*Operate the required ECCS injection/spray subsystem through the recirculation line for ≥ 10 minutes.* ~~Verify each required ECCS pump develops the specified flow rate [against a system head corresponding to the specified reactor pressure].~~ ~~[System Head Corresponding to a Reactor~~ ~~System — Flow Rate — Pressure of]~~ ~~LPCS ≥ [7115] gpm ≥ [290] psig~~ ~~LPCI ≥ [7450] gpm ≥ [125] psig~~ ~~HPCS ≥ [7115] gpm ≥ [445] psig~~	~~[In accordance with the Inservice Testing Program~~ ~~OR~~ [92 days~~]~~ OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.7	*Verify each valve credited for automatically isolating a penetration flow path actuates to the isolation position on an actual or simulated isolation signal.*	*[[18] months* *OR* *In accordance with the Surveillance Frequency Control Program]*
SR 3.5.2.*8*~~6~~	------------------------------NOTE------------------------------ Vessel injection/spray may be excluded. --- Verify ~~each~~*the* ~~-~~required ECCS injection/spray subsystem actuates on *a manual initiation signal* ~~an actual or simulated automatic initiation signal~~.	[[18] months OR In accordance with the Surveillance Frequency Control Program]

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS), *RPV WATER INVENTORY CONTROL, AND* ~~AND~~ REACTOR CORE ISOLATION COOLING *(RCIC)* SYSTEM ~~(RCIC), AND RPV WATER INVENTORY CONTROL~~

3.5.3 RCIC System

LCO 3.5.3 The RCIC System shall be OPERABLE.

APPLICABILITY: MODE 1,
MODES 2 and 3 with reactor steam dome pressure > [150] psig.

ACTIONS

---NOTE---

LCO 3.0.4.b is not applicable to RCIC.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. RCIC System inoperable.	A.1 Verify by administrative means High Pressure Core Spray System is OPERABLE. <u>AND</u> A.2 Restore RCIC System to OPERABLE status.	Immediately 14 days
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. <u>AND</u> B.2 Reduce reactor steam dome pressure to ≤ [150] psig.	12 hours 36 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
G. [Required Action and associated Completion Time of Condition A, B, C, D, or E not met for PCIV(s) required to be OPERABLE during movement of [recently] irradiated fuel assemblies in the [primary or secondary containment].	G.1 ---------------NOTE-------------- LCO 3.0.3 is not applicable. ------------------------------------- Suspend movement of [recently] irradiated fuel assemblies in [primary and secondary containment].	Immediately]
H. [Required Action and Associated Completion Time of Condition A, B, C, D, or E not met for PCIV(s) required to be OPERABLE during MODE 4 or 5 ~~or during operations with a potential for draining the reactor vessel (OPDRVs)~~.	~~H.1 Initiate action to suspend OPDRVs.~~ ~~OR~~ H.~~1~~2 Initiate action to restore valve(s) to OPERABLE status.	~~Immediately~~ Immediately]

3.6 CONTAINMENT SYSTEMS

3.6.4.1 [Secondary Containment]

LCO 3.6.4.1 The [secondary containment] shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3,
[During movement of [recently] irradiated fuel assemblies in the [primary or secondary containment]~~,~~
~~During operations with a potential for draining the reactor vessel (OPDRVs).~~]

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. [Secondary containment] inoperable [in MODE 1, 2, or 3].	A.1 Restore [secondary containment] to OPERABLE status.	4 hours
B. Required Action and associated Completion Time [of Condition A] not met.	B.1 ---------------NOTE-------------- LCO 3.0.4.a is not applicable when entering MODE 3. ------------------------------------- Be in MODE 3.	12 hours
C. [[Secondary containment] inoperable during movement of [recently] irradiated fuel assemblies in the [primary or secondary containment] ~~or during OPDRVs~~.	C.1 ---------------NOTE-------------- LCO 3.0.3 is not applicable. ------------------------------------- Suspend movement of [recently] irradiated fuel assemblies in the [primary and secondary containment]. ~~AND~~ ~~C.2 Initiate action to suspend OPDRVs.~~	Immediately ~~Immediately~~]

3.6 CONTAINMENT SYSTEMS

3.6.4.2 Secondary Containment Isolation Valves (SCIVs)

LCO 3.6.4.2 Each SCIV shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3,
During movement of [recently] irradiated fuel assemblies in the [primary or secondary containment]~~,~~
~~During operations with a potential for draining the reactor vessel (OPDRVs).~~

ACTIONS

--NOTES--

1. Penetration flow paths may be unisolated intermittently under administrative controls.

2. Separate Condition entry is allowed for each penetration flow path.

3. Enter applicable Conditions and Required Actions for systems made inoperable by SCIVs.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more penetration flow paths with one SCIV inoperable.	A.1 Isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, or blind flange. AND	8 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
	A.2	--------------NOTES------------- 1. Isolation devices in high radiation areas may be verified by use of administrative means. 2. Isolation devices that are locked, sealed, or otherwise secured may be verified by use of administrative means. ------------------------------------- Verify the affected penetration flow path is isolated.	 Once per 31 days
B. ------------NOTE------------ Only applicable to penetration flow paths with two isolation valves. -------------------------------- One or more penetration flow paths with two SCIVs inoperable.	B.1	Isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, or blind flange.	4 hours
C. Required Action and associated Completion Time of Condition A or B not met in MODE 1, 2, or 3.	C.1 <u>AND</u> C.2	Be in MODE 3. Be in MODE 4.	12 hours 36 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. Required Action and associated Completion Time of Condition A or B not met during movement of [recently] irradiated fuel assemblies in the [primary or secondary containment]~~ or during OPDRVs.~~	D.1	---------------NOTE-------------- LCO 3.0.3 is not applicable. ------------------------------------- Suspend movement of [recently] irradiated fuel assemblies in the [primary and secondary containment].	Immediately
	~~AND~~		
	~~D.2~~	~~Initiate action to suspend OPDRVs.~~	~~Immediately~~

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.4.2.1	-----------------------------NOTES----------------------------- 1. Valves and blind flanges in high radiation areas may be verified by use of administrative controls. 2. Not required to be met for SCIVs that are open under administrative means. --- Verify each secondary containment isolation manual valve and blind flange that is not locked, sealed, or otherwise secured and is required to be closed during accident conditions is closed.	[31 days OR In accordance with the Surveillance Frequency Control Program]

3.6 CONTAINMENT SYSTEMS

3.6.4.3 Standby Gas Treatment (SGT) System

LCO 3.6.4.3 Two SGT subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3,
During movement of [recently] irradiated fuel assemblies in the [primary or secondary containment]~~,~~
~~During operations with a potential for draining the reactor vessel (OPDRVs).~~

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One SGT subsystem inoperable.	A.1 Restore SGT subsystem to OPERABLE status.	7 days
B. Required Action and associated Completion Time of Condition A not met in MODE 1, 2, or 3.	B.1 ---------------NOTE-------------- LCO 3.0.4.a is not applicable when entering MODE 3. ------------------------------------- Be in MODE 3.	12 hours
C. Required Action and associated Completion Time of Condition A not met during movement of [recently] irradiated fuel assemblies in the [primary or secondary containment] ~~or during OPDRVs~~.	--------------------NOTE------------------- LCO 3.0.3 is not applicable. ---	
	C.1 Place OPERABLE SGT subsystem in operation.	Immediately
	OR	
	C.2~~.1~~ Suspend movement of [recently] irradiated fuel assemblies in the [primary and secondary containment].	Immediately
	~~AND~~	

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	~~C.2.2 Initiate action to suspend OPDRVs.~~	~~Immediately~~
D. Two SGT subsystems inoperable in MODE 1, 2, or 3.	D.1 ---------------NOTE-------------- LCO 3.0.4.a is not applicable when entering MODE 3. ------------------------------------- Be in MODE 3.	12 hours
E. Two SGT subsystems inoperable during movement of [recently] irradiated fuel assemblies in the [primary or secondary containment] ~~or during OPDRVs~~.	E.1 ---------------NOTE-------------- LCO 3.0.3 is not applicable. ------------------------------------- Suspend movement of [recently] irradiated fuel assemblies in the [primary and secondary containment].	Immediately
	~~AND~~	
	~~E.2 Initiate action to suspend OPDRVs.~~	~~Immediately~~

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.4.3.1	Operate each SGT subsystem for ≥ [10] continuous hours [with heaters operating].	[31 days OR In accordance with the Surveillance Frequency Control Program]

3.7 PLANT SYSTEMS

3.7.3 [Control Room Fresh Air (CRFA)] System

LCO 3.7.3 Two [CRFA] subsystems shall be OPERABLE.

--NOTE--
The control room envelope (CRE) boundary may be opened intermittently under administrative control.

APPLICABILITY: MODES 1, 2, and 3,
During movement of [recently] irradiated fuel assemblies in the [primary or secondary containment]~~,~~
~~During operations with a potential for draining the reactor vessel (OPDRVs).~~

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One [CRFA] subsystem inoperable for reasons other than Condition B.	A.1 Restore [CRFA] subsystem to OPERABLE status.	7 days
B. One or more [CRFA] subsystems inoperable due to inoperable CRE boundary in MODE 1, 2, or 3.	B.1 Initiate action to implement mitigating actions.	Immediately
	AND	
	B.2 Verify mitigating actions ensure CRE occupant exposures to radiological, chemical, and smoke hazards will not exceed limits.	24 hours
	AND	
	B.3 Restore CRE boundary to OPERABLE status.	90 days

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Required Action and associated Completion Time of Condition A or B not met in MODE 1, 2, or 3.	C.1 ---------------NOTE-------------- LCO 3.0.4.a is not applicable when entering MODE 3. ------------------------------------- Be in MODE 3.	12 hours
D. Required Action and associated Completion Time of Condition A not met during movement of [recently] irradiated fuel assemblies in the [primary or secondary containment] ~~or during OPDRVs~~.	--------------------NOTE------------------- LCO 3.0.3 is not applicable. ---	
	D.1 ---------------NOTE-------------- [Place in toxic gas protection mode if automatic transfer to toxic gas protection mode is inoperable.] ------------------------------------- Place OPERABLE [CRFA] subsystem in [isolation] mode.	Immediately
	OR	
	D.~~2.1~~ Suspend movement of [recently] irradiated fuel assemblies in the [primary and secondary containment].	Immediately
	~~AND~~	
	~~D.2.2 Initiate action to suspend OPDRVs.~~	~~Immediately~~

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. Two [CRFA] subsystems inoperable in MODE 1, 2, or 3 for reasons other than Condition B.	E.1 ---------------NOTE-------------- LCO 3.0.4.a is not applicable when entering MODE 3. ------------------------------------- Be in MODE 3.	I 12 hours
F. Two [CRFA] subsystems inoperable during movement of [recently] irradiated fuel assemblies in the [primary or secondary containment] ~~or during OPDRVs~~. OR One or more [CRFA] subsystems inoperable due to inoperable CRE boundary during movement of [recently] irradiated fuel assemblies in the [primary or secondary containment] ~~or during OPDRVs~~.	--------------------NOTE------------------- LCO 3.0.3 is not applicable. --- F.1 Suspend movement of [recently] irradiated fuel assemblies in the [primary and secondary containment]. ~~AND~~ ~~F.2 Initiate action to suspend OPDRVs.~~	 Immediately ~~Immediately~~

3.7 PLANT SYSTEMS

3.7.4 [Control Room Air Conditioning (AC)] System

LCO 3.7.4 Two [control room AC] subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3,
During movement of [recently] irradiated fuel assemblies in the [primary or secondary containment]~~,~~
~~During operations with a potential for draining the reactor vessel (OPDRVs).~~

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One [control room AC] subsystem inoperable.	A.1 Restore [control room AC] subsystem to OPERABLE status.	30 days
B. Two [control room AC] subsystems inoperable.	B.1 Verify control room area temperature < [90]°F. AND B.2 Restore one [control room AC] subsystem to OPERABLE status.	Once per 4 hours 7 days
C. Required Action and associated Completion Time of Condition A not met in MODE 1, 2, or 3.	C.1 ---------------NOTE-------------- LCO 3.0.4.a is not applicable when entering MODE 3. ------------------------------------- Be in MODE 3.	 12 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition A not met during movement of [recently] irradiated fuel assemblies in the [primary or secondary containment] ~~or during OPDRVs~~.	--------------------NOTE------------------- LCO 3.0.3 is not applicable. ---	
	D.1 Place OPERABLE [control room AC] subsystem in operation.	Immediately
	OR	
	D.2~~.1~~ Suspend movement of [recently] irradiated fuel assemblies in the [primary and secondary containment].	Immediately
	~~AND~~	
	~~D.2.2 Initiate action to suspend OPDRVs.~~	~~Immediately~~
E. Required Action and associated Completion Time of Condition B not met during movement of [recently] irradiated fuel assemblies in the [primary or secondary containment] ~~or during OPDRVs~~.	--------------------NOTE------------------- LCO 3.0.3 is not applicable. ---	
	E.1 Suspend movement of [recently] irradiated fuel assemblies in the [primary and secondary containment].	Immediately
	~~AND~~	
	~~E.2 Initiate action to suspend OPDRVs.~~	~~Immediately~~

ACTIONS

---NOTE---
LCO 3.0.3 is not applicable.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. LCO Item a. not met.	------------------NOTE------------------ Enter applicable Condition and Required Actions of LCO 3.8.10, with one required division de-energized as a result of Condition A. --	
	A.1 Declare affected required feature(s) with no offsite power available inoperable.	Immediately
	OR	
	A.2.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	A.2.2 Suspend movement of [recently] irradiated fuel assemblies in the [primary and secondary] containment.	Immediately
	~~AND~~	
	~~A.2.3 Initiate action to suspend operations with a potential for draining the reactor vessel (OPDRVs).~~	~~Immediately~~
	AND	
	A.2.34 Initiate action to restore required offsite power circuit to OPERABLE status.	Immediately

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. LCO Item b. not met.	B.1	Suspend CORE ALTERATIONS.	Immediately
	AND		
	B.2	Suspend movement of [recently] irradiated fuel assemblies in [primary and secondary] containment.	Immediately
	~~AND~~		
	~~B.3~~	~~Initiate action to suspend OPDRVs.~~	~~Immediately~~
	AND		
	B.34	Initiate action to restore required DG to OPERABLE status.	Immediately
C. LCO Item c. not met.	C.1	Declare HPCS [and 2C Standby Service Water System] inoperable.	[72] hours

3.8 ELECTRICAL POWER SYSTEMS

3.8.5 DC Sources - Shutdown

LCO 3.8.5

[DC electrical power subsystem(s) shall be OPERABLE to support the electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems - Shutdown."]

[One DC electrical power subsystem shall be OPERABLE.]

-----------------------------------REVIEWER'S NOTE-----------------------------------
This second option above applies for plants having a pre-ITS licensing basis (CTS) for electrical power requirements during shutdown conditions that required only one DC electrical power subsystem to be OPERABLE. Action A and the bracketed optional wording in Condition B are also eliminated for this case. The first option above is adopted for plants that have a CTS requiring the same level of DC electrical power subsystem support as is required for power operating conditions.

APPLICABILITY:

MODES 4 and 5,
During movement of [recently] irradiated fuel assemblies in the [primary or secondary] containment.

ACTIONS

--NOTE--
LCO 3.0.3 is not applicable.

CONDITION	REQUIRED ACTION	COMPLETION TIME
[A. One [or two] battery charger[s on one subsystem] inoperable. AND The redundant subsystem battery and charger[s] OPERABLE.	A.1 Restore battery terminal voltage to greater than or equal to the minimum established float voltage. AND A.2 Verify battery float current ≤ [2] amps. AND	2 hours Once per [12] hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	A.3 Restore battery charger[s] to OPERABLE status.	[72] hours]
B. One [or more] required DC electrical power subsystem[s] inoperable [for reasons other than Condition A. OR Required Action and associated Completion Time of Condition A not met.]	B.1 Declare affected required feature(s) inoperable.	Immediately
	OR	
	B.2.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	B.2.2 Suspend movement of [recently] irradiated fuel assemblies in the [primary or secondary] containment.	Immediately
	~~AND~~	
	~~B.2.3 Initiate action to suspend operations with a potential for draining the reactor vessel.~~	~~Immediately~~
	AND	
	B.2.34 Initiate action to restore required DC electrical power subsystems to OPERABLE status.	Immediately

3.8 ELECTRICAL POWER SYSTEMS

3.8.8 Inverters - Shutdown

LCO 3.8.8

[Inverter(s) shall be OPERABLE to support the onsite Class 1E AC vital bus electrical power distribution subsystem(s) required by LCO 3.8.10, "Distribution Systems - Shutdown."]

[One] inverter[s] shall be OPERABLE.]

----------------------------------REVIEWER'S NOTE----------------------------------
This second option above applies for plants having a pre-ITS licensing basis (CTS) for electrical power requirements during shutdown conditions that required only [one] inverter to be OPERABLE. The "[or more]" optional wording in Condition A is also eliminated for this case. The first option above is adopted for plants that have a CTS requiring the same level of DC electrical power subsystem/inverter support as is required for power operating conditions.

APPLICABILITY:

MODES 4 and 5,
During movement of [recently] irradiated fuel assemblies in the [primary or secondary] containment.

ACTIONS

---NOTE---
LCO 3.0.3 is not applicable.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One [or more] [required] inverter[s] inoperable.	A.1 Declare affected required feature(s) inoperable.	Immediately
	<u>OR</u>	
	A.2.1 Suspend CORE ALTERATIONS.	Immediately
	<u>AND</u>	

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	A.2.2 Suspend handling of [recently] irradiated fuel assemblies in the [primary or secondary] containment.	Immediately
	~~AND~~	
	~~A.2.3 Initiate action to suspend operations with a potential for draining the reactor vessel.~~	~~Immediately~~
	AND	
	A.2.34 Initiate action to restore required inverters to OPERABLE status.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.8.1	Verify correct inverter voltage, [frequency,] and alignments to [required] AC vital buses.	[7 days OR In accordance with the Surveillance Frequency Control Program]

3.8 ELECTRICAL POWER SYSTEMS

3.8.10 Distribution Systems - Shutdown

LCO 3.8.10 The necessary portions of the Division 1, Division 2, and Division 3 AC, DC, [and AC vital bus] electrical power distribution subsystems shall be OPERABLE to support equipment required to be OPERABLE.

APPLICABILITY: MODES 4 and 5,
During movement of [recently] irradiated fuel assemblies in the [primary or secondary] containment.

ACTIONS

---NOTE---
LCO 3.0.3 is not applicable.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required AC, DC, [or AC vital bus] electrical power distribution subsystems inoperable.	A.1 Declare associated supported required feature(s) inoperable.	Immediately
	OR	
	A.2.1 Suspend CORE ALTERATIONS.	Immediately
	AND	
	A.2.2 Suspend handling of [recently] irradiated fuel assemblies in the [primary or secondary] containment.	Immediately
	~~AND~~	

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	~~A.2.3 Initiate action to suspend operations with a potential for draining the reactor vessel.~~ AND	~~Immediately~~
	A.2.~~3~~4 Initiate actions to restore [required] AC, DC, [and AC vital bus] electrical power distribution subsystems to OPERABLE status. AND	Immediately
	A.2.~~4~~5 Declare associated required shutdown cooling subsystem(s) inoperable and not in operation.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.10.1	Verify correct breaker alignments and voltage to [required] AC, DC, [and AC vital bus] electrical power distribution subsystems.	[7 days OR In accordance with the Surveillance Frequency Control Program]

5.5 Programs and Manuals

5.5.15 Control Room Envelope (CRE) Habitability Program (continued)

CRE pressure and assessing the CRE boundary as required by paragraphs c and d, respectively.

5.5.16 [Setpoint Control Program

This program shall establish the requirements for ensuring that setpoints for automatic protective devices are initially within and remain within the assumptions of the applicable safety analyses, provides a means for processing changes to instrumentation setpoints, and identifies setpoint methodologies to ensure instrumentation will function as required. The program shall ensure that testing of automatic protective devices related to variables having significant safety functions as delineated by 10 CFR 50.36(c)(1)(ii)(A) verifies that instrumentation will function as required.

a. The program shall list the Functions in the following specifications to which it applies:

1. LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation;"
2. LCO 3.3.1.2, "Source Range Monitor (SRM) Instrumentation;"
3. LCO 3.3.2.1, "Control Rod Block Instrumentation;"
4. LCO 3.3.2.2, "Feedwater and Main Turbine High Water Level Trip Instrumentation;"
5. LCO 3.3.4.1, "End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation;"
6. LCO 3.3.4.2, "Anticipated Transient Without Scram Recirculation Pump Trip (ATWS-RPT) Instrumentation;"
7. LCO 3.3.5.1, "Emergency Core Cooling System (ECCS) Instrumentation;"
8. LCO 3.3.5.2, "Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation;"
9~~8~~. LCO 3.3.5.*3*~~2~~, "Reactor Core Isolation Cooling (RCIC) System Instrumentation;"
10~~9~~. LCO 3.3.6.1, "Primary Containment Isolation Instrumentation;"
1*1*~~0~~. LCO 3.3.6.2, "Secondary Containment Isolation Instrumentation;"
1*2*~~1~~. LCO 3.3.6.3, "Low-Low Set (LLS) Instrumentation;"
1*3*~~2~~. LCO 3.3.7.1, "[Main Control Room Environmental Control (MCREC)] System Instrumentation;"
1*4*~~3~~. LCO 3.3.8.1, "Loss of Power (LOP) Instrumentation;"
1*5*~~4~~. LCO 3.3.8.2, "Reactor Protection System (RPS) Electric Power Monitoring."

b. The program shall require the [Limiting Trip Setpoint (LTSP)], [Nominal Trip Setpoint NTSP], Allowable Value (AV), As-Found Tolerance (AFT), and As-Left Tolerance (ALT) (as applicable) of the Functions described in paragraph a. are calculated using the NRC approved setpoint methodology,

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BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The OPERABILITY of the ECCS instrumentation is dependent upon the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.5.1-1. Each Function must have a required number of OPERABLE channels, with their setpoints set within the setting tolerance of the [LTSP], where appropriate. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each ECCS subsystem must also respond within its assumed response time.

Allowable Values are specified for each ECCS Function specified in Table 3.3.5.1-1. [LTSPs] and the methodologies for calculation of the as-left and as-found tolerances are described in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. The [LTSPs] are selected to ensure that the setpoints remain conservative with respect to the as-found tolerance band between CHANNEL CALIBRATIONS. After each calibration the trip setpoint shall be left within the as-left band around the [LTSP].

Table 3.3.5.1-1 is modified by *a*~~two~~ footnote~~s~~ *which* ~~. Footnote (a) is added to clarify that the associated functions are required to be OPERABLE in MODES 4 and 5 only when their supported ECCS are required to be OPERABLE per LCO 3.5.2, ECCS - Shutdown. Footnote (b)~~ is added to show that certain ECCS instrumentation Functions also perform DG initiation and actuation of other Technical Specifications (TS) equipment.

[LTSPs] are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state. The analytical limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytical limits, corrected for calibration, process, and some of the instrument errors. The [LTSPs] are then determined, accounting for the remaining instrument errors (e.g., drift). The trip setpoints derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

In general, the individual Functions are required to be OPERABLE in the MODES or other specified conditions that may require ECCS (or DG) initiation to mitigate the consequences of a design basis accident or

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APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

Low Pressure Core Spray and Low Pressure Coolant Injection Systems

1.a, 2.a. Reactor Vessel Water Level - Low Low Low, Level 1

Low reactor pressure vessel (RPV) water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. The low pressure ECCS and associated DGs are initiated at Level 1 to ensure that core spray and flooding functions are available to prevent or minimize fuel damage. The Reactor Vessel Water Level - Low Low Low, Level 1 is one of the Functions assumed to be OPERABLE and capable of initiating the ECCS during the transients analyzed in References 2 and 4. In addition, the Reactor Vessel Water Level - Low Low Low, Level 1 Function is directly assumed in the analysis of the recirculation line break (Ref. 3). The core cooling function of the ECCS, along with the scram action of the Reactor Protection System (RPS), ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Reactor Vessel Water Level - Low Low Low, Level 1 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. The Reactor Vessel Water Level - Low Low Low, Level 1 Allowable Value is chosen to allow time for the low pressure core flooding systems to activate and provide adequate cooling.

Two channels of Reactor Vessel Water Level - Low Low Low, Level 1 Function per associated Division are only required to be OPERABLE when the associated ECCS is required to be OPERABLE, to ensure that no single instrument failure can preclude ECCS initiation. (Two channels input to LPCS and LPCI A, while the other two channels input to LPCI B and LPCI C.) ~~Per Footnote (a) to Table 3.3.5.1-1, this ECCS Function is only required to be OPERABLE in MODES 4 and 5 whenever the associated ECCS is required to be OPERABLE per LCO 3.5.2. Refer to LCO 3.5.1 and LCO 3.5.2, "ECCS - Shutdown," for Applicability Bases for the low pressure ECCS subsystems; LCO 3.8.1, "AC Sources - Operating," and LCO 3.8.2, "AC Sources - Shutdown," for Applicability Bases for the DGs.~~

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

1.b, 2.b. Drywell Pressure – High

High pressure in the drywell could indicate a break in the reactor coolant pressure boundary (RCPB). The low pressure ECCS and associated DGs are initiated upon receipt of the Drywell Pressure - High Function in order to minimize the possibility of fuel damage. The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

High drywell pressure signals are initiated from four pressure transmitters that sense drywell pressure. The Allowable Value was selected to be as low as possible and be indicative of a LOCA inside primary containment. Negative barometric fluctuations are accounted for in the Allowable Value.

The Drywell Pressure - High Function is required to be OPERABLE when the associated ECCS and DGs are required to be OPERABLE in conjunction with times when the primary containment is required to be OPERABLE. Thus, four channels of the LPCS and LPCI Drywell Pressure - High Function are required to be OPERABLE in MODES 1, 2, and 3 to ensure that no single instrument failure can preclude ECCS initiation. (Two channels input to LPCS and LPCI A, while the other two channels input to LPCI B and LPCI C.) In MODES 4 and 5, the Drywell Pressure - High Function is not required since there is insufficient energy in the reactor to pressurize the primary containment to Drywell Pressure - High setpoint. Refer to LCO 3.5.1 for Applicability Bases for the low pressure ECCS subsystems and to LCO 3.8.1 for Applicability Bases for the DGs.

1.c, 2.c. Low Pressure Coolant Injection Pump A and Pump B Start - Time Delay Relay

The purpose of this time delay is to stagger the start of the two ECCS pumps that are in each of Divisions 1 and 2, thus limiting the starting transients on the 4.16 kV emergency buses. This Function is only necessary when power is being supplied from the standby power sources (DG). However, since the time delay does not degrade ECCS operation, it remains in the pump start logic at all times. The LPCI Pump Start - Time Delay Relays are assumed to be OPERABLE in the accident and transient analyses requiring ECCS initiation. That is, the analysis assumes that the pumps will initiate when required and excess loading will not cause failure of the power sources.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

There are two LPCI Pump Start - Time Delay Relays, one in each of the RHR "A" and RHR "B" pump start logic circuits. While each time delay relay is dedicated to a single pump start logic, a single failure of a LPCI Pump Start - Time Delay Relay could result in the failure of the two low pressure ECCS pumps, powered from the same ESF bus, to perform their intended function within the assumed ECCS RESPONSE TIMES (e.g., as in the case where both ECCS pumps on one ESF bus start simultaneously due to an inoperable time delay relay). This still leaves two of the four low pressure ECCS pumps OPERABLE; thus, the single failure criterion is met (i.e., loss of one instrument does not preclude ECCS initiation). The Allowable Value for the LPCI Pump Start - Time Delay Relay is chosen to be long enough so that most of the starting transient of the first pump is complete before starting the second pump on the same 4.16 kV emergency bus and short enough so that ECCS operation is not degraded.

Each LPCI Pump Start - Time Delay Relay Function is only required to be OPERABLE when the associated LPCI subsystem is required to be OPERABLE. ~~Per Footnote (a) to Table 3.3.5.1-1, this ECCS Function is only required to be OPERABLE in MODES 4 and 5 whenever the associated ECCS is required to be OPERABLE per LCO 3.5.2. Refer to LCO 3.5.1 and LCO 3.5.2 for Applicability Bases for the LPCI subsystems.~~

<u>1.d, 2.d. Reactor Steam Dome Pressure - Low (Injection Permissive)</u>

Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS subsystems. This ensures that, prior to opening the injection valves of the low pressure ECCS subsystems, the reactor pressure has fallen to a value below these subsystems' maximum design pressure. The Reactor Steam Dome Pressure - Low is one of the Functions assumed to be OPERABLE and capable of permitting initiation of the ECCS during the transients analyzed in References 2 and 4. In addition, the Reactor Steam Dome Pressure - Low Function is directly assumed in the analysis of the recirculation line break (Ref. 3). The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

The Reactor Steam Dome Pressure - Low signals are initiated from four pressure transmitters that sense the reactor dome pressure. The four pressure transmitters each drive a master and slave trip unit (for a total of eight trip units).

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APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The Allowable Value is low enough to prevent overpressurizing the equipment in the low pressure ECCS, but high enough to ensure that the ECCS injection prevents the fuel peak cladding temperature from exceeding the limits of 10 CFR 50.46.

Three channels of Reactor Steam Dome Pressure - Low Function per associated Division are only required to be OPERABLE when the associated ECCS is required to be OPERABLE to ensure that no single instrument failure can preclude ECCS initiation. (Three channels are required for LPCS and LPCI A, while three other channels are required for LPCI B and LPCI C.) ~~Per Footnote (a) to Table 3.3.5.1-1, this ECCS Function is only required to be OPERABLE in MODES 4 and 5 whenever the associated ECCS is required to be OPERABLE per LCO 3.5.2. Refer to LCO 3.5.1 and LCO 3.5.2 for Applicability Bases for the low pressure ECCS subsystems.~~

<u>1.e, 1.f, 2.e. Low Pressure Coolant Injection and Low Pressure Core Spray Pump Discharge Flow - Low (Bypass)</u>

The minimum flow instruments are provided to protect the associated low pressure ECCS pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow is sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump. The LPCI and LPCS Pump Discharge Flow - Low Functions are assumed to be OPERABLE and capable of closing the minimum flow valves to ensure that the low pressure ECCS flows assumed during the transients and accidents analyzed in References 2, 3, and 4 are met. The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

One flow transmitter per ECCS pump is used to detect the associated subsystems' flow rates. The logic is arranged such that each transmitter causes its associated minimum flow valve to open. The logic will close the minimum flow valve once the closure setpoint is exceeded. The LPCI minimum flow valves are time delayed such that the valves will not open for 10 seconds after the switches detect low flow. The time delay is provided to limit reactor vessel inventory loss during the startup of the RHR shutdown cooling mode (for RHR A and RHR B). The Pump Discharge Flow - Low Allowable Values are high enough to ensure that the pump flow rate is sufficient to protect the pump, yet low enough to ensure that the closure of the minimum flow valve is initiated to allow full flow into the core.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Each channel of Pump Discharge Flow - Low Function (one LPCS channel and three LPCI channels) is only required to be OPERABLE when the associated ECCS is required to be OPERABLE, to ensure that no single instrument failure can preclude the ECCS function. Refer to LCO 3.5.1 and LCO 3.5.2 for Applicability Bases for the low pressure ECCS subsystems.

1.g, 2.f. Manual Initiation

The Manual Initiation push button channels introduce signals into the appropriate ECCS logic to provide manual initiation capability and are redundant to the automatic protective instrumentation. There is one push button for each of the two Divisions of low pressure ECCS (i.e., Division 1 ECCS, LPCS and LPCI A; Division 2 ECCS, LPCI B and LPCI C).

The Manual Initiation Function is not assumed in any accident or transient analyses in the FSAR. However, the Function is retained for overall redundancy and diversity of the low pressure ECCS function as required by the NRC in the plant licensing basis.

There is no Allowable Value for this Function since the channels are mechanically actuated based solely on the position of the push buttons. Each channel of the Manual Initiation Function (one channel per Division) is only required to be OPERABLE when the associated ECCS is required to be OPERABLE. ~~Per Footnote (a) to Table 3.3.5.1-1, this ECCS Function is only required to be OPERABLE in MODES 4 and 5 whenever the associated ECCS is required to be OPERABLE per LCO 3.5.2. Refer to LCO 3.5.1 and LCO 3.5.2 for Applicability Bases for the low pressure ECCS subsystems.~~

High Pressure Core Spray System

3.a. Reactor Vessel Water Level - Low Low, Level 2

Low RPV water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, the HPCS System and associated DG is initiated at Level 2 to maintain level above the top of the active fuel. The Reactor Vessel Water Level - Low Low, Level 2 is one of the Functions assumed to be OPERABLE and capable of initiating HPCS during the transients analyzed in References 2 and 4. The Reactor Vessel Water Level - Low Low, Level 2 Function associated with HPCS is directly assumed in the analysis of the recirculation line break (Ref. 3). The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

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ACTIONS (continued)

B.1, B.2, and B.3

Required Actions B.1 and B.2 are intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same Function (or in some cases, within the same variable) result in redundant automatic initiation capability being lost for the feature(s). Required Action B.1 features would be those that are initiated by Functions 1.a, 1.b, 2.a, and 2.b (e.g., low pressure ECCS). The Required Action B.2 feature would be HPCS. For Required Action B.1, redundant automatic initiation capability is lost if either (a) one or more Function 1.a channels and one or more Function 2.a channels are inoperable and untripped, or (b) one or more Function 1.b channels and one or more Function 2.b channels are inoperable and untripped.

For Divisions 1 and 2, since each inoperable channel would have Required Action B.1 applied separately (refer to ACTIONS Note), each inoperable channel would only require the affected portion of the associated Division of low pressure ECCS and DG to be declared inoperable. However, since channels in both Divisions are inoperable and untripped, and the Completion Times started concurrently for the channels in both Divisions, this results in the affected portions in both Divisions of ECCS and DG being concurrently declared inoperable.

For Required Action B.2, redundant automatic initiation capability is lost if two Function 3.a or two Function 3.b channels are inoperable and untripped in the same trip system. In this situation (loss of redundant automatic initiation capability), the 24 hour allowance of Required Action B.3 is not appropriate and the feature(s) associated with the inoperable, untripped channels must be declared inoperable within 1 hour. ~~As noted (Note 1 to Required Action B.1 and Required Action B.2), the two Required Actions are only applicable in MODES 1, 2, and 3. In MODES 4 and 5, the specific initiation time of the ECCS is not assumed and the probability of a LOCA is lower. Thus, a total loss of initiation capability for 24 hours (as allowed by Required Action B.3) is allowed during MODES 4 and 5.~~ Notes are also provided (*the* Note ~~2~~ to Required Action B.1 and Required Action B.2) to delineate which Required Action is applicable for each Function that requires entry into Condition B if an associated channel is inoperable. This ensures that the proper loss of initiation capability check is performed.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action B.1, the Completion Time only begins upon discovery that a redundant feature in both

ACTIONS (continued)

Divisions (e.g., any Division 1 ECCS and Division 2 ECCS) cannot be automatically initiated due to inoperable, untripped channels within the same variable as described in the paragraph above. For Required Action B.2, the Completion Time only begins upon discovery that the HPCS System cannot be automatically initiated due to two inoperable, untripped channels for the associated Function in the same trip system. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

Because of the diversity of sensors available to provide initiation signals and the redundancy of the ECCS design, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 5) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action B.3. Placing the inoperable channel in trip would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. Alternately, if it is not desired to place the channel in trip (e.g., as in the case where placing the inoperable channel in trip would result in an initiation), Condition H must be entered and its Required Action taken.

C.1 and C.2

Required Action C.1 is intended to ensure that appropriate actions are taken if multiple, inoperable channels within the same Function (or in some cases, within the same variable) result in redundant automatic initiation capability being lost for the feature(s). Required Action C.1 features would be those that are initiated by Functions 1.c, 1.d, 2.c, and 2.d (i.e., low pressure ECCS). For Functions 1.c and 2.c, redundant automatic initiation capability is lost if the Function 1.c and Function 2.c channels are inoperable. For Functions 1.d and 2.d, redundant automatic initiation capability is lost if two Function 1.d channels in the same trip system and two Function 2.d channels in the same trip system (but not necessarily the same trip system as the Function 1.d channels) are inoperable. Since each inoperable channel would have Required Action C.1 applied separately (refer to ACTIONS Note), each inoperable channel would only require the affected portion of the associated Division to be declared inoperable. However, since channels in both Divisions are inoperable, and the Completion Times started concurrently for the channels in both Divisions, this results in the affected portions in both Divisions being concurrently declared inoperable. For Functions 1.c

ACTIONS (continued)

and 2.c, the affected portions of the Division are LPCI A and LPCI B, respectively. For Functions 1.d and 2.d, the affected portions of the Division are the low pressure ECCS pumps (Divisions 1 and 2, respectively).

In this situation (loss of redundant automatic initiation capability), the 24 hour allowance of Required Action C.2 is not appropriate and the feature(s) associated with the inoperable channels must be declared inoperable within 1 hour. ~~As noted (Note 1), the Required Action is only applicable in MODES 1, 2, and 3. In MODES 4 and 5, the specific initiation time of the ECCS is not assumed and the probability of a LOCA is lower. Thus, a total loss of automatic initiation capability for 24 hours (as allowed by Required Action C.2) is allowed during MODES 4 and 5.~~

The Note ~~2~~ states that Required Action C.1 is only applicable for Functions 1.c, 1.d, 2.c, and 2.d. The Required Action is not applicable to Functions 1.g, 2.f, and 3.h (which also require entry into this Condition if a channel in these Functions is inoperable), since they are the Manual Initiation Functions and are not assumed in any accident or transient analysis. Thus, a total loss of manual initiation capability for 24 hours (as allowed by Required Action C.2) is allowed. Required Action C.1 is also not applicable to Function 3.c (which also requires entry into this Condition if a channel in this Function is inoperable), since the loss of one channel results in a loss of the Function (two-out-of-two logic). This loss was considered during the development of Reference 5 and considered acceptable for the 24 hours allowed by Required Action C.2.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action C.1, the Completion Time only begins upon discovery that the same feature in both Divisions (e.g., any Division 1 ECCS and Division 2 ECCS) cannot be automatically initiated due to inoperable channels within the same variable as described in the paragraph above. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration of channels.

Because of the diversity of sensors available to provide initiation signals and the redundancy of the ECCS design, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 5) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the

ACTIONS (continued)

allowable out of service time, Condition H must be entered and its Required Action taken. The Required Actions do not allow placing the channel in trip since this action would either cause the initiation or would not necessarily result in a safe state for the channel in all events.

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

Required Action D.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same Function result in a complete loss of automatic component initiation capability for the HPCS System. Automatic component initiation capability is lost if two Function 3.d channels or two Function 3.e channels are inoperable and untripped. In this situation (loss of automatic suction swap), the 24 hour allowance of Required Actions D.2.1 and D.2.2 is not appropriate and the HPCS System must be declared inoperable within 1 hour after discovery of loss of HPCS initiation capability. As noted, the Required Action is only applicable if the HPCS pump suction is not aligned to the suppression pool, since, if aligned, the Function is already performed.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action D.1, the Completion Time only begins upon discovery that the HPCS System cannot be automatically aligned to the suppression pool due to two inoperable, untripped channels in the same Function. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

Because of the diversity of sensors available to provide initiation signals and the redundancy of the ECCS design, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 5) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action D.2.1 or the suction source must be aligned to the suppression pool per Required Action D.2.2. Placing the inoperable channel in trip performs the intended function of the channel (shifting the suction source to the suppression pool). Performance of either of these two Required Actions will allow operation to continue. If Required Action D.2.1 or Required Action D.2.2 is performed, measures should be taken to ensure that the HPCS System piping remains filled

ACTIONS (continued)

with water. Alternately, if it is not desired to perform Required Actions D.2.1 and D.2.2 (e.g., as in the case where shifting the suction source could drain down the HPCS suction piping), Condition H must be entered and its Required Action taken.

E.1 and E.2

Required Action E.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the LPCS and LPCI Pump Discharge Flow - Low (Bypass) Functions result in redundant automatic initiation capability being lost for the feature(s). For Required Action E.1, the features would be those that are initiated by Functions 1.e, 1.f, and 2.e (e.g., low pressure ECCS). Redundant automatic initiation capability is lost if three of the four channels associated with Functions 1.e, 1.f, and 2.e are inoperable. Since each inoperable channel would have Required Action E.1 applied separately (refer to ACTIONS Note), each inoperable channel would only require the affected low pressure ECCS pump to be declared inoperable. However, since channels for more than one low pressure ECCS pump are inoperable, and the Completion Times started concurrently for the channels of the low pressure ECCS pumps, this results in the affected low pressure ECCS pumps being concurrently declared inoperable.

In this situation (loss of redundant automatic initiation capability), the 7 day allowance of Required Action E.2 is not appropriate and the feature(s) associated with each inoperable channel must be declared inoperable within 1 hour after discovery of loss of initiation capability for feature(s) in both Divisions. ~~As noted (Note 1 to Required Action E.1), Required Action E.1 is only applicable in MODES 1, 2, and 3. In MODES 4 and 5, the specific initiation time of the low pressure ECCS is not assumed and the probability of a LOCA is lower. Thus, a total loss of initiation capability for 7 days (as allowed by Required Action E.2) is allowed during MODES 4 and 5.~~ A Note is also provided (*the* Note ~~2~~ to Required Action E.1) to delineate that Required Action E.1 is only applicable to low pressure ECCS Functions. Required Action E.1 is not applicable to HPCS Functions 3.f and 3.g since the loss of one channel results in a loss of the Function (one-out-of-one logic). This loss was considered during the development of Reference 5 and considered acceptable for the 7 days allowed by Required Action E.2.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action E.1, the Completion Time only begins upon discovery that three channels of the variable

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will run in standby conditions (rated voltage and speed, with the DG output breaker open). The DGs will only energize their respective Engineered Safety Feature (ESF) buses if a loss of offsite power occurs. (Refer to Bases for LCO 3.3.8.1.)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The actions of the ECCS are explicitly assumed in the safety analyses of References 2, 3, and 4. The ECCS is initiated to preserve the integrity of the fuel cladding by limiting the post LOCA peak cladding temperature to less than the 10 CFR 50.46 limits.

ECCS instrumentation satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii). Certain instrumentation Functions are retained for other reasons and are described below in the individual Functions discussion.

Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy.

The OPERABILITY of the ECCS instrumentation is dependent upon the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.5.1-1. Each Function must have a required number of OPERABLE channels, with their setpoints set within the setting tolerance of the [LTSP], where appropriate. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each ECCS subsystem must also respond within its assumed response time.

Allowable Values are specified for each ECCS Function specified in the SCP. [LTSPs] and the methodologies for calculation of the as-left and as-found tolerances are described in the SCP controlled under 10 CFR 50.59. The [LTSPs] are selected to ensure that the setpoints remain conservative with respect to the as-found tolerance band between CHANNEL CALIBRATIONS. After each calibration the trip setpoint shall be left within the as-left band around the [LTSP].

Table 3.3.5.1-1 is modified by *a*~~two~~ footnote~~s~~ *which* ~~. Footnote (a) is added to clarify that the associated functions are required to be OPERABLE in MODES 4 and 5 only when their supported ECCS are required to be~~

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

~~OPERABLE per LCO 3.5.2, ECCS - Shutdown. Footnote (b)~~ is added to show that certain ECCS instrumentation Functions also perform DG initiation and actuation of other Technical Specifications (TS) equipment.

[LTSPs] are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state. The analytical limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytical limits, corrected for calibration, process, and some of the instrument errors. The [LTSPs] are then determined, accounting for the remaining instrument errors (e.g., drift). The trip setpoints derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

In general, the individual Functions are required to be OPERABLE in the MODES or other specified conditions that may require ECCS (or DG) initiation to mitigate the consequences of a design basis accident or transient. To ensure reliable ECCS and DG function, a combination of Functions is required to provide primary and secondary initiation signals.

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

Low Pressure Core Spray and Low Pressure Coolant Injection Systems

1.a, 2.a. Reactor Vessel Water Level - Low Low Low, Level 1

Low reactor pressure vessel (RPV) water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. The low pressure ECCS and associated DGs are initiated at Level 1 to ensure that core spray and flooding functions are available to prevent or minimize fuel damage. The Reactor Vessel Water Level - Low Low Low, Level 1 is one of the Functions assumed to be OPERABLE and capable of initiating the ECCS during the transients analyzed in References 2 and 4. In addition, the Reactor Vessel Water Level - Low Low Low, Level 1 Function is directly assumed in the analysis of the recirculation line break (Ref. 3). The core cooling function of the ECCS, along with the scram action of the Reactor Protection System (RPS), ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

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APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Reactor Vessel Water Level - Low Low Low, Level 1 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. The Reactor Vessel Water Level - Low Low Low, Level 1 Allowable Value is chosen to allow time for the low pressure core flooding systems to activate and provide adequate cooling.

Two channels of Reactor Vessel Water Level - Low Low Low, Level 1 Function per associated Division are only required to be OPERABLE when the associated ECCS is required to be OPERABLE, to ensure that no single instrument failure can preclude ECCS initiation. (Two channels input to LPCS and LPCI A, while the other two channels input to LPCI B and LPCI C.)~~ Per Footnote (a) to Table 3.3.5.1-1, this ECCS Function is only required to be OPERABLE in MODES 4 and 5 whenever the associated ECCS is required to be OPERABLE per LCO 3.5.2. Refer to LCO 3.5.1 and LCO 3.5.2, "ECCS - Shutdown," for Applicability Bases for the low pressure ECCS subsystems; LCO 3.8.1, "AC Sources - Operating," and LCO 3.8.2, "AC Sources - Shutdown," for Applicability Bases for the DGs.~~

1.b, 2.b. Drywell Pressure – High

High pressure in the drywell could indicate a break in the reactor coolant pressure boundary (RCPB). The low pressure ECCS and associated DGs are initiated upon receipt of the Drywell Pressure - High Function in order to minimize the possibility of fuel damage. The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

High drywell pressure signals are initiated from four pressure transmitters that sense drywell pressure. The Allowable Value was selected to be as low as possible and be indicative of a LOCA inside primary containment. Negative barometric fluctuations are accounted for in the Allowable Value.

The Drywell Pressure - High Function is required to be OPERABLE when the associated ECCS and DGs are required to be OPERABLE in conjunction with times when the primary containment is required to be OPERABLE. Thus, four channels of the LPCS and LPCI Drywell Pressure - High Function are required to be OPERABLE in MODES 1, 2, and 3 to ensure that no single instrument failure can preclude ECCS initiation. (Two channels input to LPCS and LPCI A, while the other two channels input to LPCI B and LPCI C.) In MODES 4 and 5, the Drywell

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Pressure - High Function is not required since there is insufficient energy in the reactor to pressurize the primary containment to Drywell Pressure - High setpoint. Refer to LCO 3.5.1 for Applicability Bases for the low pressure ECCS subsystems and to LCO 3.8.1 for Applicability Bases for the DGs.

1.c, 2.c. Low Pressure Coolant Injection Pump A and Pump B Start - Time Delay Relay

The purpose of this time delay is to stagger the start of the two ECCS pumps that are in each of Divisions 1 and 2, thus limiting the starting transients on the 4.16 kV emergency buses. This Function is only necessary when power is being supplied from the standby power sources (DG). However, since the time delay does not degrade ECCS operation, it remains in the pump start logic at all times. The LPCI Pump Start - Time Delay Relays are assumed to be OPERABLE in the accident and transient analyses requiring ECCS initiation. That is, the analysis assumes that the pumps will initiate when required and excess loading will not cause failure of the power sources.

There are two LPCI Pump Start - Time Delay Relays, one in each of the RHR "A" and RHR "B" pump start logic circuits. While each time delay relay is dedicated to a single pump start logic, a single failure of a LPCI Pump Start - Time Delay Relay could result in the failure of the two low pressure ECCS pumps, powered from the same ESF bus, to perform their intended function within the assumed ECCS RESPONSE TIMES (e.g., as in the case where both ECCS pumps on one ESF bus start simultaneously due to an inoperable time delay relay). This still leaves two of the four low pressure ECCS pumps OPERABLE; thus, the single failure criterion is met (i.e., loss of one instrument does not preclude ECCS initiation). The Allowable Value for the LPCI Pump Start - Time Delay Relay is chosen to be long enough so that most of the starting transient of the first pump is complete before starting the second pump on the same 4.16 kV emergency bus and short enough so that ECCS operation is not degraded.

Each LPCI Pump Start - Time Delay Relay Function is only required to be OPERABLE when the associated LPCI subsystem is required to be OPERABLE. ~~Per Footnote (a) to Table 3.3.5.1-1, this ECCS Function is only required to be OPERABLE in MODES 4 and 5 whenever the associated ECCS is required to be OPERABLE per LCO 3.5.2. Refer to LCO 3.5.1 and LCO 3.5.2 for Applicability Bases for the LPCI subsystems.~~

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APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

1.d, 2.d. Reactor Steam Dome Pressure - Low (Injection Permissive)

Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS subsystems. This ensures that, prior to opening the injection valves of the low pressure ECCS subsystems, the reactor pressure has fallen to a value below these subsystems' maximum design pressure. The Reactor Steam Dome Pressure - Low is one of the Functions assumed to be OPERABLE and capable of permitting initiation of the ECCS during the transients analyzed in References 2 and 4. In addition, the Reactor Steam Dome Pressure - Low Function is directly assumed in the analysis of the recirculation line break (Ref. 3). The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

The Reactor Steam Dome Pressure - Low signals are initiated from four pressure transmitters that sense the reactor dome pressure. The four pressure transmitters each drive a master and slave trip unit (for a total of eight trip units).

The Allowable Value is low enough to prevent overpressurizing the equipment in the low pressure ECCS, but high enough to ensure that the ECCS injection prevents the fuel peak cladding temperature from exceeding the limits of 10 CFR 50.46.

Three channels of Reactor Steam Dome Pressure - Low Function per associated Division are only required to be OPERABLE when the associated ECCS is required to be OPERABLE to ensure that no single instrument failure can preclude ECCS initiation. (Three channels are required for LPCS and LPCI A, while three other channels are required for LPCI B and LPCI C.) ~~Per Footnote (a) to Table 3.3.5.1-1, this ECCS Function is only required to be OPERABLE in MODES 4 and 5 whenever the associated ECCS is required to be OPERABLE per LCO 3.5.2. Refer to LCO 3.5.1 and LCO 3.5.2 for Applicability Bases for the low pressure ECCS subsystems.~~

1.e, 1.f, 2.e. Low Pressure Coolant Injection and Low Pressure Core Spray Pump Discharge Flow - Low (Bypass)

The minimum flow instruments are provided to protect the associated low pressure ECCS pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow is sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump. The LPCI and LPCS Pump Discharge Flow - Low Functions are assumed to be

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

OPERABLE and capable of closing the minimum flow valves to ensure that the low pressure ECCS flows assumed during the transients and accidents analyzed in References 2, 3, and 4 are met. The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

One flow transmitter per ECCS pump is used to detect the associated subsystems' flow rates. The logic is arranged such that each transmitter causes its associated minimum flow valve to open. The logic will close the minimum flow valve once the closure setpoint is exceeded. The LPCI minimum flow valves are time delayed such that the valves will not open for 10 seconds after the switches detect low flow. The time delay is provided to limit reactor vessel inventory loss during the startup of the RHR shutdown cooling mode (for RHR A and RHR B). The Pump Discharge Flow - Low Allowable Values are high enough to ensure that the pump flow rate is sufficient to protect the pump, yet low enough to ensure that the closure of the minimum flow valve is initiated to allow full flow into the core.

Each channel of Pump Discharge Flow - Low Function (one LPCS channel and three LPCI channels) is only required to be OPERABLE when the associated ECCS is required to be OPERABLE, to ensure that no single instrument failure can preclude the ECCS function. Refer to LCO 3.5.1 and LCO 3.5.2 for Applicability Bases for the low pressure ECCS subsystems.

1.g, 2.f. Manual Initiation

The Manual Initiation push button channels introduce signals into the appropriate ECCS logic to provide manual initiation capability and are redundant to the automatic protective instrumentation. There is one push button for each of the two Divisions of low pressure ECCS (i.e., Division 1 ECCS, LPCS and LPCI A; Division 2 ECCS, LPCI B and LPCI C).

The Manual Initiation Function is not assumed in any accident or transient analyses in the FSAR. However, the Function is retained for overall redundancy and diversity of the low pressure ECCS function as required by the NRC in the plant licensing basis.

There is no Allowable Value for this Function since the channels are mechanically actuated based solely on the position of the push buttons. Each channel of the Manual Initiation Function (one channel per Division) is only required to be OPERABLE when the associated ECCS is required to be OPERABLE. ~~Per Footnote (a) to Table 3.3.5.1-1, this ECCS~~

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

~~Function is only required to be OPERABLE in MODES 4 and 5 whenever the associated ECCS is required to be OPERABLE per LCO 3.5.2. Refer to LCO 3.5.1 and LCO 3.5.2 for Applicability Bases for the low pressure ECCS subsystems.~~

High Pressure Core Spray System

3.a. Reactor Vessel Water Level - Low Low, Level 2

Low RPV water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, the HPCS System and associated DG is initiated at Level 2 to maintain level above the top of the active fuel. The Reactor Vessel Water Level - Low Low, Level 2 is one of the Functions assumed to be OPERABLE and capable of initiating HPCS during the transients analyzed in References 2 and 4. The Reactor Vessel Water Level - Low Low, Level 2 Function associated with HPCS is directly assumed in the analysis of the recirculation line break (Ref. 3). The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Reactor Vessel Water Level - Low Low, Level 2 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel.

The Reactor Vessel Water Level - Low Low, Level 2 Allowable Value is chosen such that for complete loss of feedwater flow, the Reactor Core Isolation Cooling (RCIC) System flow with HPCS assumed to fail will be sufficient to avoid initiation of low pressure ECCS at Reactor Vessel Water Level - Low Low Low, Level 1.

Four channels of Reactor Vessel Water Level - Low Low, Level 2 Function are only required to be OPERABLE when HPCS is required to be OPERABLE to ensure that no single instrument failure can preclude HPCS initiation. Refer to LCO 3.5.1 and LCO 3.5.2 for HPCS Applicability Bases.

3.b. Drywell Pressure – High

High pressure in the drywell could indicate a break in the RCPB. The HPCS System and associated DG are initiated upon receipt of the Drywell Pressure - High Function in order to minimize the possibility of fuel damage. The Drywell Pressure - High Function is not assumed in the analysis of the recirculation line break (Ref. 3); that is, HPCS is assumed to be initiated on Reactor Water Level - Low Low, Level 2. The core

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ACTIONS (continued)

inoperable. However, since channels in both Divisions are inoperable and untripped, and the Completion Times started concurrently for the channels in both Divisions, this results in the affected portions in both Divisions of ECCS and DG being concurrently declared inoperable.

For Required Action B.2, redundant automatic initiation capability is lost if two Function 3.a or two Function 3.b channels are inoperable and untripped in the same trip system. In this situation (loss of redundant automatic initiation capability), the 24 hour allowance of Required Action B.3 is not appropriate and the feature(s) associated with the inoperable, untripped channels must be declared inoperable within 1 hour. ~~As noted (Note 1 to Required Action B.1 and Required Action B.2), the two Required Actions are only applicable in MODES 1, 2, and 3. In MODES 4 and 5, the specific initiation time of the ECCS is not assumed and the probability of a LOCA is lower. Thus, a total loss of initiation capability for 24 hours (as allowed by Required Action B.3) is allowed during MODES 4 and 5.~~ Notes are also provided (*the* Note ~~2~~ to Required Action B.1 and Required Action B.2) to delineate which Required Action is applicable for each Function that requires entry into Condition B if an associated channel is inoperable. This ensures that the proper loss of initiation capability check is performed.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action B.1, the Completion Time only begins upon discovery that a redundant feature in both Divisions (e.g., any Division 1 ECCS and Division 2 ECCS) cannot be automatically initiated due to inoperable, untripped channels within the same variable as described in the paragraph above. For Required Action B.2, the Completion Time only begins upon discovery that the HPCS System cannot be automatically initiated due to two inoperable, untripped channels for the associated Function in the same trip system. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

Because of the diversity of sensors available to provide initiation signals and the redundancy of the ECCS design, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 5) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action B.3. Placing the inoperable channel in trip would conservatively compensate for the inoperability, restore capability

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ACTIONS (continued)

to accommodate a single failure, and allow operation to continue. Alternately, if it is not desired to place the channel in trip (e.g., as in the case where placing the inoperable channel in trip would result in an initiation), Condition H must be entered and its Required Action taken.

C.1 and C.2

Required Action C.1 is intended to ensure that appropriate actions are taken if multiple, inoperable channels within the same Function (or in some cases, within the same variable) result in redundant automatic initiation capability being lost for the feature(s). Required Action C.1 features would be those that are initiated by Functions 1.c, 1.d, 2.c, and 2.d (i.e., low pressure ECCS). For Functions 1.c and 2.c, redundant automatic initiation capability is lost if the Function 1.c and Function 2.c channels are inoperable. For Functions 1.d and 2.d, redundant automatic initiation capability is lost if two Function 1.d channels in the same trip system and two Function 2.d channels in the same trip system (but not necessarily the same trip system as the Function 1.d channels) are inoperable. Since each inoperable channel would have Required Action C.1 applied separately (refer to ACTIONS Note), each inoperable channel would only require the affected portion of the associated Division to be declared inoperable. However, since channels in both Divisions are inoperable, and the Completion Times started concurrently for the channels in both Divisions, this results in the affected portions in both Divisions being concurrently declared inoperable. For Functions 1.c and 2.c, the affected portions of the Division are LPCI A and LPCI B, respectively. For Functions 1.d and 2.d, the affected portions of the Division are the low pressure ECCS pumps (Divisions 1 and 2, respectively).

In this situation (loss of redundant automatic initiation capability), the 24 hour allowance of Required Action C.2 is not appropriate and the feature(s) associated with the inoperable channels must be declared inoperable within 1 hour. ~~As noted (Note 1), the Required Action is only applicable in MODES 1, 2, and 3. In MODES 4 and 5, the specific initiation time of the ECCS is not assumed and the probability of a LOCA is lower. Thus, a total loss of automatic initiation capability for 24 hours (as allowed by Required Action C.2) is allowed during MODES 4 and 5.~~

The Note ~~2~~ states that Required Action C.1 is only applicable for Functions 1.c, 1.d, 2.c, and 2.d. The Required Action is not applicable to Functions 1.g, 2.f, and 3.h (which also require entry into this Condition if a channel in these Functions is inoperable), since they are the Manual Initiation Functions and are not assumed in any accident or transient analysis. Thus, a total loss of manual initiation capability for 24 hours (as

BASES

ACTIONS (continued)

In this situation (loss of redundant automatic initiation capability), the 7 day allowance of Required Action E.2 is not appropriate and the feature(s) associated with each inoperable channel must be declared inoperable within 1 hour after discovery of loss of initiation capability for feature(s) in both Divisions. ~~As noted (Note 1 to Required Action E.1), Required Action E.1 is only applicable in MODES 1, 2, and 3. In MODES 4 and 5, the specific initiation time of the low pressure ECCS is not assumed and the probability of a LOCA is lower. Thus, a total loss of initiation capability for 7 days (as allowed by Required Action E.2) is allowed during MODES 4 and 5.~~ A Note is also provided (*the* Note ~~2~~ to Required Action E.1) to delineate that Required Action E.1 is only applicable to low pressure ECCS Functions. Required Action E.1 is not applicable to HPCS Functions 3.f and 3.g since the loss of one channel results in a loss of the Function (one-out-of-one logic). This loss was considered during the development of Reference 5 and considered acceptable for the 7 days allowed by Required Action E.2.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action E.1, the Completion Time only begins upon discovery that three channels of the variable (Pump Discharge Flow - Low) cannot be automatically initiated due to inoperable channels. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration of channels.

If the instrumentation that controls the pump minimum flow valve is inoperable such that the valve will not automatically open, extended pump operation with no injection path available could lead to pump overheating and failure. If there were a failure of the instrumentation such that the valve would not automatically close, a portion of the pump flow could be diverted from the reactor injection path, causing insufficient core cooling. These consequences can be averted by the operator's manual control of the valve, which would be adequate to maintain ECCS pump protection and required flow. Furthermore, other ECCS pumps would be sufficient to complete the assumed safety function if no additional single failure were to occur. The 7 day Completion Time of Required Action E.2 to restore the inoperable channel to OPERABLE status is reasonable based on the remaining capability of the associated ECCS subsystems, the redundancy available in the ECCS design, and the low probability of a DBA occurring during the allowed out of service time. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, Condition H must be entered and its Required Action

B 3.3 INSTRUMENTATION

B 3.3.5.2A Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation (Without Setpoint Control Program)

BASES

BACKGROUND

The RPV contains penetrations below the top of the active fuel (TAF) that have the potential to drain the reactor coolant inventory to below the TAF. If the water level should drop below the TAF, the ability to remove decay heat is reduced, which could lead to elevated cladding temperatures and clad perforation. Safety Limit 2.1.1.3 requires the RPV water level to be above the top of the active irradiated fuel at all times to prevent such elevated cladding temperatures.

Technical Specifications are required by 10 CFR 50.36 to include limiting safety system settings (LSSS) for variables that have significant safety functions. LSSS are defined by the regulation as "Where a LSSS is specified for a variable on which a safety limit has been placed, the setting must be chosen so that automatic protective actions will correct the abnormal situation before a Safety Limit (SL) is exceeded." The Analytical Limit is the limit of the process variable at which a safety action is initiated to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur. The actual settings for the automatic isolation channels are the same as those established for the same functions in MODES 1, 2, and 3 in LCO 3.3.5.1, "Emergency Core Cooling System (ECCS) Instrumentation," or LCO 3.3.6.1, "Primary Containment Isolation instrumentation".

With the unit in MODE 4 or 5, RPV water inventory control is not required to mitigate any events or accidents evaluated in the safety analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material should a draining event occur. Under the definition of DRAIN TIME, some penetration flow paths may be excluded from the DRAIN TIME calculation if they will be isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the TAF when actuated by RPV water level isolation instrumentation.

BASES

BACKGROUND (continued)

The purpose of the RPV Water Inventory Control Instrumentation is to support the requirements of LCO 3.5.2, “Reactor Pressure Vessel (RPV) Water Inventory Control,” and the definition of DRAIN TIME. There are functions that are required for manual initiation or operation of the ECCS injection/spray subsystem required to be OPERABLE by LCO 3.5.2 and other functions that support automatic isolation of Residual Heat Removal subsystem and Reactor Water Cleanup system penetration flow path(s) on low RPV water level.

The RPV Water Inventory Control Instrumentation supports operation of low pressure core spray (LPCS), low pressure coolant injection (LPCI), and high pressure core spray (HPCS). The equipment involved with each of these systems is described in the Bases for LCO 3.5.2.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

With the unit in MODE 4 or 5, RPV water inventory control is not required to mitigate any events or accidents evaluated in the safety analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material should a draining event occur.

A double-ended guillotine break of the Reactor Coolant System (RCS) is not postulated in MODES 4 and 5 due to the reduced RCS pressure, reduced piping stresses, and ductile piping systems. Instead, an event is postulated in which a single operator error or initiating event allows draining of the RPV water inventory through a single penetration flow path with the highest flow rate, or the sum of the drain rates through multiple penetration flow paths susceptible to a common mode failure (e.g., seismic event, loss of normal power, single human error). It is assumed, based on engineering judgment, that while in MODES 4 and 5, one ECCS injection/spray subsystem can be manually initiated to maintain adequate reactor vessel water level.

As discussed in References 1, 2, 3, 4, and 5, operating experience has shown RPV water inventory to be significant to public health and safety. Therefore, RPV Water Inventory Control satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).

Permissive and interlock setpoints are generally considered as nominal values without regard to measurement accuracy.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

Low Pressure Core Spray and Low Pressure Coolant Injection Systems

1.a, 2.a. Reactor Steam Dome Pressure - Low (Injection Permissive)

Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS subsystems. This ensures that, prior to opening the injection valves of the low pressure ECCS subsystems, the reactor pressure has fallen to a value below these subsystems' maximum design pressure. While it is assured during Modes 4 and 5 that the reactor steam dome pressure will be below the ECCS maximum design pressure, the Reactor Steam Dome Pressure - Low signals are assumed to be operable and capable of permitting initiation of the ECCS.

The Reactor Steam Dome Pressure - Low signals are initiated from four pressure transmitters that sense the reactor dome pressure. The four pressure transmitters each drive a master and slave trip unit. The outputs of the trip units are connected to relays whose contacts are arranged in a one-out-of-two taken twice logic for each Division.

The Allowable Value is low enough to prevent overpressuring the equipment in the low pressure ECCS.

Three channels of Reactor Steam Dome Pressure - Low Function per associated ECCS Division are only required to be OPERABLE in MODES 4 and 5 when ECCS Manual Initiation is required to be OPERABLE, since these channels support the manual initiation Function. In addition, the channels are only required when the associated ECCS subsystem is required to be OPERABLE by LCO 3.5.2.

1.b, 1.c, 2.b. Low Pressure Coolant Injection and Low Pressure Core Spray Pump Discharge Flow - Low (Bypass)

The minimum flow instruments are provided to protect the associated low pressure ECCS pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow is sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump.

One flow transmitter per ECCS pump is used to detect the associated subsystems' flow rates. The logic is arranged such that each transmitter causes its associated minimum flow valve to open. The logic will close

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

the minimum flow valve once the closure setpoint is exceeded. The LPCI minimum flow valves are time delayed such that the valves will not open for 10 seconds after the switches detect low flow. The time delay is provided to limit reactor vessel inventory loss during the startup of the Residual Heat Removal (RHR) shutdown cooling mode (for RHR A and RHR B).

The Pump Discharge Flow - Low Allowable Values are high enough to ensure that the pump flow rate is sufficient to protect the pump, yet low enough to ensure that the closure of the minimum flow valve is initiated to allow full flow into the core.

One channel of the Pump Discharge Flow - Low Function is required to be OPERABLE in MODES 4 and 5 when the associated LPCS or LPCI pump is required to be OPERABLE by LCO 3.5.2 to ensure the pumps are capable of injecting into the Reactor Pressure Vessel when manually initiated.

1.d, 2.c. Manual Initiation

The Manual Initiation push button channels introduce signals into the appropriate ECCS logic to provide manual initiation capability. There is one push button for each of the two Divisions of low pressure ECCS (i.e., Division 1 ECCS, LPCS and LPCI A; Division 2 ECCS, LPCI B and LPCI C). The only the manual initiation function required to be OPERABLE is that associated with the ECCS subsystem required to be OPERABLE by LCO 3.5.2.

There is no Allowable Value for this Function since the channels are mechanically actuated based solely on the position of the push buttons.

High Pressure Core Spray System

3.a. Reactor Vessel Water Level - High, Level 8

The high RPV water level Level 8 signal is used to close the HPCS injection valve to prevent overflow into the main steam lines (MSLs). Reactor Vessel Water Level - High, Level 8 signals for HPCS are initiated from two level transmitters from the narrow range water level measurement instrumentation. One channel associated with the HPCS System required to be OPERABLE by LCO 3.5.2 is required to be OPERABLE.

The Reactor Vessel Water Level - High, Level 8 Allowable Value is chosen to isolate flow from the HPCS System prior to water overflowing into the MSLs.

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APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

One channel of Reactor Vessel Water Level - High, Level 8 Function is required to be OPERABLE in MODES 4 and 5 when the associated HPCS is required to be OPERABLE by LCO 3.5.2 to ensure to the HPCS is capable of injecting into the Reactor Pressure Vessel when manually initiated.

3.b. Condensate Storage Tank Level – Low

Low level in the CST indicates the unavailability of an adequate supply of makeup water from this normal source. Normally the suction valves between HPCS and the CST are open and water for HPCS injection would be taken from the CST. However, if the water level in the CST falls below a preselected level, first the suppression pool suction valve automatically opens, and then the CST suction valve automatically closes. This ensures that an adequate supply of makeup water is available to the HPCS pump. To prevent losing suction to the pump, the suction valves are interlocked so that the suppression pool suction valve must be open before the CST suction valve automatically closes.

Condensate Storage Tank Level - Low signals are initiated from two level transmitters. The logic is arranged such that either transmitter and associated trip unit can cause the suppression pool suction valve to open and the CST suction valve to close.

The Condensate Storage Tank Level - Low Function Allowable Value is high enough to ensure adequate pump suction head while water is being taken from the CST.

One channel of the Condensate Storage Tank Level - Low Function is only required to be OPERABLE when HPCS is required to be OPERABLE to fulfill the requirements of LCO 3.5.2 and HPCS is aligned to the CST.

3.c, 3.d. HPCS Pump Discharge Pressure - High (Bypass) and HPCS System Flow Rate - Low (Bypass)

The minimum flow instruments are provided to protect the HPCS pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow and high pump discharge pressure are sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump or the discharge pressure is low (indicating the HPCS pump is not operating).

One flow transmitter is used to detect the HPCS System's flow rate. The logic is arranged such that the transmitter causes the minimum flow valve

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

to open, provided the HPCS pump discharge pressure, sensed by another transmitter, is high enough (indicating the pump is operating). The logic will close the minimum flow valve once the closure setpoint is exceeded. (The valve will also close upon HPCS pump discharge pressure decreasing below the setpoint.)

The HPCS System Flow Rate - Low and HPCS Pump Discharge Pressure - High Allowable Value is high enough to ensure that pump flow rate is sufficient to protect the pump, yet low enough to ensure that the closure of the minimum flow valve is initiated to allow full flow into the core.

The HPCS Pump Discharge Pressure - High Allowable Value is set high enough to ensure that the valve will not be open when the pump is not operating.

One channel of each Function associated with one pump is required to be OPERABLE when HPCS is required to be OPERABLE by LCO 3.5.2 in MODES 4 and 5.

<u>3.e. Manual Initiation</u>

The Manual Initiation push button channel introduces a signal into the HPCS logic to provide manual initiation capability. There is one push button for the HPCS System. One channel of the Manual Initiation Function is only required to be OPERABLE in MODES 4 and 5 when the associated ECCS subsystem is required to be OPERABLE per LCO 3.5.2.

There is no Allowable Value for this Function since the channel is mechanically actuated based solely on the position of the push button.

<u>RHR System Isolation</u>

<u>4.a - Reactor Vessel Water Level - Low. Level 3</u>

The definition of DRAIN TIME allows crediting the closing of penetration flow paths that are capable of being automatically isolated by RPV water level isolation instrumentation prior to the RPV water level being equal to the TAF. The Reactor Vessel Water Level - Low, Level 3 Function is only required to be OPERABLE when automatic isolation of the associated RHR penetration flow path is credited in calculating DRAIN TIME.

Reactor Vessel Water Level - Low, Level 3 signals are initiated from four level transmitters (two per trip system) that sense the difference between the pressure due to a constant column of water (reference leg) and the

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

pressure due to the actual water level (variable leg) in the vessel. While four channels (two channels per trip system) of the Reactor Vessel Water Level - Low, Level 3 Function are available, only two channels (all in the same trip system) are required to be OPERABLE.

The Reactor Vessel Water Level - Low, Level 3 Allowable Value was chosen to be the same as the RPS Reactor Vessel Water Level - Low, Level 3 Allowable Value (LCO 3.3.1.1), since the capability to cool the fuel may be threatened.

This Function isolates the Group 11 valves.

<u>Reactor Water Cleanup (RWCU) System Isolation</u>

<u>5.a - Reactor Vessel Water level - Low Low, Level 2</u>

The definition of DRAIN TIME allows crediting the closing of penetration flow paths that are capable of being automatically isolated by RPV water level isolation instrumentation prior to the RPV water level being equal to the TAF. The Reactor Vessel Water Level - Low Low, Level 2 Function associated with RWCU System isolation may be credited for automatic isolation of penetration flow paths associated with the RWCU System.

Reactor Vessel Water Level - Low Low, Level 2 is initiated from two channels per trip system that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. While four channels (two channels per trip system) of the Reactor Vessel Water Level - Low, Level 2 Function are available, only two channels (all in the same trip system) are required to be OPERABLE.

The Reactor Vessel Water Level - Low Low, Level 2 Allowable Value was chosen to be the same as the ECCS Reactor Vessel Water Level - Low Low, Level 2 Allowable Value (LCO 3.3.5.1), since the capability to cool the fuel may be threatened.

The Reactor Vessel Water Level - Low Low, Level 2 Function is only required to be OPERABLE when automatic isolation of the associated penetration flow path is credited in calculating DRAIN TIME.

This Function isolates the Group 8 valves.

BASES

ACTIONS

A Note has been provided to modify the ACTIONS related to RPV Water Inventory Control instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition discovered to be inoperable or not within limits will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable RPV Water Inventory Control instrumentation channels provide appropriate compensatory measures for separate inoperable Condition entry for each inoperable RPV Water Inventory Control instrumentation channel.

<u>A.1</u>

Required Action A.1 directs entry into the appropriate Condition referenced in Table 3.3.5.2-1. The applicable Condition referenced in the Table is Function dependent. Each time a channel is discovered inoperable, Condition A is entered for that channel and provides for transfer to the appropriate subsequent Condition.

<u>B.1 and B.2</u>

RHR System Isolation, Reactor Vessel Water Level - Low Level 3, and Reactor Water Cleanup System, Reactor Vessel Water Level - Low Low, Level 2 functions are applicable when automatic isolation of the associated penetration flow path is credited in calculating Drain Time. If the instrumentation is inoperable, Required Action B.1 directs an immediate declaration that the associated penetration flow path(s) are incapable of automatic isolation. Required Action B.2 directs calculation of DRAIN TIME. The calculation cannot credit automatic isolation of the affected penetration flow paths.

BASES

ACTIONS (continued)

C.1

Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS injection/spray subsystem manual initiation functions. If this permissive is inoperable, manual initiation of ECCS is prohibited. Therefore, the permissive must be placed in the trip condition within 1 hour. With the permissive in the trip condition, manual initiation may be performed. Prior to placing the permissive in the tripped condition, the operator can take manual control of the pump and the injection valve to inject water into the RPV.

The Completion Time of 1 hour is intended to allow the operator time to evaluate any discovered inoperabilities and to place the channel in trip.

D.1 and D.2

Required Actions D.1 and D.2 are intended to ensure that appropriate actions are taken if multiple, inoperable channels within the same Function result in a loss of automatic suction swap for the HPCS system from the condensate storage tank to the suppression pool. The HPCS system must be declared inoperable within 1 hour or the HPCS pump suction must be aligned to the suppression pool, since, if aligned, the function is already performed.

The 1 hour Completion Time is acceptable because it minimizes the risk of HPCS being needed without an adequate water source while allowing time for restoration or alignment of HPCS pump suction to the suppression pool.

E.1 and E.2

Required Actions E.1 and E.2 apply when the HPCS Reactor Vessel Water Level - High, Level 8 function is inoperable. If the function is inoperable and the channel is tripped, the HPCS pump discharge valve will not open and HPCS injection is prevented. The HPCS system must be declared inoperable within 1 hour and the function must be restored to Operable status within 24 hours.

The Completion Time of 1 hour is provided to declare the HPCS System inoperable. The 24 hour Completion Time was chosen to allow time for the operator to evaluate and repair any discovered inoperabilities. The Completion Time is appropriate given the ability to manually start the HPCS and to locally open the discharge valve.

BASES

ACTIONS (continued)

F.1

If an LPCI or LPCS Discharge Flow - Low bypass function or HPCS System Discharge Pressure - High or Flow Rate - Low bypass function is inoperable, there is a risk that the associated ECCS pump could overheat when the pump is operating and the associated injection valve is not fully open. In this condition, the operator can take manual control of the pump and the injection valve to ensure the pump does not overheat. If a manual initiation function is inoperable, the ECCS subsystem pumps can be started manually and the valves can be opened manually, but this is not the preferred condition.

The 24 hour Completion Time was chosen to allow time for the operator to evaluate and repair any discovered inoperabilities. The Completion Time is appropriate given the ability to manually start the ECCS pumps and open the injection valves and to manually ensure the pump does not overheat.

G.1

With the Required Action and associated Completion Time of Conditions C, D, E, or f not met, the associated ECCS injection/spray subsystem may be incapable of performing the intended function, and must be declared inoperable immediately.

SURVEILLANCE REQUIREMENTS

As noted in the beginning of the SRs, the SRs for each RPV Water Inventory Control instrument Function are found in the SRs column of Table 3.3.5.2-1.

SR 3.3.5.2.1

Performance of the CHANNEL CHECK ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A CHANNEL CHECK guarantees that undetected outright channel failure is limited; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL FUNCTIONAL TEST.

BASES

SURVEILLANCE REQUIREMENTS (continued)

Agreement criteria are determined by the plant staff, based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

[The Frequency of 12 hours is based upon operating experience that demonstrates channel failure is rare.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.5.2.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests.

Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

[The Frequency of 92 days is based upon operating experience that demonstrates channel failure is rare.

OR

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

SR 3.3.5.2.3

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required initiation logic for a specific channel. The system functional testing performed in LCO 3.5.2 overlaps this Surveillance to complete testing of the assumed safety function.

[The 18 month Frequency is based on operating experience that has shown that these components usually pass the Surveillance when performed at the 18 month Frequency.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

BASES

REFERENCES

1. Information Notice 84-81 "Inadvertent Reduction in Primary Coolant Inventory in Boiling Water Reactors During Shutdown and Startup," November 1984.

2. Information Notice 86-74, "Reduction of Reactor Coolant Inventory Because of Misalignment of RHR Valves," August 1986.

3. Generic Letter 92-04, "Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs Pursuant to 10 CFR 50.54(F), " August 1992.

4. NRC Bulletin 93-03, "Resolution of Issues Related to Reactor Vessel Water Level Instrumentation in BWRs," May 1993.

5. Information Notice 94-52, "Inadvertent Containment Spray and Reactor Vessel Draindown at Millstone 1," July 1994.

B 3.3 INSTRUMENTATION

B 3.3.5.2B Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation (Without Setpoint Control Program)

BASES

BACKGROUND

The RPV contains penetrations below the top of the active fuel (TAF) that have the potential to drain the reactor coolant inventory to below the TAF. If the water level should drop below the TAF, the ability to remove decay heat is reduced, which could lead to elevated cladding temperatures and clad perforation. Safety Limit 2.1.1.3 requires the RPV water level to be above the top of the active irradiated fuel at all times to prevent such elevated cladding temperatures.

Technical Specifications are required by 10 CFR 50.36 to include limiting safety system settings (LSSS) for variables that have significant safety functions. LSSS are defined by the regulation as "Where a LSSS is specified for a variable on which a safety limit has been placed, the setting must be chosen so that automatic protective actions will correct the abnormal situation before a Safety Limit (SL) is exceeded." The Analytical Limit is the limit of the process variable at which a safety action is initiated to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur. The actual settings are identified and maintained in the Setpoint Control Program (SCP) controlled by 10 CFR 50.59.

With the unit in MODE 4 or 5, RPV water inventory control is not required to mitigate any events or accidents evaluated in the safety analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material should a draining event occur. Under the definition of DRAIN TIME, some penetration flow paths may be excluded from the DRAIN TIME calculation if they will be isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the TAF when actuated by RPV water level isolation instrumentation.

The purpose of the RPV Water Inventory Control Instrumentation is to support the requirements of LCO 3.5.2, “Reactor Pressure Vessel (RPV) Water Inventory Control,” and the definition of DRAIN TIME. There are

BASES

BACKGROUND (continued)

functions that are required for manual initiation or operation of the ECCS injection/spray subsystem required to be OPERABLE by LCO 3.5.2 and other functions that support automatic isolation of Residual Heat Removal subsystem and Reactor Water Cleanup system penetration flow path(s) on low RPV water level.

The RPV Water Inventory Control Instrumentation supports operation of low pressure core spray (LPCS), low pressure coolant injection (LPCI), and high pressure core spray (HPCS). The equipment involved with each of these systems is described in the Bases for LCO 3.5.2.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

With the unit in MODE 4 or 5, RPV water inventory control is not required to mitigate any events or accidents evaluated in the safety analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material should a draining event occur.

A double-ended guillotine break of the Reactor Coolant System (RCS) is not postulated in MODES 4 and 5 due to the reduced RCS pressure, reduced piping stresses, and ductile piping systems. Instead, an event is postulated in which a single operator error or initiating event allows draining of the RPV water inventory through a single penetration flow path with the highest flow rate, or the sum of the drain rates through multiple penetration flow paths susceptible to a common mode failure (e.g., seismic event, loss of normal power, single human error). It is assumed, based on engineering judgment, that while in MODES 4 and 5, one ECCS injection/spray subsystem can be manually initiated to maintain adequate reactor vessel water level.

As discussed in References 1, 2, 3, 4, and 5, operating experience has shown RPV water inventory to be significant to public health and safety. Therefore, RPV Water Inventory Control satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Low Pressure Core Spray and Low Pressure Coolant Injection Systems

1.a, 2.a. Reactor Steam Dome Pressure - Low (Injection Permissive)
Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS subsystems. This ensures that, prior to opening the injection valves of the low pressure ECCS subsystems, the reactor pressure has fallen to a value below these subsystems' maximum design pressure. While it is assured during Modes 4 and 5 that the reactor steam dome pressure will be below the ECCS maximum design pressure, the Reactor Steam Dome Pressure - Low signals are assumed to be operable and capable of permitting initiation of the ECCS.

The Reactor Steam Dome Pressure - Low signals are initiated from four pressure transmitters that sense the reactor dome pressure. The four pressure transmitters each drive a master and slave trip unit. The outputs of the trip units are connected to relays whose contacts are arranged in a one-out-of-two taken twice logic for each Division.

Three channels of Reactor Steam Dome Pressure - Low Function per associated ECCS Division are only required to be OPERABLE in MODES 4 and 5 when ECCS Manual Initiation is required to be OPERABLE, since these channels support the manual initiation Function. In addition, the channels are only required when the associated ECCS subsystem is required to be OPERABLE by LCO 3.5.2.

1.b, 1.c, 2.b. Low Pressure Coolant Injection and Low Pressure Core Spray Pump Discharge Flow - Low (Bypass)

The minimum flow instruments are provided to protect the associated low pressure ECCS pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow is sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump.

One flow transmitter per ECCS pump is used to detect the associated subsystems' flow rates. The logic is arranged such that each transmitter causes its associated minimum flow valve to open. The logic will close the minimum flow valve once the closure setpoint is exceeded. The LPCI minimum flow valves are time delayed such that the valves will not open for 10 seconds after the switches detect low flow. The time delay is provided to limit reactor vessel inventory loss during the startup of the Residual Heat Removal (RHR) shutdown cooling mode (for RHR A and RHR B).

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

One channel of the Pump Discharge Flow - Low Function is required to be OPERABLE in MODES 4 and 5 when the associated LPCS or LPCI pump is required to be OPERABLE by LCO 3.5.2 to ensure the pumps are capable of injecting into the Reactor Pressure Vessel when manually initiated.

1.d, 2.c. Manual Initiation

The Manual Initiation push button channels introduce signals into the appropriate ECCS logic to provide manual initiation capability. There is one push button for each of the two Divisions of low pressure ECCS (i.e., Division 1 ECCS, LPCS and LPCI A; Division 2 ECCS, LPCI B and LPCI C). The only the manual initiation function required to be OPERABLE is that associated with the ECCS subsystem required to be OPERABLE by LCO 3.5.2.

High Pressure Core Spray System

3.a. Reactor Vessel Water Level - High, Level 8

The high RPV water level Level 8 signal is used to close the HPCS injection valve to prevent overflow into the main steam lines (MSLs). Reactor Vessel Water Level - High, Level 8 signals for HPCS are initiated from two level transmitters from the narrow range water level measurement instrumentation. One channel associated with the HPCS System required to be OPERABLE by LCO 3.5.2 is required to be OPERABLE.

One channel of Reactor Vessel Water Level - High, Level 8 Function is required to be OPERABLE in MODES 4 and 5 when the associated HPCS is required to be OPERABLE by LCO 3.5.2 to ensure to the HPCS is capable of injecting into the Reactor Pressure Vessel when manually initiated.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

3.b. Condensate Storage Tank Level – Low

Low level in the CST indicates the unavailability of an adequate supply of makeup water from this normal source. Normally the suction valves between HPCS and the CST are open and water for HPCS injection would be taken from the CST. However, if the water level in the CST falls below a preselected level, first the suppression pool suction valve automatically opens, and then the CST suction valve automatically closes. This ensures that an adequate supply of makeup water is available to the HPCS pump. To prevent losing suction to the pump, the suction valves are interlocked so that the suppression pool suction valve must be open before the CST suction valve automatically closes.

Condensate Storage Tank Level - Low signals are initiated from two level transmitters. The logic is arranged such that either transmitter and associated trip unit can cause the suppression pool suction valve to open and the CST suction valve to close.

One channel of the Condensate Storage Tank Level - Low Function is only required to be OPERABLE when HPCS is required to be OPERABLE to fulfill the requirements of LCO 3.5.2 and HPCS is aligned to the CST.

3.c, 3.d. HPCS Pump Discharge Pressure - High (Bypass) and HPCS System Flow Rate - Low (Bypass)

The minimum flow instruments are provided to protect the HPCS pump from overheating when the pump is operating and the associated injection valve is not fully open. The minimum flow line valve is opened when low flow and high pump discharge pressure are sensed, and the valve is automatically closed when the flow rate is adequate to protect the pump or the discharge pressure is low (indicating the HPCS pump is not operating).

One flow transmitter is used to detect the HPCS System's flow rate. The logic is arranged such that the transmitter causes the minimum flow valve to open, provided the HPCS pump discharge pressure, sensed by another transmitter, is high enough (indicating the pump is operating). The logic will close the minimum flow valve once the closure setpoint is exceeded. (The valve will also close upon HPCS pump discharge pressure decreasing below the setpoint.)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

One channel of each Function associated with one pump is required to be OPERABLE when HPCS is required to be OPERABLE by LCO 3.5.2 in MODES 4 and 5.

3.e. Manual Initiation

The Manual Initiation push button channel introduces a signal into the HPCS logic to provide manual initiation capability. There is one push button for the HPCS System. One channel of the Manual Initiation Function is only required to be OPERABLE in MODES 4 and 5 when the associated ECCS subsystem is required to be OPERABLE per LCO 3.5.2.

RHR Cooling System Isolation

4.a - Reactor Vessel Water Level - Low, Level 3

The definition of DRAIN TIME allows crediting the closing of penetration flow paths that are capable of being automatically isolated by RPV water level isolation instrumentation prior to the RPV water level being equal to the TAF. The Reactor Vessel Water Level - Low, Level 3 Function is only required to be OPERABLE when automatic isolation of the associated RHR penetration flow path is credited in calculating DRAIN TIME.

Reactor Vessel Water Level - Low, Level 3 signals are initiated from four level transmitters (two per trip system) that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. While four channels (two channels per trip system) of the Reactor Vessel Water Level - Low, Level 3 Function are available, only two channels (all in the same trip system) are required to be OPERABLE.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

This Function isolates the Group 11 valves.

Reactor Water Cleanup (RWCU) System Isolation

5.a - Reactor Vessel Water level - Low Low, Level 2

The definition of DRAIN TIME allows crediting the closing of penetration flow paths that are capable of being automatically isolated by RPV water level isolation instrumentation prior to the RPV water level being equal to the TAF. The Reactor Vessel Water Level - Low Low, Level 2 Function associated with RWCU System isolation may be credited for automatic isolation of penetration flow paths associated with the RWCU System.

Reactor Vessel Water Level - Low Low, Level 2 is initiated from two channels per trip system that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. While four channels (two channels per trip system) of the Reactor Vessel Water Level - Low, Level 2 Function are available, only two channels (all in the same trip system) are required to be OPERABLE.

The Reactor Vessel Water Level - Low Low, Level 2 Function is only required to be OPERABLE when automatic isolation of the associated penetration flow path is credited in calculating DRAIN TIME.

This Function isolates the Group 8 valves.

ACTIONS

A Note has been provided to modify the ACTIONS related to RPV Water Inventory Control instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition discovered to be inoperable or not within limits will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable RPV Water Inventory Control instrumentation channels provide appropriate compensatory measures for separate inoperable Condition entry for each inoperable RPV Water Inventory Control instrumentation channel.

BASES

ACTIONS (continued)

A.1

Required Action A.1 directs entry into the appropriate Condition referenced in Table 3.3.5.2-1. The applicable Condition referenced in the Table is Function dependent. Each time a channel is discovered inoperable, Condition A is entered for that channel and provides for transfer to the appropriate subsequent Condition.

B.1 and B.2

RHR System Isolation, Reactor Vessel Water Level - Low Level 3, and Reactor Water Cleanup System, Reactor Vessel Water Level - Low Low, Level 2 functions are applicable when automatic isolation of the associated penetration flow path is credited in calculating Drain Time. If the instrumentation is inoperable, Required Action B.1 directs an immediate declaration that the associated penetration flow path(s) are incapable of automatic isolation. Required Action B.2 directs calculation of DRAIN TIME. The calculation cannot credit automatic isolation of the affected penetration flow paths.

C.1

Low reactor steam dome pressure signals are used as permissives for the low pressure ECCS injection/spray subsystem manual initiation functions. If this permissive is inoperable, manual initiation of ECCS is prohibited. Therefore, the permissive must be placed in the trip condition within 1 hour. With the permissive in the trip condition, manual initiation may be performed. Prior to placing the permissive in the tripped condition, the operator can take manual control of the pump and the injection valve to inject water into the RPV.

BASES

ACTIONS (continued)

The Completion Time of 1 hour is intended to allow the operator time to evaluate any discovered inoperabilities and to place the channel in trip.

D.1 and D.2

Required Actions D.1 and D.2 are intended to ensure that appropriate actions are taken if multiple, inoperable channels within the same Function result in a loss of automatic suction swap for the HPCS system from the condensate storage tank to the suppression pool. The HPCS system must be declared inoperable within 1 hour or the HPCS pump suction must be aligned to the suppression pool, since, if aligned, the function is already performed.

The 1 hour Completion Time is acceptable because it minimizes the risk of HPCS being needed without an adequate water source while allowing time for restoration or alignment of HPCS pump suction to the suppression pool.

E.1 and E.2

Required Actions E.1 and E.2 apply when the HPCS Reactor Vessel Water Level - High, Level 8 function is inoperable. If the function is inoperable and the channel is tripped, the HPCS pump discharge valve will not open and HPCS injection is prevented. The HPCS system must be declared inoperable within 1 hour and the function must be restored to Operable status within 24 hours.

The Completion Time of 1 hour is provided to declare the HPCS System inoperable. The 24 hour Completion Time was chosen to allow time for the operator to evaluate and repair any discovered inoperabilities. The Completion Time is appropriate given the ability to manually start the HPCS and to locally open the discharge valve.

BASES

ACTIONS (continued)

F.1

If an LPCI or LPCS Discharge Flow - Low bypass function or HPCS System Discharge Pressure - High or Flow Rate - Low bypass function is inoperable, there is a risk that the associated ECCS pump could overheat when the pump is operating and the associated injection valve is not fully open. In this condition, the operator can take manual control of the pump and the injection valve to ensure the pump does not overheat. If a manual initiation function is inoperable, the ECCS subsystem pumps can be started manually and the valves can be opened manually, but this is not the preferred condition.

The 24 hour Completion Time was chosen to allow time for the operator to evaluate and repair any discovered inoperabilities. The Completion Time is appropriate given the ability to manually start the ECCS pumps and open the injection valves and to manually ensure the pump does not overheat.

G.1

With the Required Action and associated Completion Time of Conditions C, D, E, or F not met, the associated ECCS injection/spray subsystem may be incapable of performing the intended function, and must be declared inoperable immediately.

SURVEILLANCE REQUIREMENTS

As noted in the beginning of the SRs, the SRs for each RPV Water Inventory Control instrument Function are found in the SRs column of Table 3.3.5.2-1.

SR 3.3.5.2.1

Performance of the CHANNEL CHECK ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A CHANNEL CHECK guarantees that undetected outright channel failure is limited; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL FUNCTIONAL TEST.

BASES

SURVEILLANCE REQUIREMENTS (continued)

Agreement criteria are determined by the plant staff, based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

[The Frequency of 12 hours is based upon operating experience that demonstrates channel failure is rare.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

The CHANNEL CHECK supplements less formal, but more frequent, checks of channels during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.5.2.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests.

Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

[The Frequency of 92 days is based upon operating experience that demonstrates channel failure is rare.

OR

SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]

SR 3.3.5.2.3

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required initiation logic for a specific channel. The system functional testing performed in LCO 3.5.2 overlaps this Surveillance to complete testing of the assumed safety function.

[The 18 month Frequency is based on operating experience that has shown that these components usually pass the Surveillance when performed at the 18 month Frequency.
OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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BASES

REFERENCES

1. Information Notice 84-81 "Inadvertent Reduction in Primary Coolant Inventory in Boiling Water Reactors During Shutdown and Startup," November 1984.

2. Information Notice 86-74, "Reduction of Reactor Coolant Inventory Because of Misalignment of RHR Valves," August 1986.

3. Generic Letter 92-04, "Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs Pursuant to 10 CFR 50.54(F), " August 1992.

4. NRC Bulletin 93-03, "Resolution of Issues Related to Reactor Vessel Water Level Instrumentation in BWRs," May 1993.

5. Information Notice 94-52, "Inadvertent Containment Spray and Reactor Vessel Draindown at Millstone 1," July 1994.

B 3.3 INSTRUMENTATION

B 3.3.5.~~3~~2A Reactor Core Isolation Cooling (RCIC) System Instrumentation (Without Setpoint Control Program)

BASES

BACKGROUND

The purpose of the RCIC System instrumentation is to initiate actions to ensure adequate core cooling when the reactor vessel is isolated from its primary heat sink (the main condenser) and normal coolant makeup flow from the Reactor Feedwater System is unavailable, such that initiation of the low pressure Emergency Core Cooling Systems (ECCS) pumps does not occur. A more complete discussion of RCIC System operation is provided in the Bases of LCO 3.5.3, "RCIC System." This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the RCIC instrumentation, as well as LCOs on other reactor system parameters and equipment performance.

Technical Specifications are required by 10 CFR 50.36 to include LSSSs for variables that have significant safety functions. LSSS are defined by the regulation as "Where a LSSS is specified for a variable on which a safety limit has been placed, the setting must be chosen so that automatic protective actions will correct the abnormal situation before a Safety Limit (SL) is exceeded." The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur.

---------------------------------REVIEWER'S NOTE-----------------------------------
The term "Limiting Trip Setpoint" [LTSP] is generic terminology for the calculated trip setting (setpoint) value calculated by means of the plant specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term [LTSP] indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting.

"Nominal Trip Setpoint [NTSP]" is the suggested terminology for the actual setpoint implemented in the plant surveillance procedures where margin has been added to the calculated [LTSP]. The as-found and as-left tolerances will apply to the [NTSP] implemented in the Surveillance procedures to confirm channel performance.

BASES

BACKGROUND (continued)

Licensees are to insert the name of the document(s) controlled under 10 CFR 50.59 that contain the methodology for calculating the as-left and as-found tolerances in Note b of Table 3.3.5.3~~2~~-1, for the phrase "[insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]" throughout the Bases.

If the [LTSP] is not included in Table 3.3.5.3~~2~~-1, the plant specific location for the [LTSP] or [NTSP] must be cited in Note b of Table 3.3.5.3~~2~~-1. The brackets indicate plant specific terms may apply, as reviewed and approved by the NRC.

The [Limiting Trip Setpoint (LTSP)] specified in Table 3.3.5.3~~2~~-1 is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. Therefore, the [LTSP] accounts for uncertainties in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an LSSS (Ref. 1)

The Allowable Value specified in Table 3.3.5.~~2~~3-1, serves as the LSSS such that a channel is OPERABLE if the trip setpoint is found not to exceed the Allowable Value. As such, the Allowable Value differs from the trip setpoint by an amount primarily equal to the expected instrument loop uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the device will still meet the LSSS definition and ensure that a SL is not exceeded at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval.

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. OPERABLE is defined in Technical Specifications as "...being capable of performing its safety function(s)." Relying solely on the [LTSP] to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel with a setting that

BASES

BACKGROUND (continued)

has been found to be different from the [LTSP] due to some drift of the setting may still be OPERABLE because drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the [LTSP] and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the protection channel. Therefore, the channel would still be OPERABLE because it would have performed its safety function and the only corrective action required would be to reset the channel within the established as-left tolerance around [LTSP] to account for further drift during the next surveillance interval. Note that, although the channel is OPERABLE under these circumstances, the trip setpoint must be left adjusted to a value within the as-left tolerance, in accordance with uncertainty assumptions stated in the referenced setpoint methodology (as-left criteria), and confirmed to be operating within the statistical allowances of the uncertainty terms assigned (as-found criteria).

However, there is also some point beyond which the channel may not be able to perform its function due to, for example, greater than expected drift. This value needs to be specified in the Technical Specifications in order to define OPERABILITY of the channels and is designated as the Allowable Value.

If the actual setting (as-found setpoint) of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE, but degraded. The degraded condition will be further evaluated during performance of the SR. This evaluation will consist of resetting the channel setpoint to the [Nominal Trip Setpoint (NTSP)] (within the allowed tolerance), and evaluating the channel response. If the channel is functioning as required and is expected to pass the next surveillance, then the channel is OPERABLE and can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel as-found condition will be entered into the Corrective Action Program for further evaluation.

The RCIC System may be initiated by either automatic or manual means. Automatic initiation occurs for conditions of reactor vessel Low Low water level. The variable is monitored by four transmitters that are connected to four trip units. The outputs of the trip units are connected to relays whose contacts are arranged in a one-out-of-two taken twice logic arrangement. Once initiated, the RCIC logic seals in and can be reset by the operator only when the reactor vessel water level signals have cleared.

BASES

BACKGROUND (continued)

The RCIC test line isolation valve (which is also a primary containment isolation valve) is closed on a RCIC initiation signal to allow full system flow and maintain containment isolated in the event RCIC is not operating.

The RCIC System also monitors the water levels in the condensate storage tank (CST) and the suppression pool, since these are the two sources of water for RCIC operation. Reactor grade water in the CST is the normal source. Upon receipt of a RCIC initiation signal, the CST suction valve is automatically signaled to open (it is normally in the open position) unless the pump suction from the suppression pool valve is open. If the water level in the CST falls below a preselected level, first the suppression pool suction valve automatically opens and then the CST suction valve automatically closes. Two level transmitters are used to detect low water level in the CST. Either switch can cause the suppression pool suction valve to open and the CST suction valve to close. The suppression pool suction valve also automatically opens and the CST suction valve closes if high water level is detected in the suppression pool (one-out-of-two logic similar to the CST water level logic). To prevent losing suction to the pump, the suction valves are interlocked so that one suction path must be open before the other automatically closes.

The RCIC System provides makeup water to the reactor until the reactor vessel water level reaches the high water level (Level 8) trip (two-out-of-two logic), at which time the RCIC steam supply, steam supply bypass, and cooling water supply valves close (the injection valve also closes due to the closure of the steam supply valves). The RCIC System restarts if vessel level again drops to the low level initiation point (Level 2).

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The function of the RCIC System, to provide makeup coolant to the reactor, is to respond to transient events. The RCIC System is not an Engineered Safety Feature System and no credit is taken in the safety analysis for RCIC System operation. The RCIC System instrumentation satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii). Certain instrumentation Functions are retained for other reasons and are described below in the individual Functions discussion.

Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy.

The OPERABILITY of the RCIC System instrumentation is dependent on the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.5.*3*~~2~~-1. Each Function must have a required number of OPERABLE channels with their setpoints set within the setting tolerance of the [LTSPs], where appropriate. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions. Each channel must also respond within its assumed response time.

Allowable Values are specified for each RCIC System instrumentation Function specified in Table 3.3.5.*3*~~2~~-1. [LTSPs] and the methodologies for calculation of the as-left and as-found tolerances are described in [insert the name of a document controlled under 10 CFR 50.59 such as the Technical Requirements Manual or any document incorporated into the facility FSAR]. The [LTSPs] are selected to ensure that the setpoints remain conservative to the as-left tolerance band between CHANNEL CALIBRATIONS. After each calibration the trip setpoint shall be left within the as-left band around the [LTSP]. [LTSPs] are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state. The analytical limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytical limits, corrected for calibration, process, and some of the instrument errors. The [LTSPs] are then determined, accounting for the remaining instrument errors (e.g., drift). The trip setpoints derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

Note that, although the channel is OPERABLE under these circumstances, the trip setpoint must be left adjusted to a value within the as-left tolerance, in accordance with uncertainty assumptions stated in the referenced setpoint methodology (as-left criteria), and confirmed to be operating within the statistical allowances of the uncertainty terms assigned (as-found criteria).

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The individual Functions are required to be OPERABLE in MODE 1, and in MODES 2 and 3 with reactor steam dome pressure > 150 psig, since this is when RCIC is required to be OPERABLE. (Refer to LCO 3.5.3 for Applicability Bases for the RCIC System.)

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

<u>1. Reactor Vessel Water Level - Low Low, Level 2</u>

Low reactor pressure vessel (RPV) water level indicates that normal feedwater flow is insufficient to maintain reactor vessel water level and that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, the RCIC System is initiated at Level 2 to assist in maintaining water level above the top of the active fuel.

Reactor Vessel Water Level - Low Low, Level 2 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel.

The Reactor Vessel Water Level - Low Low, Level 2 Allowable Value is set high enough such that for complete loss of feedwater flow, the RCIC System flow with high pressure core spray assumed to fail will be sufficient to avoid initiation of low pressure ECCS at Level 1.

Four channels of Reactor Vessel Water Level - Low Low, Level 2 Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure that no single instrument failure can preclude RCIC initiation. Refer to LCO 3.5.3 for RCIC Applicability Bases.

<u>2. Reactor Vessel Water Level - High, Level 8</u>

High RPV water level indicates that sufficient cooling water inventory exists in the reactor vessel such that there is no danger to the fuel. Therefore, the Level 8 signal is used to close the RCIC steam supply, steam supply bypass, and cooling water supply valves to prevent overflow into the main steam lines (MSLs). (The injection valve also closes due to the closure of the steam supply valve.)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Reactor Vessel Water Level - High, Level 8 signals for RCIC are initiated from two level transmitters from the narrow range water level measurement instrumentation, which sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel.

The Reactor Vessel Water Level - High, Level 8 Allowable Value is high enough to preclude isolating the injection valve of the RCIC during normal operation, yet low enough to trip the RCIC System prior to water overflowing into the MSLs.

Two channels of Reactor Vessel Water Level - High, Level 8 Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure that no single instrument failure can preclude RCIC initiation. Refer to LCO 3.5.3 for RCIC Applicability Bases.

<u>3. Condensate Storage Tank Level - Low</u>

Low level in the CST indicates the unavailability of an adequate supply of makeup water from this normal source. Normally the suction valve between the RCIC pump and the CST is open and, upon receiving a RCIC initiation signal, water for RCIC injection would be taken from the CST. However, if the water level in the CST falls below a preselected level, first the suppression pool suction valve automatically opens and then the CST suction valve automatically closes. This ensures that an adequate supply of makeup water is available to the RCIC pump. To prevent losing suction to the pump, the suction valves are interlocked so that the suppression pool suction valve must be open before the CST suction valve automatically closes.

Two level transmitters are used to detect low water level in the CST. The Condensate Storage Tank Level - Low Function Allowable Value is set high enough to ensure adequate pump suction head while water is being taken from the CST.

Two channels of Condensate Storage Tank Level - Low Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure that no single instrument failure can preclude RCIC swap to suppression pool source. Refer to LCO 3.5.3 for RCIC Applicability Bases.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

4. Suppression Pool Water Level - High

Excessively high suppression pool water level could result in the loads on the suppression pool exceeding design values should there be a blowdown of the reactor vessel pressure through the safety/relief valves. Therefore, signals indicating high suppression pool water level are used to transfer the suction source of RCIC from the CST to the suppression pool to eliminate the possibility of RCIC continuing to provide additional water from a source outside primary containment. This Function satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii). To prevent losing suction to the pump, the suction valves are interlocked so that the suppression pool suction valve must be open before the CST suction valve automatically closes.

Suppression pool water level signals are initiated from two level transmitters. The Allowable Value for the Suppression Pool Water Level - High Function is set low enough to ensure that RCIC will be aligned to take suction from the suppression pool before the water level reaches the point at which suppression design loads would be exceeded.

Two channels of Suppression Pool Water Level - High Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure that no single instrument failure can preclude RCIC swap to suppression pool source. Refer to LCO 3.5.3 for RCIC Applicability Bases.

5. Manual Initiation

The Manual Initiation push button switch introduces a signal into the RCIC System initiation logic that is redundant to the automatic protective instrumentation and provides manual initiation capability. There is one push button for the RCIC System.

The Manual Initiation Function is not assumed in any accident or transient analyses in the FSAR. However, the Function is retained for overall redundancy and diversity of the RCIC function as required by the NRC in the plant licensing basis.

There is no Allowable Value for this Function since the channel is mechanically actuated based solely on the position of the push button. One channel of Manual Initiation is required to be OPERABLE when RCIC is required to be OPERABLE.

BASES

ACTIONS

-----------------------------------REVIEWER'S NOTE-----------------------------------
Certain LCO Completion Times are based on approved topical reports. In order for a licensee to use the times, the licensee must justify the Completion Times as required by the NRC staff Safety Evaluation Report (SER) for the topical report.

A Note has been provided to modify the ACTIONS related to RCIC System instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition discovered to be inoperable or not within limits will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable RCIC System instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable RCIC System instrumentation channel.

A.1

Required Action A.1 directs entry into the appropriate Condition referenced in Table 3.3.5.3~~2~~-1 in the accompanying LCO. The applicable Condition referenced in the Table is Function dependent. Each time a channel is discovered to be inoperable, Condition A is entered for that channel and provides for transfer to the appropriate subsequent Condition.

B.1 and B.2

Required Action B.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same Function result in a complete loss of automatic initiation capability for the RCIC System. In this case, automatic initiation capability is lost if two Function 1 channels in the same trip system are inoperable and untripped. In this situation (loss of automatic initiation capability), the 24 hour allowance of Required Action B.2 is not appropriate, and the RCIC System must be declared inoperable within 1 hour after discovery of loss of RCIC initiation capability.

BASES

ACTIONS (continued)

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action B.1, the Completion Time only begins upon discovery that the RCIC System cannot be automatically initiated due to two inoperable, untripped Reactor Vessel Water Level - Low Low, Level 2 channels in the same trip system. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

Because of the redundancy of sensors available to provide initiation signals and the fact that the RCIC System is not assumed in any accident or transient analysis, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 2) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action B.2. Placing the inoperable channel in trip would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. Alternately, if it is not desired to place the channel in trip (e.g., as in the case where placing the inoperable channel in trip would result in an initiation), Condition E must be entered and its Required Action taken.

C.1

A risk based analysis was performed and determined that an allowable out of service time of 24 hours (Ref. 2) is acceptable to permit restoration of any inoperable channel to OPERABLE status (Required Action C.1). A Required Action (similar to Required Action B.1), limiting the allowable out of service time if a loss of automatic RCIC initiation capability exists, is not required. This Condition applies to the Reactor Vessel Water Level - High, Level 8 Function, whose logic is arranged such that any inoperable channel will result in a loss of automatic RCIC initiation capability. As stated above, this loss of automatic RCIC initiation capability was analyzed and determined to be acceptable. This Condition also applies to the Manual Initiation Function. Since this Function is not assumed in any accident or transient analysis, a total loss of manual initiation capability (Required Action C.1) for 24 hours is allowed. The Required Action does not allow placing a channel in trip since this action would not necessarily result in the safe state for the channel in all events.

BASES

ACTIONS (continued)

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

Required Action D.1 is intended to ensure that appropriate actions are taken if multiple inoperable, untripped channels within the same Function result in automatic component initiation capability being lost for the feature(s). For Required Action D.1, the RCIC System is the only associated feature. In this case, automatic component initiation capability is lost if two Function 3 channels or two Function 4 channels are inoperable and untripped. In this situation (loss of automatic suction swap), the 24 hour allowance of Required Actions D.2.1 and D.2.2 is not appropriate, and the RCIC System must be declared inoperable within 1 hour from discovery of loss of RCIC initiation capability. As noted, Required Action D.1 is only applicable if the RCIC pump suction is not aligned to the suppression pool since, if aligned, the Function is already performed.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action D.1, the Completion Time only begins upon discovery that the RCIC System cannot be automatically aligned to the suppression pool due to two inoperable, untripped channels in the same Function. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

Because of the redundancy of sensors available to provide initiation signals and the fact that the RCIC System is not assumed in any accident or transient analysis, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 2) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action D.2.1, which performs the intended function of the channel (shifting the suction source to the suppression pool). Alternatively, Required Action D.2.2 allows the manual alignment of the RCIC suction to the suppression pool, which also performs the intended function. If Required Action D.2.1 or D.2.2 is performed, measures should be taken to ensure that the RCIC System piping remains filled with water. If it is not desired to perform Required Actions D.2.1 and D.2.2 (e.g., as in the case where shifting the suction source could drain down the RCIC suction piping), Condition E must be entered and its Required Action taken.

BASES

ACTIONS (continued)

E.1

With any Required Action and associated Completion Time not met, the RCIC System may be incapable of performing the intended function, and the RCIC System must be declared inoperable immediately.

SURVEILLANCE REQUIREMENTS

-----------------------------------REVIEWER'S NOTE-----------------------------------
Certain Frequencies are based on approved topical reports. In order for a licensee to use these Frequencies, the licensee must justify the Frequencies as required by the staff SER for the topical report.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Notes a and b are applied to the setpoint verification Surveillances for all RCIC System Instrumentation Functions in Table 3.3.5.3~~2~~-1 unless one or more of the following exclusions apply:

1. Manual actuation circuits, automatic actuation logic circuits or instrument functions that derive input from contacts which have no associated sensor or adjustable device, e.g., limit switches, breaker position switches, manual actuation switches, float switches, proximity detectors, etc. are excluded. In addition, those permissives and interlocks that derive input from a sensor or adjustable device that is tested as part of another TS function are excluded.

2. Settings associated with safety relief valves are excluded. The performance of these components is already controlled (i.e., trended with as-left and as-found limits) under the ASME Code for Operation and Maintenance of Nuclear Power Plants testing program.

3. Functions and Surveillance Requirements which test only digital components are normally excluded. There is no expected change in result between SR performances for these components. Where separate as-left and as-found tolerance is established for digital component SRs, the requirements would apply.

A generic evaluation of RCIC System Instrumentation Functions resulted in Notes a and b being applied to the Functions shown in TS 3.3.5.3~~2~~. Each licensee adopting this change must review the list of potential Functions to identify whether any of the identified functions meet any of the exclusion criteria based on the plant specific design and safety analysis (AOOs). The footnotes applied to Function 3.3.5.3~~2~~-1.[2], Reactor Vessel Water Level - High, Level 8 are optional.

BASES

SURVEILLANCE REQUIREMENTS (continued)

As noted in the beginning of the SRs, the SRs for each RCIC System instrument Function are found in the SRs column of Table 3.3.5.*3*~~2~~-1.

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours for Functions 2 and 5; and (b) for up to 6 hours for Functions 1, 3, and 4 provided the associated Function maintains trip capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Ref. 2) assumption of the average time required to perform channel Surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that the RCIC will initiate when necessary.

SR 3.3.5.*3*~~2~~.1

Performance of the CHANNEL CHECK ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying that the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined by the plant staff based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

[The Frequency of 12 hours is based upon operating experience that demonstrates channel failure is rare.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

The CHANNEL CHECK supplements less formal, but more frequent, checks of channel status during normal operational use of the displays associated with the channels required by the LCO.

SR 3.3.5.~~3~~2.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

[The Frequency of 92 days is based on the reliability analysis of Reference 2.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.5.*3*~~2~~.3

The calibration of trip units provides a check of the actual trip setpoints. The channel must be declared inoperable if the trip setting is discovered to be less conservative than the Allowable Value specified in Table 3.3.5.*3*~~2~~-1. If the trip setting is discovered to be less conservative than accounted for in the appropriate setpoint methodology, but is not beyond the Allowable Value, the channel performance is still within the requirements of the plant safety analysis. Under these conditions, the setpoint must be re-adjusted to be equal to or more conservative than accounted for in the appropriate setpoint methodology.

[The Frequency of 92 days is based on the reliability analysis of Reference 2.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

SR 3.3.5.*3*~~2~~.3 is modified by two Notes as identified in Table 3.3.5.*3*~~2~~-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. For channels determined to be OPERABLE but degraded, after returning the channel to service the performance of these channels will be evaluated under the plant Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures [NTSP], the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to

BASES

SURVEILLANCE REQUIREMENTS (continued)

the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable. The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference].

SR 3.3.5.3~~2~~.4

CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies the channel responds to the measured parameter with the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations consistent with the plant specific setpoint methodology.

[The Frequency is based on the assumption of an 18 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

SR 3.3.5.3~~2~~.4 is modified by two Notes as identified in Table 3.3.5.3~~2~~-1. The first Note requires evaluation of channel performance for the condition where the as-found setting for the channel setpoint is outside its as-found tolerance but conservative with respect to the Allowable Value. Evaluation of channel performance will verify that the channel will continue to behave in accordance with safety analysis assumptions and the channel performance assumptions in the setpoint methodology. The

BASES

SURVEILLANCE REQUIREMENTS (continued)

purpose of the assessment is to ensure confidence in the channel performance prior to returning the channel to service. For channels determined to be OPERABLE but degraded, after returning the channel to service the performance of these channels will be evaluated under the plant Corrective Action Program. Entry into the Corrective Action Program will ensure required review and documentation of the condition. The second Note requires that the as-left setting for the channel be within the as-left tolerance of the [LTSP]. Where a setpoint more conservative than the [LTSP] is used in the plant surveillance procedures [NTSP], the as-left and as-found tolerances, as applicable, will be applied to the surveillance procedure setpoint. This will ensure that sufficient margin to the Safety Limit and/or Analytical Limit is maintained. If the as-left channel setting cannot be returned to a setting within the as-left tolerance of the [LTSP], then the channel shall be declared inoperable. The second Note also requires that [LTSP] and the methodologies for calculating the as-left and the as-found tolerances be in [insert the facility FSAR reference or the name of any document incorporated into the facility FSAR by reference].

SR 3.3.5.~~3~~2.5

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required initiation logic for a specific channel. The system functional testing performed in LCO 3.5.3 overlaps this Surveillance to provide complete testing of the safety function.

[The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

BASES

REFERENCES

1. Regulatory Guide 1.105, "Setpoints for Safety-Related Instrumentation," Revision 3.

2. NEDE-770-06-2, "Addendum to Bases for Changes to Surveillance Test Intervals and Allowed Out-of-Service Times for Selected Instrumentation Technical Specifications," February 1991.

B 3.3 INSTRUMENTATION

B 3.3.5.3~~2~~B Reactor Core Isolation Cooling (RCIC) System Instrumentation (With Setpoint Control Program)

BASES

BACKGROUND

The purpose of the RCIC System instrumentation is to initiate actions to ensure adequate core cooling when the reactor vessel is isolated from its primary heat sink (the main condenser) and normal coolant makeup flow from the Reactor Feedwater System is unavailable, such that initiation of the low pressure Emergency Core Cooling Systems (ECCS) pumps does not occur. A more complete discussion of RCIC System operation is provided in the Bases of LCO 3.5.3, "RCIC System." This is achieved by specifying limiting safety system settings (LSSS) in terms of parameters directly monitored by the RCIC instrumentation, as well as LCOs on other reactor system parameters and equipment performance.

Technical Specifications are required by 10 CFR 50.36 to include LSSSs for variables that have significant safety functions. LSSS are defined by the regulation as "Where a LSSS is specified for a variable on which a safety limit has been placed, the setting must be chosen so that automatic protective actions will correct the abnormal situation before a Safety Limit (SL) is exceeded." The Analytical Limit is the limit of the process variable at which a safety action is initiated, as established by the safety analysis, to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur. The LSSS values are identified and maintained in the Setpoint Control Program (SCP) controlled by 10 CFR 50.59.

---------------------------------REVIEWER'S NOTE-----------------------------------
The term "Limiting Trip Setpoint" [LTSP] is generic terminology for the calculated trip setting (setpoint) value calculated by means of the plant specific setpoint methodology documented in a document controlled under 10 CFR 50.59. The term [LTSP] indicates that no additional margin has been added between the Analytical Limit and the calculated trip setting.

"Nominal Trip Setpoint [NTSP]" is the suggested terminology for the actual setpoint implemented in the plant surveillance procedures where margin has been added to the calculated [LTSP]. The as-found and as-left tolerances will apply to the [NTSP] implemented in the Surveillance procedures to confirm channel performance.

BASES

BACKGROUND (continued)

The [LTSP] and [NTSP] are located in the SCP.

The [Limiting Trip Setpoint (LTSP)] specified in the SCP is a predetermined setting for a protection channel chosen to ensure automatic actuation prior to the process variable reaching the Analytical Limit and thus ensuring that the SL would not be exceeded. As such, the [LTSP] accounts for uncertainties in setting the channel (e.g., calibration), uncertainties in how the channel might actually perform (e.g., repeatability), changes in the point of action of the channel over time (e.g., drift during surveillance intervals), and any other factors which may influence its actual performance (e.g., harsh accident environments). In this manner, the [LTSP] ensures that SLs are not exceeded. As such, the [LTSP] meets the definition of an LSSS (Ref. 1)

The Allowable Value specified in the SCP, serves as the LSSS such that a channel is OPERABLE if the trip setpoint is found not to exceed the Allowable Value. As such, the Allowable Value differs from the trip setpoint by an amount primarily equal to the expected instrument loop uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the device will still meet the LSSS definition and ensure that a SL is not exceeded at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval.

Technical Specifications contain values related to the OPERABILITY of equipment required for safe operation of the facility. OPERABLE is defined in Technical Specifications as "...being capable of performing its safety function(s)." Relying solely on the [LTSP] to define OPERABILITY in Technical Specifications would be an overly restrictive requirement if it were applied as an OPERABILITY limit for the "as found" value of a protection channel setting during a Surveillance. This would result in Technical Specification compliance problems, as well as reports and corrective actions required by the rule which are not necessary to ensure safety. For example, an automatic protection channel with a setting that has been found to be different from the [LTSP] due to some drift of the setting may still be OPERABLE because drift is to be expected. This expected drift would have been specifically accounted for in the setpoint methodology for calculating the [LTSP] and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as found" setting of the protection channel. Therefore, the channel would still be OPERABLE because it would have performed its safety function and the only corrective action required would be to reset the channel within the established as-left tolerance around [LTSP] to account for further drift during the next surveillance interval. Note that, although

BACKGROUND (continued)

the channel is OPERABLE under these circumstances, the trip setpoint must be left adjusted to a value within the as-left tolerance, in accordance with uncertainty assumptions stated in the referenced setpoint methodology (as-left criteria), and confirmed to be operating within the statistical allowances of the uncertainty terms assigned (as-found criteria).

However, there is also some point beyond which the channel may not be able to perform its function due to, for example, greater than expected drift. This value needs to be specified in the Technical Specifications in order to define OPERABILITY of the channels and is designated as the Allowable Value.

If the actual setting (as-found setpoint) of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE, but degraded. The degraded condition will be further evaluated during performance of the SR. This evaluation will consist of resetting the channel setpoint to the [Nominal Trip Setpoint (NTSP)] (within the allowed tolerance), and evaluating the channel response. If the channel is functioning as required and is expected to pass the next surveillance, then the channel is OPERABLE and can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel as-found condition will be entered into the Corrective Action Program for further evaluation.

The RCIC System may be initiated by either automatic or manual means. Automatic initiation occurs for conditions of reactor vessel Low Low water level. The variable is monitored by four transmitters that are connected to four trip units. The outputs of the trip units are connected to relays whose contacts are arranged in a one-out-of-two taken twice logic arrangement. Once initiated, the RCIC logic seals in and can be reset by the operator only when the reactor vessel water level signals have cleared.

The RCIC test line isolation valve (which is also a primary containment isolation valve) is closed on a RCIC initiation signal to allow full system flow and maintain containment isolated in the event RCIC is not operating.

The RCIC System also monitors the water levels in the condensate storage tank (CST) and the suppression pool, since these are the two sources of water for RCIC operation. Reactor grade water in the CST is the normal source. Upon receipt of a RCIC initiation signal, the CST suction valve is automatically signaled to open (it is normally in the open position) unless the pump suction from the suppression pool valve is open. If the water level in the CST falls below a preselected level, first

BASES

BACKGROUND (continued)

the suppression pool suction valve automatically opens and then the CST suction valve automatically closes. Two level transmitters are used to detect low water level in the CST. Either switch can cause the suppression pool suction valve to open and the CST suction valve to close. The suppression pool suction valve also automatically opens and the CST suction valve closes if high water level is detected in the suppression pool (one-out-of-two logic similar to the CST water level logic). To prevent losing suction to the pump, the suction valves are interlocked so that one suction path must be open before the other automatically closes.

The RCIC System provides makeup water to the reactor until the reactor vessel water level reaches the high water level (Level 8) trip (two-out-of-two logic), at which time the RCIC steam supply, steam supply bypass, and cooling water supply valves close (the injection valve also closes due to the closure of the steam supply valves). The RCIC System restarts if vessel level again drops to the low level initiation point (Level 2).

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY

The function of the RCIC System, to provide makeup coolant to the reactor, is to respond to transient events. The RCIC System is not an Engineered Safety Feature System and no credit is taken in the safety analysis for RCIC System operation. The RCIC System instrumentation satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii). Certain instrumentation Functions are retained for other reasons and are described below in the individual Functions discussion.

Permissive and interlock setpoints allow the blocking of trips during plant startups, and restoration of trips when the permissive conditions are not satisfied, but they are not explicitly modeled in the Safety Analyses. These permissives and interlocks ensure that the starting conditions are consistent with the safety analysis, before preventive or mitigating actions occur. Because these permissives or interlocks are only one of multiple conservative starting assumptions for the accident analysis, they are generally considered as nominal values without regard to measurement accuracy.

The OPERABILITY of the RCIC System instrumentation is dependent on the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.5.3~~2~~-1. Each Function must have a required number of OPERABLE channels with their setpoints set within the setting tolerance of the [LTSPs], where appropriate. The actual setpoint is calibrated consistent with the SCP. Each channel must also respond within its assumed response time.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Allowable Values are specified for each RCIC System instrumentation Function in the SCP. [LTSPs] and the methodologies for calculation of the as-left and as-found tolerances are described in the SCP controlled under 10 CFR 50.59. The [LTSPs] are selected to ensure that the setpoints remain conservative to the as-left tolerance band between CHANNEL CALIBRATIONS. After each calibration the trip setpoint shall be left within the as-left band around the [LTSP].

[LTSPs] are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state. The analytical limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytical limits, corrected for calibration, process, and some of the instrument errors. The [LTSPs] are then determined, accounting for the remaining instrument errors (e.g., drift). The trip setpoints derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

Note that, although the channel is OPERABLE under these circumstances, the trip setpoint must be left adjusted to a value within the as-left tolerance, in accordance with uncertainty assumptions stated in the referenced setpoint methodology (as-left criteria), and confirmed to be operating within the statistical allowances of the uncertainty terms assigned (as-found criteria).

The individual Functions are required to be OPERABLE in MODE 1, and in MODES 2 and 3 with reactor steam dome pressure > 150 psig, since this is when RCIC is required to be OPERABLE. (Refer to LCO 3.5.3 for Applicability Bases for the RCIC System.)

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

1. Reactor Vessel Water Level - Low Low, Level 2

Low reactor pressure vessel (RPV) water level indicates that normal feedwater flow is insufficient to maintain reactor vessel water level and that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, the RCIC System is initiated at Level 2 to assist in maintaining water level above the top of the active fuel.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Reactor Vessel Water Level - Low Low, Level 2 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel.

The Reactor Vessel Water Level - Low Low, Level 2 Allowable Value is set high enough such that for complete loss of feedwater flow, the RCIC System flow with high pressure core spray assumed to fail will be sufficient to avoid initiation of low pressure ECCS at Level 1.

Four channels of Reactor Vessel Water Level - Low Low, Level 2 Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure that no single instrument failure can preclude RCIC initiation. Refer to LCO 3.5.3 for RCIC Applicability Bases.

2. Reactor Vessel Water Level - High, Level 8

High RPV water level indicates that sufficient cooling water inventory exists in the reactor vessel such that there is no danger to the fuel. Therefore, the Level 8 signal is used to close the RCIC steam supply, steam supply bypass, and cooling water supply valves to prevent overflow into the main steam lines (MSLs). (The injection valve also closes due to the closure of the steam supply valve.)

Reactor Vessel Water Level - High, Level 8 signals for RCIC are initiated from two level transmitters from the narrow range water level measurement instrumentation, which sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel.

The Reactor Vessel Water Level - High, Level 8 Allowable Value is high enough to preclude isolating the injection valve of the RCIC during normal operation, yet low enough to trip the RCIC System prior to water overflowing into the MSLs.

Two channels of Reactor Vessel Water Level - High, Level 8 Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure that no single instrument failure can preclude RCIC initiation. Refer to LCO 3.5.3 for RCIC Applicability Bases.

3. Condensate Storage Tank Level - Low

Low level in the CST indicates the unavailability of an adequate supply of makeup water from this normal source. Normally the suction valve between the RCIC pump and the CST is open and, upon receiving a

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

RCIC initiation signal, water for RCIC injection would be taken from the CST. However, if the water level in the CST falls below a preselected level, first the suppression pool suction valve automatically opens and then the CST suction valve automatically closes. This ensures that an adequate supply of makeup water is available to the RCIC pump. To prevent losing suction to the pump, the suction valves are interlocked so that the suppression pool suction valve must be open before the CST suction valve automatically closes.

Two level transmitters are used to detect low water level in the CST. The Condensate Storage Tank Level - Low Function Allowable Value is set high enough to ensure adequate pump suction head while water is being taken from the CST.

Two channels of Condensate Storage Tank Level - Low Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure that no single instrument failure can preclude RCIC swap to suppression pool source. Refer to LCO 3.5.3 for RCIC Applicability Bases.

4. Suppression Pool Water Level - High

Excessively high suppression pool water level could result in the loads on the suppression pool exceeding design values should there be a blowdown of the reactor vessel pressure through the safety/relief valves. Therefore, signals indicating high suppression pool water level are used to transfer the suction source of RCIC from the CST to the suppression pool to eliminate the possibility of RCIC continuing to provide additional water from a source outside primary containment. This Function satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii). To prevent losing suction to the pump, the suction valves are interlocked so that the suppression pool suction valve must be open before the CST suction valve automatically closes.

Suppression pool water level signals are initiated from two level transmitters. The Allowable Value for the Suppression Pool Water Level - High Function is set low enough to ensure that RCIC will be aligned to take suction from the suppression pool before the water level reaches the point at which suppression design loads would be exceeded.

Two channels of Suppression Pool Water Level - High Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure that no single instrument failure can preclude RCIC swap to suppression pool source. Refer to LCO 3.5.3 for RCIC Applicability Bases.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

5. Manual Initiation

The Manual Initiation push button switch introduces a signal into the RCIC System initiation logic that is redundant to the automatic protective instrumentation and provides manual initiation capability. There is one push button for the RCIC System.

The Manual Initiation Function is not assumed in any accident or transient analyses in the FSAR. However, the Function is retained for overall redundancy and diversity of the RCIC function as required by the NRC in the plant licensing basis.

There is no Allowable Value for this Function since the channel is mechanically actuated based solely on the position of the push button. One channel of Manual Initiation is required to be OPERABLE when RCIC is required to be OPERABLE.

ACTIONS

----------------------------------REVIEWER'S NOTE----------------------------------
Certain LCO Completion Times are based on approved topical reports. In order for a licensee to use the times, the licensee must justify the Completion Times as required by the NRC staff Safety Evaluation Report (SER) for the topical report.

A Note has been provided to modify the ACTIONS related to RCIC System instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition discovered to be inoperable or not within limits will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable RCIC System instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable RCIC System instrumentation channel.

A.1

Required Action A.1 directs entry into the appropriate Condition referenced in Table 3.3.5.~~3~~2-1 in the accompanying LCO. The applicable Condition referenced in the Table is Function dependent. Each time a

ACTIONS (continued)

channel is discovered to be inoperable, Condition A is entered for that channel and provides for transfer to the appropriate subsequent Condition.

<u>B.1 and B.2</u>

Required Action B.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same Function result in a complete loss of automatic initiation capability for the RCIC System. In this case, automatic initiation capability is lost if two Function 1 channels in the same trip system are inoperable and untripped. In this situation (loss of automatic initiation capability), the 24 hour allowance of Required Action B.2 is not appropriate, and the RCIC System must be declared inoperable within 1 hour after discovery of loss of RCIC initiation capability.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action B.1, the Completion Time only begins upon discovery that the RCIC System cannot be automatically initiated due to two inoperable, untripped Reactor Vessel Water Level - Low Low, Level 2 channels in the same trip system. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

Because of the redundancy of sensors available to provide initiation signals and the fact that the RCIC System is not assumed in any accident or transient analysis, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 2) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action B.2. Placing the inoperable channel in trip would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. Alternately, if it is not desired to place the channel in trip (e.g., as in the case where placing the inoperable channel in trip would result in an initiation), Condition E must be entered and its Required Action taken.

BASES

ACTIONS (continued)

C.1

A risk based analysis was performed and determined that an allowable out of service time of 24 hours (Ref. 2) is acceptable to permit restoration of any inoperable channel to OPERABLE status (Required Action C.1). A Required Action (similar to Required Action B.1), limiting the allowable out of service time if a loss of automatic RCIC initiation capability exists, is not required. This Condition applies to the Reactor Vessel Water Level - High, Level 8 Function, whose logic is arranged such that any inoperable channel will result in a loss of automatic RCIC initiation capability. As stated above, this loss of automatic RCIC initiation capability was analyzed and determined to be acceptable. This Condition also applies to the Manual Initiation Function. Since this Function is not assumed in any accident or transient analysis, a total loss of manual initiation capability (Required Action C.1) for 24 hours is allowed. The Required Action does not allow placing a channel in trip since this action would not necessarily result in the safe state for the channel in all events.

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

Required Action D.1 is intended to ensure that appropriate actions are taken if multiple inoperable, untripped channels within the same Function result in automatic component initiation capability being lost for the feature(s). For Required Action D.1, the RCIC System is the only associated feature. In this case, automatic component initiation capability is lost if two Function 3 channels or two Function 4 channels are inoperable and untripped. In this situation (loss of automatic suction swap), the 24 hour allowance of Required Actions D.2.1 and D.2.2 is not appropriate, and the RCIC System must be declared inoperable within 1 hour from discovery of loss of RCIC initiation capability. As noted, Required Action D.1 is only applicable if the RCIC pump suction is not aligned to the suppression pool since, if aligned, the Function is already performed.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action D.1, the Completion Time only begins upon discovery that the RCIC System cannot be automatically aligned to the suppression pool due to two inoperable, untripped channels in the same Function. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

BASES

ACTIONS (continued)

Because of the redundancy of sensors available to provide initiation signals and the fact that the RCIC System is not assumed in any accident or transient analysis, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 2) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action D.2.1, which performs the intended function of the channel (shifting the suction source to the suppression pool). Alternatively, Required Action D.2.2 allows the manual alignment of the RCIC suction to the suppression pool, which also performs the intended function. If Required Action D.2.1 or D.2.2 is performed, measures should be taken to ensure that the RCIC System piping remains filled with water. If it is not desired to perform Required Actions D.2.1 and D.2.2 (e.g., as in the case where shifting the suction source could drain down the RCIC suction piping), Condition E must be entered and its Required Action taken.

E.1

With any Required Action and associated Completion Time not met, the RCIC System may be incapable of performing the intended function, and the RCIC System must be declared inoperable immediately.

SURVEILLANCE REQUIREMENTS

-----------------------------------REVIEWER'S NOTE-----------------------------------
Certain Frequencies are based on approved topical reports. In order for a licensee to use these Frequencies, the licensee must justify the Frequencies as required by the staff SER for the topical report.

As noted in the beginning of the SRs, the SRs for each RCIC System instrument Function are found in the SRs column of Table 3.3.5.3~~2~~-1.

The Surveillances are modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed as follows: (a) for up to 6 hours for Functions 2 and 5; and (b) for up to 6 hours for Functions 1, 3, and 4 provided the associated Function maintains trip capability. Upon completion of the Surveillance, or expiration of the 6 hour allowance, the channel must be returned to OPERABLE status or the applicable Condition entered and Required Actions taken. This Note is based on the reliability analysis (Ref. 2)

BASES

SURVEILLANCE REQUIREMENTS (continued)

assumption of the average time required to perform channel Surveillance. That analysis demonstrated that the 6 hour testing allowance does not significantly reduce the probability that the RCIC will initiate when necessary.

SR 3.3.5.3~~2~~.1

Performance of the CHANNEL CHECK ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying that the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined by the plant staff based on a combination of the channel instrument uncertainties, including indication and readability. If a channel is outside the criteria, it may be an indication that the instrument has drifted outside its limit.

[The Frequency of 12 hours is based upon operating experience that demonstrates channel failure is rare.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

The CHANNEL CHECK supplements less formal, but more frequent, checks of channel status during normal operational use of the displays associated with the channels required by the LCO.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.5.~~3~~2.2

A CHANNEL FUNCTIONAL TEST is performed on each required channel to ensure that the entire channel will perform the intended function. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. Any setpoint adjustment shall be consistent with the assumptions of the current plant specific setpoint methodology.

[The Frequency of 92 days is based on the reliability analysis of Reference 2.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

SR 3.3.5.~~3~~2.3

The calibration of trip units provides a check of the actual trip setpoints. The test is performed in accordance with the SCP. If the actual setting of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE but degraded. The degraded condition of the channel will be further evaluated during performance of the SR. This evaluation will consist of resetting the channel setpoint to the [NTSP] (within the allowed tolerance), and evaluating the channel response. If the channel is functioning as required and is expected to pass the next surveillance, then the channel is OPERABLE and can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel as-found condition will be entered into the Corrective Action Program for further evaluation.

BASES

SURVEILLANCE REQUIREMENTS (continued)

[The Frequency of 92 days is based on the reliability analysis of Reference 2.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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SR 3.3.5.~~3~~2.4

CHANNEL CALIBRATION is a complete check of the instrument loop and the sensor. This test verifies the channel responds to the measured parameter with the necessary range and accuracy. The test is performed in accordance with the SCP. If the actual setting of the channel is found to be conservative with respect to the Allowable Value but is beyond the as-found tolerance band, the channel is OPERABLE but degraded. The degraded condition of the channel will be further evaluated during performance of the SR. This evaluation will consist of resetting the channel setpoint to the [NTSP] (within the allowed tolerance), and evaluating the channel response. If the channel is functioning as required and is expected to pass the next surveillance, then the channel is OPERABLE and can be restored to service at the completion of the surveillance. After the surveillance is completed, the channel as-found condition will be entered into the Corrective Action Program for further evaluation.

[The Frequency is based on the assumption of an 18 month calibration interval in the determination of the magnitude of equipment drift in the setpoint analysis.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]

SR 3.3.5.~~3~~2.5

The LOGIC SYSTEM FUNCTIONAL TEST demonstrates the OPERABILITY of the required initiation logic for a specific channel. The system functional testing performed in LCO 3.5.3 overlaps this Surveillance to provide complete testing of the safety function.

[The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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REFERENCES

1. Regulatory Guide 1.105, "Setpoints for Safety-Related Instrumentation," Revision 3.
2. NEDE-770-06-2, "Addendum to Bases for Changes to Surveillance Test Intervals and Allowed Out-of-Service Times for Selected Instrumentation Technical Specifications," February 1991.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The Reactor Vessel Water Level - Low Low Low, Level 1 Allowable Value is chosen to be the same as the ECCS Reactor Vessel Water Level - Low Low Low, Level 1 Allowable Value (LCO 3.3.5.1) to ensure the valves are isolated to prevent offsite doses from exceeding 10 CFR 100 limits.

This Function isolates the E61 isolation valves.

2.g. Containment and Drywell Ventilation Exhaust Radiation - High

High ventilation exhaust radiation is an indication of possible gross failure of the fuel cladding. The release may have originated from the primary containment due to a break in the RCPB. When Exhaust Radiation - High is detected, valves whose penetrations communicate with the primary containment atmosphere are isolated to limit the release of fission products. Additionally, the Ventilation Exhaust Radiation - High is assumed to initiate isolation of the primary containment during a fuel handling accident [involving handling recently irradiated fuel] (Ref. 2).

The Exhaust Radiation - High signals are initiated from radiation detectors that are located on the ventilation exhaust piping coming from the drywell and containment. The signal from each detector is input to an individual monitor whose trip outputs are assigned to an isolation channel. Four channels of Containment and Drywell Ventilation Exhaust - High Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Allowable Values are chosen to promptly detect gross failure of the fuel cladding and to ensure offsite doses remain below 10 CFR 20 and 10 CFR 100 limits.

The Function is required to be OPERABLE during ~~operations with a potential for draining the reactor vessel (OPDRVs) and~~ movement of [recently] irradiated fuel assemblies in the primary or secondary containment because the capability of detecting radiation releases due to fuel failures (due to ~~fuel uncovery or~~ dropped [recently] irradiated fuel assemblies) must be provided to ensure offsite dose limits are not exceeded. [Due to radioactive decay, this Function is only required to isolate primary containment during fuel handling accidents involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [x] days)].

These Functions isolate the Group 7 valves.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The Allowable Values are set low enough to detect a leak equivalent to 25 gpm.

This Function isolates the Group 3 valves.

5.c. Reactor Vessel Water Level - Low, Level 3

Low RPV water level indicates the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, isolation of some reactor vessel interfaces occurs to begin isolating the potential sources of a break. The Reactor Vessel Water Level - Low, Level 3 Function associated with RHR Shutdown Cooling System isolation is not directly assumed in any transient or accident analysis, since bounding analyses are performed for large breaks such as MSLBs. The RHR Shutdown Cooling System isolation on Level 3 supports actions to ensure that the RPV water level does not drop below the top of the active fuel during a vessel draindown event caused by a leak (e.g., pipe break or inadvertent valve opening) in the RHR Shutdown Cooling System.

Reactor Vessel Water Level - Low, Level 3 signals are initiated from level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels (two channels per trip system) of the Reactor Vessel Water Level - Low, Level 3 Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function. ~~As noted (footnote (c) to Table 3.3.6.1-1), only two channels of the Reactor Vessel Water Level - Low, Level 3 Function are required to be OPERABLE in MODES 4 and 5 (both channels must input into the same trip system) provided the RHR Shutdown Cooling System integrity is maintained. System integrity is maintained provided the piping is intact and no maintenance is being performed that has the potential for draining the reactor vessel through the system.~~

The Reactor Vessel Water Level - Low, Level 3 Allowable Value was chosen to be the same as the RPS Reactor Vessel Water Level - Low, Level 3 Allowable Value (LCO 3.3.1.1) since the capability to cool the fuel may be threatened.

The Reactor Vessel Water Level - Low, Level 3 Function is only required to be OPERABLE in MODE~~S~~ 3~~, 4, and 5~~ to prevent this potential flow path from lowering reactor vessel level to the top of the fuel. In MODES 1 and 2, other isolations (e.g., Reactor Steam Dome Pressure - High) and administrative controls ensure that this flow path remains isolated to prevent unexpected loss of inventory via this flow path.

BASES

ACTIONS (continued)

J.1 and J.2

If the channel is not restored to OPERABLE status or placed in trip within the allowed Completion Time, the associated penetration flow path should be closed. However, if the shutdown cooling function is needed to provide core cooling, these Required Actions allow the penetration flow path to remain unisolated provided action is immediately initiated to restore the channel to OPERABLE status or to isolate the RHR Shutdown Cooling System (i.e., provide alternate decay heat removal capabilities so the penetration flow path can be isolated). ACTIONS must continue until the channel is restored to OPERABLE status or the RHR Shutdown Cooling System is isolated.

K.1~~,~~ *and* K.2~~.1~~, ~~and K.2.2~~

If the channel is not restored to OPERABLE status or placed in trip within the allowed Completion Time, the associated penetration flow path(s) should be isolated (Required Action K.1). Isolating the affected penetration flow path(s) accomplishes the safety function of the inoperable instrumentation. Alternately, the plant must be placed in a condition in which the LCO does not apply. If applicable, movement of [recently] irradiated fuel assemblies must be immediately suspended. Suspension of these activities shall not preclude completion of movement of a component to a safe condition. ~~Also, if applicable, action must be immediately initiated to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission production release. Actions must continue until OPDRVs are suspended.~~

SURVEILLANCE REQUIREMENTS

----------------------------------REVIEWER'S NOTE----------------------------------
Certain Frequencies are based on approved topical reports. In order for a licensee to use these Frequencies, the licensee must justify the Frequencies as required by the staff SER for the topical report.

As noted at the beginning of the SRs, the SRs for each Primary Containment Isolation Instrumentation Function are found in the SRs column of Table 3.3.6.1-1.

The Surveillances are also modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Function maintains trip capability. Upon completion of the Surveillance,

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The Reactor Vessel Water Level - Low Low Low, Level 1 Allowable Value is chosen to be the same as the ECCS Reactor Vessel Water Level - Low Low Low, Level 1 Allowable Value (LCO 3.3.5.1) to ensure the valves are isolated to prevent offsite doses from exceeding 10 CFR 100 limits.

This Function isolates the E61 isolation valves.

2.g. Containment and Drywell Ventilation Exhaust Radiation - High

High ventilation exhaust radiation is an indication of possible gross failure of the fuel cladding. The release may have originated from the primary containment due to a break in the RCPB. When Exhaust Radiation - High is detected, valves whose penetrations communicate with the primary containment atmosphere are isolated to limit the release of fission products. Additionally, the Ventilation Exhaust Radiation - High is assumed to initiate isolation of the primary containment during a fuel handling accident [involving handling recently irradiated fuel] (Ref. 2).

The Exhaust Radiation - High signals are initiated from radiation detectors that are located on the ventilation exhaust piping coming from the drywell and containment. The signal from each detector is input to an individual monitor whose trip outputs are assigned to an isolation channel. Four channels of Containment and Drywell Ventilation Exhaust - High Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Allowable Values are chosen to promptly detect gross failure of the fuel cladding and to ensure offsite doses remain below 10 CFR 20 and 10 CFR 100 limits.

The Function is required to be OPERABLE during ~~operations with a potential for draining the reactor vessel (OPDRVs) and~~ movement of [recently] irradiated fuel assemblies in the primary or secondary containment because the capability of detecting radiation releases due to fuel failures (due to ~~fuel uncovery or~~ dropped [recently] irradiated fuel assemblies) must be provided to ensure offsite dose limits are not exceeded. [Due to radioactive decay, this Function is only required to isolate primary containment during fuel handling accidents involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [x] days)].

These Functions isolate the Group 7 valves.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The Allowable Values are set low enough to detect a leak equivalent to 25 gpm.

This Function isolates the Group 3 valves.

5.c. Reactor Vessel Water Level - Low, Level 3

Low RPV water level indicates the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, isolation of some reactor vessel interfaces occurs to begin isolating the potential sources of a break. The Reactor Vessel Water Level - Low, Level 3 Function associated with RHR Shutdown Cooling System isolation is not directly assumed in any transient or accident analysis, since bounding analyses are performed for large breaks such as MSLBs. The RHR Shutdown Cooling System isolation on Level 3 supports actions to ensure that the RPV water level does not drop below the top of the active fuel during a vessel draindown event caused by a leak (e.g., pipe break or inadvertent valve opening) in the RHR Shutdown Cooling System.

Reactor Vessel Water Level - Low, Level 3 signals are initiated from level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels (two channels per trip system) of the Reactor Vessel Water Level - Low, Level 3 Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function. ~~As noted (footnote (c) to Table 3.3.6.1-1), only two channels of the Reactor Vessel Water Level - Low, Level 3 Function are required to be OPERABLE in MODES 4 and 5 (both channels must input into the same trip system) provided the RHR Shutdown Cooling System integrity is maintained. System integrity is maintained provided the piping is intact and no maintenance is being performed that has the potential for draining the reactor vessel through the system.~~

The Reactor Vessel Water Level - Low, Level 3 Allowable Value was chosen to be the same as the RPS Reactor Vessel Water Level - Low, Level 3 Allowable Value (LCO 3.3.1.1) since the capability to cool the fuel may be threatened.

The Reactor Vessel Water Level - Low, Level 3 Function is only required to be OPERABLE in MODE~~S~~ 3~~, 4, and 5~~ to prevent this potential flow path from lowering reactor vessel level to the top of the fuel. In MODES 1 and 2, other isolations (e.g., Reactor Steam Dome Pressure - High) and administrative controls ensure that this flow path remains isolated to prevent unexpected loss of inventory via this flow path.

BASES

ACTIONS (continued)

J.1 and J.2

If the channel is not restored to OPERABLE status or placed in trip within the allowed Completion Time, the associated penetration flow path should be closed. However, if the shutdown cooling function is needed to provide core cooling, these Required Actions allow the penetration flow path to remain unisolated provided action is immediately initiated to restore the channel to OPERABLE status or to isolate the RHR Shutdown Cooling System (i.e., provide alternate decay heat removal capabilities so the penetration flow path can be isolated). ACTIONS must continue until the channel is restored to OPERABLE status or the RHR Shutdown Cooling System is isolated.

K.1 *and* ~~,~~ K.2~~.1, and K.2.2~~

If the channel is not restored to OPERABLE status or placed in trip within the allowed Completion Time, the associated penetration flow path(s) should be isolated (Required Action K.1). Isolating the affected penetration flow path(s) accomplishes the safety function of the inoperable instrumentation. Alternately, the plant must be placed in a condition in which the LCO does not apply. If applicable, movement of [recently] irradiated fuel assemblies must be immediately suspended. Suspension of these activities shall not preclude completion of movement of a component to a safe condition. ~~Also, if applicable, action must be immediately initiated to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission production release. Actions must continue until OPDRVs are suspended~~.

SURVEILLANCE REQUIREMENTS

-----------------------------------REVIEWER'S NOTE-----------------------------------
Certain Frequencies are based on approved topical reports. In order for a licensee to use these Frequencies, the licensee must justify the Frequencies as required by the staff SER for the topical report.

As noted at the beginning of the SRs, the SRs for each Primary Containment Isolation Instrumentation Function are found in the SRs column of Table 3.3.6.1-1.

The Surveillances are also modified by a Note to indicate that when a channel is placed in an inoperable status solely for performance of required Surveillances, entry into associated Conditions and Required Actions may be delayed for up to 6 hours provided the associated Function maintains trip capability. Upon completion of the Surveillance,

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

1. Reactor Vessel Water Level - Low Low, Level 2

Low reactor pressure vessel (RPV) water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. An isolation of the secondary containment and actuation of the SGT System are initiated in order to minimize the potential of an offsite dose release. The Reactor Vessel Water Level - Low Low, Level 2 Function is one of the Functions assumed to be OPERABLE and capable of providing isolation and initiation signals. The isolation and initiation of systems on Reactor Vessel Water Level - Low Low, Level 2 support actions to ensure that any offsite releases are within the limits calculated in the safety analysis.

Reactor Vessel Water Level - Low Low, Level 2 signals are initiated from level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels of Reactor Vessel Water Level - Low Low, Level 2 Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Reactor Vessel Water Level - Low Low, Level 2 Allowable Value was chosen to be the same as the High Pressure Core Spray (HPCS)/Reactor Core Isolation Cooling (RCIC) Reactor Vessel Water Level - Low Low, Level 2 Allowable Value (LCO 3.3.5.1, "Emergency Core Cooling System (ECCS) Instrumentation," and LCO 3.3.5.3~~2~~, "Reactor Core Isolation Cooling (RCIC) System Actuation"), since this could indicate the capability to cool the fuel is being threatened.

The Reactor Vessel Water Level - Low Low, Level 2 Function is required to be OPERABLE in MODES 1, 2, and 3 where considerable energy exists in the Reactor Coolant System (RCS); thus, there is a probability of pipe breaks resulting in significant releases of radioactive steam and gas. In MODES 4 and 5, the probability and consequences of these events are low due to the RCS pressure and temperature limitations of these MODES; thus, this Function is not required. ~~In addition, the Function is also required to be OPERABLE during operations with a potential for draining the reactor vessel (OPDRVs) because the capability of isolating potential sources of leakage must be provided to ensure that offsite dose limits are not exceeded if core damage occurs.~~

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

channels of Fuel Handling Area Ventilation Exhaust Radiation - High High Function and four channels of Fuel Handling Area Pool Sweep Exhaust Radiation - High High Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Allowable Values are chosen to promptly detect gross failure of the fuel cladding.

The Exhaust Radiation - High High Functions are required to be OPERABLE in MODES 1, 2, and 3 where considerable energy exists; thus, there is a probability of pipe breaks resulting in significant releases of radioactive steam and gas. In MODES 4 and 5, the probability and consequences of these events are low due to the RCS pressure and temperature limitations of these MODES; thus, these Functions are not required. In addition, the Functions are required to be OPERABLE during ~~OPDRVs and~~ movement of [recently] irradiated fuel assemblies in the primary or secondary containment because the capability of detecting radiation releases due to fuel failures (due to ~~fuel uncovery or~~ dropped fuel assemblies) must be provided to ensure that offsite dose limits are not exceeded. [Due to radioactive decay, this Function is only required to isolate secondary containment during fuel handling accidents involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [x] days).]

5. Manual Initiation

The Manual Initiation push button channels introduce signals into the secondary containment isolation logic that are redundant to the automatic protective instrumentation channels, and provide manual isolation capability. There is no specific FSAR safety analysis that takes credit for this Function. It is retained for the overall redundancy and diversity of the secondary containment isolation instrumentation as required by the NRC approved licensing basis.

There are four push buttons for the logic, two manual initiation push buttons per trip system. There is no Allowable Value for this Function since the channels are mechanically actuated based solely on the position of the push buttons.

Four channels of the Manual Initiation Function are available and are required to be OPERABLE in MODES 1, 2, and 3 and during ~~OPDRVs and~~ movement of [recently] irradiated fuel assemblies in the secondary containment, since these are the MODES and other specified conditions in which the Secondary Containment Isolation automatic Functions are required to be OPERABLE.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

1. Reactor Vessel Water Level - Low Low, Level 2

Low reactor pressure vessel (RPV) water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. An isolation of the secondary containment and actuation of the SGT System are initiated in order to minimize the potential of an offsite dose release. The Reactor Vessel Water Level - Low Low, Level 2 Function is one of the Functions assumed to be OPERABLE and capable of providing isolation and initiation signals. The isolation and initiation of systems on Reactor Vessel Water Level - Low Low, Level 2 support actions to ensure that any offsite releases are within the limits calculated in the safety analysis.

Reactor Vessel Water Level - Low Low, Level 2 signals are initiated from level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels of Reactor Vessel Water Level - Low Low, Level 2 Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Reactor Vessel Water Level - Low Low, Level 2 Allowable Value was chosen to be the same as the High Pressure Core Spray (HPCS)/Reactor Core Isolation Cooling (RCIC) Reactor Vessel Water Level - Low Low, Level 2 Allowable Value (LCO 3.3.5.1, "Emergency Core Cooling System (ECCS) Instrumentation," and LCO 3.3.5.3~~2~~, "Reactor Core Isolation Cooling (RCIC) System Actuation"), since this could indicate the capability to cool the fuel is being threatened.

The Reactor Vessel Water Level - Low Low, Level 2 Function is required to be OPERABLE in MODES 1, 2, and 3 where considerable energy exists in the Reactor Coolant System (RCS); thus, there is a probability of pipe breaks resulting in significant releases of radioactive steam and gas. In MODES 4 and 5, the probability and consequences of these events are low due to the RCS pressure and temperature limitations of these MODES; thus, this Function is not required. ~~In addition, the Function is also required to be OPERABLE during operations with a potential for draining the reactor vessel (OPDRVs) because the capability of isolating potential sources of leakage must be provided to ensure that offsite dose limits are not exceeded if core damage occurs.~~

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

channels of Fuel Handling Area Ventilation Exhaust Radiation - High High Function and four channels of Fuel Handling Area Pool Sweep Exhaust Radiation - High High Function are available and are required to be OPERABLE to ensure that no single instrument failure can preclude the isolation function.

The Allowable Values are chosen to promptly detect gross failure of the fuel cladding.

The Exhaust Radiation - High High Functions are required to be OPERABLE in MODES 1, 2, and 3 where considerable energy exists; thus, there is a probability of pipe breaks resulting in significant releases of radioactive steam and gas. In MODES 4 and 5, the probability and consequences of these events are low due to the RCS pressure and temperature limitations of these MODES; thus, these Functions are not required. In addition, the Functions are required to be OPERABLE during ~~OPDRVs and~~ movement of [recently] irradiated fuel assemblies in the primary or secondary containment because the capability of detecting radiation releases due to fuel failures (due to ~~fuel uncovery or~~ dropped fuel assemblies) must be provided to ensure that offsite dose limits are not exceeded. [Due to radioactive decay, this Function is only required to isolate secondary containment during fuel handling accidents involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [x] days).]

5. Manual Initiation

The Manual Initiation push button channels introduce signals into the secondary containment isolation logic that are redundant to the automatic protective instrumentation channels, and provide manual isolation capability. There is no specific FSAR safety analysis that takes credit for this Function. It is retained for the overall redundancy and diversity of the secondary containment isolation instrumentation as required by the NRC approved licensing basis.

There are four push buttons for the logic, two manual initiation push buttons per trip system. There is no Allowable Value for this Function since the channels are mechanically actuated based solely on the position of the push buttons.

Four channels of the Manual Initiation Function are available and are required to be OPERABLE in MODES 1, 2, and 3 and during ~~OPDRVs and~~ movement of [recently] irradiated fuel assemblies in the secondary containment, since these are the MODES and other specified conditions in which the Secondary Containment Isolation automatic Functions are required to be OPERABLE.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The OPERABILITY of the [CRFA] System instrumentation is dependent upon the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.7.1-1. Each Function must have a required number of OPERABLE channels, with their setpoints within the specified Allowable Values, where appropriate. A channel is inoperable if its actual trip setpoint is not within its required Allowable Value. The actual setpoint is calibrated consistent with applicable setpoint methodology assumptions.

Allowable Values are specified for each [CRFA] System Function specified in the Table. Nominal trip setpoints are specified in the setpoint calculations. These nominal setpoints are selected to ensure that the setpoints do not exceed the Allowable Value between successive CHANNEL CALIBRATIONS. Operation with a trip setpoint that is less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable.

Trip setpoints are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state. The analytic limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytic limits, corrected for calibration, process, and some of the instrument errors. The trip setpoints are then determined, accounting for the remaining instrument errors (e.g., drift). The trip setpoints derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

<u>1. Reactor Vessel Water Level - Low Low, Level 2</u>

Low reactor pressure vessel (RPV) water level indicates that the capability to cool the fuel may be threatened. A low reactor vessel water level could indicate a LOCA, and will automatically initiate the [CRFA] System, since this could be a precursor to a potential radiation release and subsequent radiation exposure to control room personnel.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Reactor Vessel Water Level - Low Low, Level 2 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels of Reactor Vessel Water Level - Low Low, Level 2 Function are available (two channels per trip system) and are required to be OPERABLE to ensure that no single instrument failure can preclude [CRFA] System initiation. The Allowable Value for the Reactor Vessel Water Level - Low Low, Level 2 is chosen to be the same as the Secondary Containment Isolation Reactor Vessel Water Level - Low Low, Level 2 Allowable Value (LCO 3.3.6.2).

The Reactor Vessel Water Level - Low Low, Level 2 Function is required to be OPERABLE in MODES 1, 2, and 3~~, and during operations with a potential for draining the reactor vessel (OPDRVs),~~ to ensure that the control room personnel are protected. In MODES 4 and 5, ~~at times other than during OPDRVs, the probability of a vessel draindown event releasing radioactive material into the environment, or of a LOCA, is minimal. Therefore this Function is not required. In addition,~~ the Control Room Ventilation Radiation Monitor Function provides adequate protection.

2. Drywell Pressure - High

High pressure in the drywell could indicate a break in the reactor coolant pressure boundary (RCPB). A high drywell pressure signal could indicate a LOCA and will automatically initiate the [CRFA] System, since this could be a precursor to a potential radiation release and subsequent radiation exposure to control room personnel.

Drywell Pressure - High signals are initiated from four pressure transmitters that sense drywell pressure. Four channels of Drywell Pressure - High Function are available (two channels per trip system) and are required to be OPERABLE to ensure that no single instrument failure can preclude [CRFA] System initiation.

The Drywell Pressure - High Allowable Value was chosen to be the same as the Secondary Containment Isolation Drywell Pressure - High Allowable Value (LCO 3.3.6.2).

The Drywell Pressure - High Function is required to be OPERABLE in MODES 1, 2, and 3 to ensure that control room personnel are protected during a LOCA. In MODES 4 and 5, the Drywell Pressure - High Function is not required since there is insufficient energy in the reactor to pressurize the drywell to the Drywell Pressure - High setpoint.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

3. Control Room Ventilation Radiation Monitors

The Control Room Ventilation Radiation Monitors measure radiation levels exterior to the inlet ducting of the MCR. A high radiation level may pose a threat to MCR personnel; thus, a detector indicating this condition automatically signals initiation of the [CRFA] System.

The Control Room Ventilation Radiation Monitors Function consists of four independent monitors. Four channels of Control Room Ventilation Radiation Monitors are available and are required to be OPERABLE to ensure that no single instrument failure can preclude [CRFA] System initiation. The Allowable Value was selected to ensure protection of the control room personnel.

The Control Room Ventilation Radiation Monitors Function is required to be OPERABLE in MODES 1, 2, and 3, and during ~~OPDRVs and~~ movement of [recently] irradiated fuel in the secondary containment to ensure that control room personnel are protected during a LOCA~~,~~ *or a* fuel handling event [involving handling recently irradiated fuel]~~, or a vessel draindown event~~. During MODES 4 and 5, when these specified conditions are not in progress~~ (e.g., OPDRVs)~~, the probability of a LOCA is low; thus, the Function is not required. [Also due to radioactive decay, this Function is only required to initiate the [CRFA] System during fuel handling accidents involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [x] days).]

ACTIONS

----------------------------------REVIEWER'S NOTE----------------------------------
Certain LCO Completion Times are based on approved topical reports. In order for a licensee to use these times, the licensee must justify the Completion Times as required by the staff Safety Evaluation Report (SER) for the topical report.

A Note has been provided to modify the ACTIONS related to [CRFA] System instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition discovered to be inoperable or not within limits will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable [CRFA] System instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable [CRFA] System instrumentation channel.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The OPERABILITY of the [CRFA] System instrumentation is dependent upon the OPERABILITY of the individual instrumentation channel Functions specified in Table 3.3.7.1-1. Each Function must have a required number of OPERABLE channels, with their setpoints within the specified Allowable Values, where appropriate. A channel is inoperable if its actual trip setpoint is not within its required Allowable Value. The actual setpoint is calibrated consistent with the Setpoint Control Program.

Allowable Values and nominal trip setpoints are specified for each [CRFA] System Function specified in the Setpoint Control Program (SCP). These nominal setpoints are selected to ensure that the setpoints do not exceed the Allowable Value between successive CHANNEL CALIBRATIONS. Operation with a trip setpoint that is less conservative than the nominal trip setpoint, but within its Allowable Value, is acceptable.

Trip setpoints are those predetermined values of output at which an action should take place. The setpoints are compared to the actual process parameter (e.g., reactor vessel water level), and when the measured output value of the process parameter exceeds the setpoint, the associated device (e.g., trip unit) changes state. The analytic limits are derived from the limiting values of the process parameters obtained from the safety analysis. The Allowable Values are derived from the analytic limits, corrected for calibration, process, and some of the instrument errors. The trip setpoints are then determined, accounting for the remaining instrument errors (e.g., drift). The trip setpoints derived in this manner provide adequate protection because instrumentation uncertainties, process effects, calibration tolerances, instrument drift, and severe environment errors (for channels that must function in harsh environments as defined by 10 CFR 50.49) are accounted for.

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

<u>1. Reactor Vessel Water Level - Low Low, Level 2</u>

Low reactor pressure vessel (RPV) water level indicates that the capability to cool the fuel may be threatened. A low reactor vessel water level could indicate a LOCA, and will automatically initiate the [CRFA] System, since this could be a precursor to a potential radiation release and subsequent radiation exposure to control room personnel.

Reactor Vessel Water Level - Low Low, Level 2 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels of Reactor

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Vessel Water Level - Low Low, Level 2 Function are available (two channels per trip system) and are required to be OPERABLE to ensure that no single instrument failure can preclude [CRFA] System initiation. The Allowable Value for the Reactor Vessel Water Level - Low Low, Level 2 is chosen to be the same as the Secondary Containment Isolation Reactor Vessel Water Level - Low Low, Level 2 Allowable Value (LCO 3.3.6.2).

The Reactor Vessel Water Level - Low Low, Level 2 Function is required to be OPERABLE in MODES 1, 2, and 3~~, and during operations with a potential for draining the reactor vessel (OPDRVs),~~ to ensure that the control room personnel are protected. In MODES 4 and 5~~, at times other than during OPDRVs, the probability of a vessel draindown event releasing radioactive material into the environment, or of a LOCA, is minimal. Therefore this Function is not required. In addition,~~ the Control Room Ventilation Radiation Monitor Function provides adequate protection.

2. Drywell Pressure - High

High pressure in the drywell could indicate a break in the reactor coolant pressure boundary (RCPB). A high drywell pressure signal could indicate a LOCA and will automatically initiate the [CRFA] System, since this could be a precursor to a potential radiation release and subsequent radiation exposure to control room personnel.

Drywell Pressure - High signals are initiated from four pressure transmitters that sense drywell pressure. Four channels of Drywell Pressure - High Function are available (two channels per trip system) and are required to be OPERABLE to ensure that no single instrument failure can preclude [CRFA] System initiation.

The Drywell Pressure - High Allowable Value was chosen to be the same as the Secondary Containment Isolation Drywell Pressure - High Allowable Value (LCO 3.3.6.2).

The Drywell Pressure - High Function is required to be OPERABLE in MODES 1, 2, and 3 to ensure that control room personnel are protected during a LOCA. In MODES 4 and 5, the Drywell Pressure - High Function is not required since there is insufficient energy in the reactor to pressurize the drywell to the Drywell Pressure - High setpoint.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

3. Control Room Ventilation Radiation Monitors

The Control Room Ventilation Radiation Monitors measure radiation levels exterior to the inlet ducting of the MCR. A high radiation level may pose a threat to MCR personnel; thus, a detector indicating this condition automatically signals initiation of the [CRFA] System.

The Control Room Ventilation Radiation Monitors Function consists of four independent monitors. Four channels of Control Room Ventilation Radiation Monitors are available and are required to be OPERABLE to ensure that no single instrument failure can preclude [CRFA] System initiation. The Allowable Value was selected to ensure protection of the control room personnel.

The Control Room Ventilation Radiation Monitors Function is required to be OPERABLE in MODES 1, 2, and 3, and during ~~OPDRVs and~~ movement of [recently] irradiated fuel in the secondary containment to ensure that control room personnel are protected during a LOCA~~,~~ *or a* fuel handling event [involving handling recently irradiated fuel]~~, or a vessel draindown event~~. During MODES 4 and 5, when these specified conditions are not in progress ~~(e.g., OPDRVs)~~, the probability of a LOCA is low; thus, the Function is not required. [Also due to radioactive decay, this Function is only required to initiate the [CRFA] System during fuel handling accidents involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [x] days).]

ACTIONS

----------------------------------REVIEWER'S NOTE----------------------------------
Certain LCO Completion Times are based on approved topical reports. In order for a licensee to use these times, the licensee must justify the Completion Times as required by the staff Safety Evaluation Report (SER) for the topical report.

A Note has been provided to modify the ACTIONS related to [CRFA] System instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition discovered to be inoperable or not within limits will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable [CRFA] System instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable [CRFA] System instrumentation channel.

B 3.~~5~~ *5* EMERGENCY CORE COOLING SYSTEMS (ECCS)*, RPV WATER INVENTORY CONTROL, AND* ~~AND~~ REACTOR CORE ISOLATION COOLING ~~SYSTEM~~ (RCIC) *SYSTEM* ~~*, AND RPV WATER INVENTORY CONTROL*~~

B 3.5.1 ECCS - Operating

BASES

BACKGROUND

The ECCS is designed, in conjunction with the primary and secondary containment, to limit the release of radioactive materials to the environment following a loss of coolant accident (LOCA). The ECCS uses two independent methods (flooding and spraying) to cool the core during a LOCA. The ECCS network is composed of the High Pressure Core Spray (HPCS) System, the Low Pressure Core Spray (LPCS) System, and the low pressure coolant injection (LPCI) mode of the Residual Heat Removal (RHR) System. The ECCS also consists of the Automatic Depressurization System (ADS). The suppression pool provides the required source of water for the ECCS. Although no credit is taken in the safety analyses for the condensate storage tank (CST), it is capable of providing a source of water for the HPCS System.

On receipt of an initiation signal, ECCS pumps automatically start; simultaneously the system aligns, and the pumps inject water, taken either from the CST or suppression pool, into the Reactor Coolant System (RCS) as RCS pressure is overcome by the discharge pressure of the ECCS pumps. Although the system is initiated, ADS action is delayed, allowing the operator to interrupt the timed sequence if the system is not needed. The HPCS pump discharge pressure almost immediately exceeds that of the RCS, and the pump injects coolant into the spray sparger above the core. If the break is small, HPCS will maintain coolant inventory, as well as vessel level, while the RCS is still pressurized. If HPCS fails, it is backed up by ADS in combination with LPCI and LPCS. In this event, the ADS timed sequence would be allowed to time out and open the selected safety/relief valves (S/RVs), depressurizing the RCS and allowing the LPCI and LPCS to overcome RCS pressure and inject coolant into the vessel. If the break is large, RCS pressure initially drops rapidly, and the LPCI and LPCS systems cool the core.

Water from the break returns to the suppression pool where it is used again and again. Water in the suppression pool is circulated through a heat exchanger cooled by the Standby Service Water (SWS) System. Depending on the location and size of the break, portions of the ECCS may be ineffective; however, the overall design is effective in cooling the core regardless of the size or location of the piping break. Although no credit is taken in the safety analysis for the RCIC System, it performs a similar function as HPCS but has reduced makeup capability. Nevertheless, it will maintain inventory and cool the core, while the RCS is still pressurized, following a reactor pressure vessel (RPV) isolation.

BASES

APPLICABLE SAFETY ANALYSES (continued)

The limiting single failures are discussed in Reference 11. For a large break LOCA, failure of ECCS subsystems in Division 1 (LPCS and LPCI-A) or Division 2 (LPCI-B and LPCI-C) due to failure of its associated diesel generator is, in general, the most severe failure. For a small break LOCA, HPCS System failure is the most severe failure. One ADS valve failure is analyzed as a limiting single failure for events requiring ADS operation. The remaining OPERABLE ECCS subsystems provide the capability to adequately cool the core and prevent excessive fuel damage.

The ECCS satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

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

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

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

APPLICABILITY

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

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS), RPV WATER INVENTORY CONTROL, AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM ~~(RCIC)~~
~~B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS), AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM, AND RPV WATER INVENTORY CONTROL~~

B 3.5.2 *Reactor Pressure Vessel (RPV) Water Inventory Control*~~ECCS - Shutdown~~

BASES

BACKGROUND

The RPV contains penetrations below the top of the active fuel (TAF) that have the potential to drain the reactor coolant inventory to below the TAF. If the water level should drop below the TAF, the ability to remove decay heat is reduced, which could lead to elevated cladding temperatures and clad perforation. Safety Limit 2.1.1.3 requires the RPV water level to be above the top of the active irradiated fuel at all times to prevent such elevated cladding temperatures.~~A description of the High Pressure Core Spray (HPCS) System, Low Pressure Core Spray (LPCS) System, and low pressure coolant injection (LPCI) mode of the Residual Heat Removal (RHR) System is provided in the Bases for LCO 3.5.1, "ECCS - Operating."~~

APPLICABLE SAFETY ANALYSES

With the unit in MODE 4 or 5, RPV water inventory control is not ~~The ECCS performance is evaluated for the entire spectrum of break~~ *required to mitigate any events or accidents evaluated in the safety* ~~sizes for a postulated loss of coolant accident (LOCA). The long term~~ *analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material to the environment should an unexpected draining event occur.*

~~cooling analysis following a design basis LOCA (Ref. 1) demonstrates that only one low pressure ECCS injection/spray subsystem is required, post LOCA, to maintain adequate reactor vessel water level in the event of an inadvertent vessel draindown.~~ *A double-ended guillotine break of the Reactor Coolant System (RCS) is not postulated in MODES 4 and 5 due to the reduced RCS pressure, reduced piping stresses, and ductile piping systems. Instead, an event is considered in which single operator error or initiating event allows draining of the RPV water inventory through a single penetration flow path with the highest flow rate, or the sum of the drain rates through multiple penetration flow paths susceptible to a common mode failure (e.g., seismic event, loss of normal power, single human error). It is assumed, based on engineering judgment, that while in MODES 4 and 5, one low pressure ECCS injection/spray subsystem can maintain adequate reactor vessel water level.*~~It is reasonable to assume, based on engineering judgment, that while in MODES 4 and 5, one low pressure ECCS injection/spray subsystem can maintain adequate reactor vessel water level. To provide redundancy, a minimum of two low pressure ECCS injection/spray subsystems are required to be OPERABLE in MODES 4 and 5.~~

As discussed in References 1, 2, 3, 4, and 5, operating experience has shown RPV water inventory to be significant to public health and safety. Therefore, RPV Water Inventory Control satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii). ~~The ECCS satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).~~

LCO

The RPV water level must be controlled in MODES 4 and 5 to ensure that if an unexpected draining event should occur, the reactor coolant water level remains above the top of the active irradiated fuel as required by Safety Limit 2.1.1.3.

BASES

LCO (continued)

The Limiting Condition for Operation (LCO) requires the DRAIN TIME of RPV water inventory to the TAF to be ≥ 36 hours. A DRAIN TIME of 36 hours is considered reasonable to identify and initiate action to mitigate unexpected draining of reactor coolant. An event that could cause loss of RPV water inventory and result in the RPV water level reaching the TAF in greater than 36 hours does not represent a significant challenge to Safety Limit 2.1.1.3 and can be managed as part of normal plant operation.

One~~Two~~ ECCS injection/spray subsystem~~s~~ is ~~are~~ required to be OPERABLE and capable of being manually started to provide defense-in-depth should an unexpected draining event occur. A ~~The~~ ECCS injection/spray subsystem~~s~~ is ~~are~~ defined as either one of t~~t~~he three Low Pressure Coolant Injection (LPCI) subsystems, one ~~the~~ Low Pressure Core Spray (LPCS) System~~System~~, or ~~and~~ one ~~the~~ High Pressure Core Spray (HPCS) System~~System~~. The LPCI~~S~~ subsystems~~System~~ and the ~~each~~ LPCS~~I~~ System ~~subsystem~~ consist of one motor driven pump, piping, and valves to transfer water from the suppression pool to the RPV. The HPCS System consists of one motor driven pump, piping, and valves to transfer water from the suppression pool or condensate storage tank (CST) to the RPV.

The LCO is modified by a Note which allows a required ~~As noted, one~~ LPCI subsystem (A or B) to ~~may~~ be considered OPERABLE during alignment and operation for decay heat removal, if capable of being manually realigned (remote or local) to the LPCI mode and is not otherwise inoperable. Alignment and operation for decay heat removal includes when the required RHR pump is not operating or when the system is realigned from or to the RHR shutdown cooling mode. This allowance is necessary since the RHR System may be required to operate in the shutdown cooling mode to remove decay heat and sensible heat from the reactor. Because of the restrictions on DRAIN TIME, sufficient time will be available following an unexpected draining event to manually align and initiate LPCI subsystem operation to maintain RPV water inventory prior to the RPV water level reaching the TAF.~~low pressure and low temperature conditions in MODES 4 and 5, sufficient time will be available to manually align and initiate LPCI subsystem operation to provide core cooling prior to postulated fuel uncovery.~~

~~BASES~~

APPLICABILITY

RPV water inventory control is required in MODES 4 and 5. Requirements on water inventory control in other MODES are contained in LCOs in Section 3.3, Instrumentation, and other LCOs in Section 3.5, ECCS, RCIC, and RPV Water Inventory Control. RPV water inventory control is required to protect Safety Limit 2.1.1.3 which is applicable whenever irradiated fuel is in the reactor vessel.

~~OPERABILITY of the ECCS injection/spray subsystems is required in MODES 4 and 5 to ensure adequate coolant inventory and sufficient heat removal capability for the irradiated fuel in the core in case of an inadvertent draindown of the vessel. Requirements for ECCS OPERABILITY during MODES 1, 2, and 3 are discussed in the Applicability section of the Bases for LCO 3.5.1. ECCS subsystems are not required to be OPERABLE during MODE 5 with the upper containment pool gate removed, and the water level maintained at ≥ 22 ft 8 inches above the RPV flange. This provides sufficient coolant inventory to allow operator action to terminate the inventory loss prior to fuel uncovery in case of an inadvertent draindown.~~

~~The Automatic Depressurization System is not required to be OPERABLE during MODES 4 and 5 because the RPV pressure is < 150 psig, and the LPCS, HPCS, and LPCI subsystems can provide core cooling without any depressurization of the primary system.~~

BASES

ACTIONS

A.1 and B.1

If ~~any~~ *the* ~~one~~ required ECCS injection/spray subsystem is inoperable, *it* ~~the required inoperable ECCS injection/spray subsystem~~ must be restored to OPERABLE status within 4 hours. In this Condition, *the LCO controls on DRAIN TIME minimize the possibility that an unexpected draining event could necessitate the use of the ECCS injection/spray subsystem, however the defense-in-depth provided by the ECCS injection/spray subsystem is lost.* ~~the remaining OPERABLE subsystem can provide sufficient RPV flooding capability to recover from an inadvertent vessel draindown. However, overall system reliability is reduced because a single failure in the remaining OPERABLE subsystem concurrent with a vessel draindown could result in the ECCS not being able to perform its intended function.~~ The 4 hour Completion Time for restoring the required ECCS injection/spray subsystem to OPERABLE status is based on engineering judgment that consider*s the LCO controls on DRAIN TIME* ~~ed the availability of one subsystem~~ and the low probability of *an unexpected draining* ~~a vessel draindown~~ event *that would result in loss of RPV water inventory*.

~~With~~ *If* the inoperable *ECCS injection/spray* subsystem *is* not restored to OPERABLE status within the required Completion Time, action must be initiated immediately to *establish a method of water injection capable of operating without offsite electrical power. The method of water injection includes the necessary instrumentation and controls, water sources, and pumps and valves needed to add water to the RPV or refueling cavity should an unexpected draining event occur. The method of water injection may be manually initiated and may consist of one or more systems or subsystems, and must be able to access water inventory capable of maintaining the RPV water level above the TAF for ≥ 36 hours. If recirculation of injected water would occur, it may be credited in determining the necessary water volume.*~~suspend operations with a potential for draining the reactor vessel (OPDRVs) to minimize the probability of a vessel draindown and the subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.~~

C.1, C.2, and C.3

With the DRAIN TIME less than 36 hours but greater than or equal to 8 hours, compensatory measures should be taken to ensure the ability to implement mitigating actions should an unexpected draining event occur. Should a draining event lower the reactor coolant level to below the TAF, there is potential for damage to the reactor fuel cladding and release of radioactive material. Additional actions are taken to ensure that radioactive material will be contained, diluted[, and processed] prior to being released to the environment.

The [secondary containment] provides a controlled volume in which fission products can be contained, diluted[, and processed] prior to release to the environment. Required Action C.1 requires verification of the capability to establish the [secondary containment] boundary in less than the DRAIN TIME. The required verification confirms actions to establish the [secondary containment] boundary are preplanned and necessary materials are available. [The [secondary containment] boundary is considered established when one Standby Gas Treatment (SGT) subsystem is capable of maintaining a negative pressure in the [secondary containment] with respect to the environment.]

BASES

ACTIONS (continued)

Verification that the [secondary containment] boundary can be established must be performed within 4 hours. The required verification is an administrative activity and does not require manipulation or testing of equipment. [Secondary containment] penetration flow paths form a part of the [secondary containment] boundary. Required Action C.2 requires verification of the capability to isolate each [secondary containment] penetration flow path in less than the DRAIN TIME. The required verification confirms actions to isolate the [secondary containment] penetration flow paths are preplanned and necessary materials are available. Power operated valves are not required to receive automatic isolation signals if they can be closed manually within the required time. Verification that the [secondary containment] penetration flow paths can be isolated must be performed within 4 hours. The required verification is an administrative activity and does not require manipulation or testing of equipment.

[One SGT subsystem is capable of maintaining the [secondary containment] at a negative pressure with respect to the environment and filter gaseous releases. Required Action C.3 requires verification of the capability to place one SGT subsystem in operation in less than the DRAIN TIME. The required verification confirms actions to place a SGT subsystem in operation are preplanned and necessary materials are available. Verification that a SGT subsystem can be placed in operation must be performed within 4 hours. The required verification is an administrative activity and does not require manipulation or testing of equipment.]

<u>D.1, D.2, D.3, and D.4</u>

With the DRAIN TIME less than 8 hours, mitigating actions are implemented in case an unexpected draining event should occur. Note that if the DRAIN TIME is less than 1 hour, Required Action E.1 is also applicable.

Required Action D.1 requires immediate action to establish an additional method of water injection augmenting the ECCS injection/spray subsystem required by the LCO. The additional method of water injection includes the necessary instrumentation and controls, water sources, and pumps and valves needed to add water to the RPV or refueling cavity should an unexpected draining event occur. The Note to Required Action D.1 states that either the ECCS injection/spray subsystem or the additional method of water injection must be capable of operating without offsite electrical power. The additional method of water injection may be manually initiated and may consist of one or more systems or ~~injection and the ECCS~~

BASES

ACTIONS (continued)

subsystems. The additional method of water injection must be able to access water inventory capable of being injected to maintain the RPV water level above the TAF for ≥ 36 hours. The additional method of water injection and the ECCS injection/spray subsystem may share all or part of the same water sources. If recirculation of injected water would occur, it may be credited in determining the required water volume.

Should a draining event lower the reactor coolant level to below the TAF, there is potential for damage to the reactor fuel cladding and release of radioactive material. Additional actions are taken to ensure that radioactive material will be contained, diluted, and processed prior to being released to the environment.
The [secondary containment] provides a control volume in~~to~~ which fission products can be contained, diluted[, and processed] prior to release to the environment. Required Action D.2 requires that actions be immediately initiated to establish the [secondary containment] boundary. [With the [secondary containment] boundary established, one SGT subsystem is capable of maintaining a negative pressure in the [secondary containment] with respect to the environment].

The [secondary containment] penetrations form a part of the [secondary containment] boundary. Required Action D.3 requires that actions be immediately initiated to verify that each [secondary containment] penetration flow path is isolated or to verify that it can be manually isolated from the control room.

[One SGT subsystem is capable of maintaining the [secondary containment] at a negative pressure with respect to the environment and filter gaseous releases. Required Action D.4 requires that actions be immediately initiated to verify that at least one SGT subsystem is capable of being placed in operation. The required verification is an administrative activity and does not require manipulation or testing of equipment.]

<u>E.1</u>

If the Required Actions and associated Completion times of Conditions C or D are not met or if the DRAIN TIME is less than 1 hour, actions must be initiated immediately to restore the DRAIN TIME to ≥ 36 hours. In this condition, there may be insufficient time to respond to an unexpected draining event to prevent the RPV water inventory from reaching the TAF. Note that Required Actions D.1, D.2, D.3, and D.4 are also applicable when DRAIN TIME is less than 1 hour.

BASES

~~*ACTIONS (continued)*~~

~~C.1, C.2, D.1, D.2, and D.3~~

~~If both of the required ECCS injection/spray subsystems are inoperable, all coolant inventory makeup capability may be unavailable. Therefore, actions must be initiated immediately to suspend OPDRVs in order to minimize the probability of a vessel draindown and the subsequent potential for fission product release. Actions must continue until OPDRVs are suspended. One ECCS injection/spray subsystem must also be restored to OPERABLE status within 4 hours.~~

~~If at least one ECCS injection/spray subsystem is not restored to OPERABLE status within the 4 hour Completion Time, additional actions are required to minimize any potential fission product release to the environment. This includes ensuring secondary containment is OPERABLE; one standby gas treatment subsystem is OPERABLE; and secondary containment isolation capability (i.e., one isolation valve and associated instrumentation are OPERABLE or other acceptable administrative controls to assure isolation capability) in each secondary containment penetration flow path not isolated that is assumed to be isolated to mitigate radioactivity releases. This may be performed by an administrative check, by examining logs or other information, to determine if the components are out of service for maintenance or other reasons. It is not necessary to perform the Surveillances needed to demonstrate OPERABILITY of the components. If, however, any required component is inoperable, then it must be restored to OPERABLE status. In this case, the Surveillances may need to be performed to restore the component to OPERABLE status. Actions must continue until all required components are OPERABLE.~~

~~The 4 hour Completion Time to restore at least one ECCS injection/spray subsystem to OPERABLE status ensures that prompt action will be taken to provide the required cooling capacity or to initiate actions to place the plant in a condition that minimizes any potential fission product release to the environment.~~

SURVEILLANCE REQUIREMENTS

SR ~~-~~3.5.2.1~~ and SR 3.5.2.2~~

This Surveillance verifies that the DRAIN TIME of RPV water inventory to the TAF is ≥ 36 hours. The period of 36 hours is considered reasonable to identify and initiate action to mitigate draining of reactor coolant. Loss of RPV water inventory that would result in the RPV water level reaching the TAF in greater than 36 hours does not represent a significant challenge to Safety Limit 2.1.1.3 and can be managed as part of normal plant operation.

The definition of DRAIN TIME states that realistic cross-sectional areas and drain rates are used in the calculation. A realistic drain rate may be determined using a single, step-wise, or integrated calculation considering the changing RPV water level during a draining event. For a Control Rod RPV penetration flow path with the Control Rod Drive Mechanism removed and not replaced with a blank flange, the realistic cross-sectional area is based on the control rod blade seated in the control rod guide tube. If the control rod blade will be raised from the penetration to adjust or verify seating of the blade, the exposed cross-sectional area of the RPV penetration flow path is used.

The definition of DRAIN TIME excludes from the calculation those penetration flow paths connected to an intact closed system, or isolated by manual or automatic valves that are locked, sealed, or otherwise secured in the closed position, blank flanges, or other devices that prevent flow of reactor coolant through the penetration flow paths. A blank flange or other bolted device must be connected with a sufficient number of bolts to prevent draining in the event of an Operating Basis Earthquake. Normal or expected leakage from closed systems or past isolation devices is permitted. Determination that a system is intact and closed or isolated must consider the status of branch lines and ongoing plant maintenance and testing activities.

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Residual Heat Removal (RHR) Shutdown Cooling System is only considered an intact closed system when misalignment issues (Reference 6) have been precluded by functional valve interlocks or by isolation devices, such that redirection of RPV water out of an RHR subsystem is precluded. Further, RHR Shutdown Cooling System is only considered an intact closed system if its controls have not been transferred to Remote Shutdown, which disables the interlocks and isolation signals.

The exclusion of penetration flow paths from the determination of DRAIN TIME must consider the potential effects of a single operator error or initiating event on items supporting maintenance and testing (rigging, scaffolding, temporary shielding, piping plugs, snubber removal, freeze seals, etc.). If failure of such items could result and would cause a draining event from a closed system or between the RPV and the isolation device, the penetration flow path may not be excluded from the DRAIN TIME calculation.

Surveillance Requirement 3.0.1 requires SRs to be met between performances. Therefore, any changes in plant conditions that would change the DRAIN TIME requires that a new DRAIN TIME be determined.

[The Frequency of 12 hours is sufficient in view of indications of RPV water level available to the operator .

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]

SR 3.5.2.2 and SR 3.5.2.3

The minimum water level of [12.67 ft] required for the suppression pool is periodically verified to ensure that the suppression pool will provide adequate net positive suction head (NPSH) for the ECCS pump~~s~~, recirculation volume, and vortex prevention. With the suppression pool ~~water level less than the required limit, all *the required* ECCS~~

~~injection/spray subsystem *i*s are inoperable unless they are aligned to an OPERABLE CST.~~

BASES

SURVEILLANCE REQUIREMENTS (continued)

water level less than the required limit, the required ECCS injection/spray subsystem is inoperable unless aligned to an OPERABLE CST.

When the suppression pool level is < [12.67 ft], the HPCS System is considered OPERABLE only if it can take suction from the CST and the CST water level is sufficient to provide the required NPSH for the HPCS pump. Therefore, a verification that either the suppression pool water level is ≥ [12.67 ft] or the HPCS System is aligned to take suction from the CST and the CST contains ≥ [170,000] gallons of water, equivalent to *[*18*]* ft, ensures that the HPCS System can supply makeup water to the RPV.

[The 12 hour Frequency of these SRs was developed considering operating experience related to suppression pool and CST water level variations~~ and instrument drift during the applicable MODES~~. Furthermore, the 12 hour Frequency is considered adequate in view of other indications *available* in the control room, including alarms, to alert the operator to an abnormal suppression pool or CST water level condition.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

SR 3.5.2.4

The flow path piping has the potential to develop voids and pockets of entrained air. Maintaining the pump discharge lines of the required ECCS injection/spray subsystems full of water ensures that the ECCS subsystem will perform properly. This may also prevent a water hammer following an ECCS initiation signal. One acceptable method of ensuring that the lines are full is to vent at the high points. [The 31 day Frequency is based on the gradual nature of void buildup in the ECCS piping, the procedural controls governing system operation, and operating experience.

OR

~~*The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.*~~

~~are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves. [The 31 day Frequency is appropriate because the valves are operated under procedural control and the probability of their being mispositioned during this time period is low.~~

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]

SR 3.5.2.*5*~~4~~

Verifying the correct alignment for manual, power operated, and automatic valves in the *required* ECCS *subsystem* flow path~~s~~ provides assurance that the proper flow paths will *be available* ~~exist~~ for ECCS operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position since these valves were verified to be in the correct position prior to locking, sealing, or securing. A valve that receives an initiation signal is allowed to be in a nonaccident position provided the valve will automatically reposition in the proper stroke time. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of potentially being mispositioned *are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves.* *[The 31 day Frequency is appropriate because the valves are operated under procedural control and the probability of their being mispositioned during this time period is low.*

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
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BASES

SURVEILLANCE REQUIREMENTS (continued)

~~SR 3.5.2.6~~

~~Performance of a CHANNEL FUNCTIONAL TEST demonstrates that instrumentation credited for automatically isolating penetration flow paths will function properly when a simulated or actual signal indicative of a low RPV water level is injected into the logic. A successful test of the required contact(s) of a channel relay may be performed by the verification of the change of state of a single contact of the relay. This clarifies what is an acceptable CHANNEL FUNCTIONAL TEST of a relay. This is acceptable because all of the other required contacts of the relay are verified by other Technical Specifications and non-Technical Specifications tests at least once per refueling interval with applicable extensions. The CHANNEL FUNCTIONAL TEST may be performed by any series of sequential, overlapping, or total channel steps so that the entire channel is tested.~~

~~[The Frequency of 92 days considers instrument reliability, and operating experience has shown it proper for detecting degradation.~~

~~OR~~

~~The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

~~-----------------------------------REVIEWER'S NOTE-----------------------------------~~
~~Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.~~
~~---]~~

SR 3.5.2.6

Verifying that the required ECCS injection/spray subsystem can be manually started and operate for at least 10 minutes demonstrates that the subsystem is available to mitigate a draining event. Testing the ECCS injection/spray subsystem through the recirculation line is necessary to avoid overfilling the refueling cavity. The minimum operating time of 10 minutes was based on engineering judgement. [The performance frequency of 92 days is consistent with similar at-power testing required by SR 3.5.1.7.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

SR 3.5.2.7

Verifying that each valve credited for automatically isolating a penetration flow path actuates to the isolation position on an actual or simulated RPV water level isolation signal is required to prevent RPV water inventory from dropping below the TAF should an unexpected draining event occur. [The [18] month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown these components usually pass the Surveillance when performed at the [18] month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

~~BASES~~

~~SURVEILLANCE REQUIREMENTS (continued)~~

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]

SR 3.5.2.8

The required ECCS subsystem is required to actuate on a manual initiation signal. This Surveillance verifies that a manual initiation signal will cause the required LCPI subsystem, LCPS System, or HPCS System to start and operate as designed, including pump startup and actuation of all automatic valves to their required positions.

[The [18] month Frequency is based on the need to perform the Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power.

Operating experience has shown that these components usually pass the SR when performed at the [18] month Frequency, which is based on the refueling cycle. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]
This SR is modified by a Note that excludes vessel injection/spray during the Surveillance. Since all active components are testable and full flow can be demonstrated by recirculation through the test line, coolant injection into the RPV is not required during the Surveillance.

~~*OR*~~

~~*The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.*~~

~~*-----------------------------------REVIEWER'S NOTE-----------------------------------*~~
~~*Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.*~~
~~*--]*~~

~~SR 3.5.2.3, SR 3.5.2.5, and SR 3.5.2.6~~

~~The Bases provided for SR 3.5.1.1, SR 3.5.1.4, and SR 3.5.1.5 are applicable to SR 3.5.2.3, SR 3.5.2.5, and SR 3.5.2.6, respectively.~~

BASES

REFERENCES

1. ~~FSAR, Section [6.3.3.4].~~*Information Notice 84-81 "Inadvertent Reduction in Primary Coolant Inventory in Boiling Water Reactors During Shutdown and Startup," November 1984.*

2. *Information Notice 86-74, "Reduction of Reactor Coolant Inventory Because of Misalignment of RHR Valves," August 1986.*

3. *Generic Letter 92-04, "Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs Pursuant to 10 CFR 50.54(F), " August 1992.*

4. *NRC Bulletin 93-03, "Resolution of Issues Related to Reactor Vessel Water Level Instrumentation in BWRs," May 1993.*

5. *Information Notice 94-52, "Inadvertent Containment Spray and Reactor Vessel Draindown at Millstone 1," July 1994.*

6. *General Electric Service Information Letter No. 388, "RHR Valve Misalignment During Shutdown Cooling Operation for BWR 3/4/5/6," February 1983.*

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS), *RPV WATER INVENTORY CONTROL, AND* ~~AND~~ REACTOR CORE ISOLATION COOLING *(RCIC)* SYSTEM ~~(RCIC), AND RPV WATER INVENTORY CONTROL~~

B 3.5.3 RCIC System

BASES

BACKGROUND

The RCIC System is not part of the ECCS; however, the RCIC System is included with the ECCS section because of their similar functions.

The RCIC System is designed to operate either automatically or manually following reactor pressure vessel (RPV) isolation accompanied by a loss of coolant flow from the feedwater system to provide adequate core cooling and control of RPV water level. Under these conditions, the High Pressure Core Spray (HPCS) and RCIC systems perform similar functions. The RCIC System design requirements ensure that the criteria of Reference 1 are satisfied.

The RCIC System (Ref. 2) consists of a steam driven turbine pump unit, piping, and valves to provide steam to the turbine, as well as piping and valves to transfer water from the suction source to the core via the feedwater system line. Suction piping is provided from the condensate storage tank (CST) and the suppression pool. Pump suction is normally aligned to the CST to minimize injection of suppression pool water into the RPV. However, if the CST water supply is low, or the suppression pool level is high, an automatic transfer to the suppression pool water source ensures a water supply for continuous operation of the RCIC System. The steam supply to the turbine is piped from main steam line A, upstream of the inboard main steam line isolation valve.

The RCIC System is designed to provide core cooling for a wide range of reactor pressures, [165] psig to [1155] psig. Upon receipt of an initiation signal, the RCIC turbine accelerates to a specified speed. As the RCIC flow increases, the turbine control valve is automatically adjusted to maintain design flow. Exhaust steam from the RCIC turbine is discharged to the suppression pool. A full flow test line is provided to route water from and to the CST to allow testing of the RCIC System during normal operation without injecting water into the RPV.

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

BASES

APPLICABLE SAFETY ANALYSES

The function of the RCIC System is to respond to transient events by providing makeup coolant to the reactor. The RCIC System is not an Engineered Safety Feature System and no credit is taken in the safety analyses for RCIC System operation. The RCIC System satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).

LCO

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

APPLICABILITY

The RCIC System is required to be OPERABLE in MODE 1, and MODES 2 and 3 with reactor steam dome pressure > 150 psig since RCIC is the primary non-ECCS water source for core cooling when the reactor is isolated and pressurized. In MODES 2 and 3 with reactor steam dome pressure ≤ 150 psig, *.the ECCS injection/spray subsystems can provide sufficient flow to the vessel. In* ~~and in~~ MODES 4 and 5, RCIC is not required to be OPERABLE since *RPV water inventory control is required by LCO 3.5.2, "RPV Water Level Inventory Control."* ~~."the ECCS injection/spray subsystems can provide sufficient flow to the vessel~~.

ACTIONS

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

A.1 and A.2

If the RCIC System is inoperable during MODE 1, or MODES 2 or 3 with reactor steam dome pressure > 150 psig, and the HPCS System is verified to be OPERABLE, the RCIC System must be restored to OPERABLE status within 14 days. In this Condition, loss of the RCIC System will not affect the overall plant capability to provide makeup inventory at high RPV pressure since the HPCS System is the only high pressure system assumed to function during a loss of coolant accident (LOCA). OPERABILITY of the HPCS is therefore verified immediately when the RCIC System is inoperable. This may be performed as an administrative check, by examining logs or other information, to determine if the HPCS is out of service for maintenance or other reasons. Verification does not require performing the Surveillances needed to demonstrate the OPERABILITY of the HPCS System. If the OPERABILITY of the HPCS System cannot be verified, however,

BASES

LCO

PCIVs form a part of the primary containment boundary. The PCIV safety function is related to minimizing the loss of reactor coolant inventory and establishing the primary containment boundary during a DBA.

The power operated, automatic isolation valves are required to have isolation times within limits and actuate on an automatic isolation signal. Primary containment purge valves that are not qualified to close under accident conditions must be sealed closed [or blocked to prevent full opening] to be OPERABLE. The valves covered by this LCO are listed with their associated stroke times in the FSAR (Ref. 3).

The normally closed PCIVs are considered OPERABLE when manual valves are closed or open in accordance with appropriate administrative controls, automatic valves are de-activated and secured in their closed position, blind flanges are in place, and closed systems are intact. These passive isolation valves and devices are those listed in Reference 3. Purge valves with resilient seals, secondary bypass valves, MSIVs, and hydrostatically tested valves must meet additional leakage rate requirements. Other PCIV leakage rates are addressed by LCO 3.6.1.1, "Primary Containment," as Type B or C testing.

This LCO provides assurance that the PCIVs will perform their designed safety functions to minimize the loss of reactor coolant inventory and establish the primary containment boundary during accidents.

APPLICABILITY

In MODES 1, 2, and 3, a DBA could cause a release of radioactive material to primary containment. In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODES. Therefore, ~~most~~ PCIVs are not required to be OPERABLE and the primary containment purge valves are not required to be sealed closed in MODES 4 and 5. Certain valves are required to be OPERABLE *when the* ~~, however, to prevent inadvertent reactor vessel draindown and release of radioactive material during a postulated fuel handling accident [involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days)]. These valves are those whose~~ associated instrumentation is required to be OPERABLE according to LCO 3.3.6.1, "Primary Containment Isolation Instrumentation." (This does not include the valves that isolate the associated instrumentation.)

ACTIONS

The ACTIONS are modified by a Note allowing penetration flow path(s) [except for the [ ] inch primary containment purge valve flow path(s)] to be unisolated intermittently under administrative controls. [The primary containment purge valve exception applies to primary containment purge valves that are not qualified to close under accident conditions.] These controls consist of stationing a dedicated operator at the controls of the valve, who is in continuous communication with the control room. In this way, the penetration can be rapidly isolated when a need for primary

BASES

ACTIONS (continued)

does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

[G.1~~,~~ ~~H.1,~~ and H.*1*~~2~~

If any Required Action and associated Completion Time cannot be met, the plant must be placed in a condition in which the LCO does not apply. If applicable, movement of [recently] irradiated fuel assemblies must be immediately suspended. Suspension of these activities shall not preclude completion of movement of a component to a safe condition. Also, if applicable, action must be immediately initiated to ~~suspend operations with a potential for draining the reactor vessel (OPDRVs) to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until OPDRVs are suspended. If suspending the OPDRVs would result in closing the residual heat removal (RHR) shutdown cooling isolation valves, an alternative Required Action is provided to immediately initiate action~~ to restore the valves to OPERABLE status. This allows RHR to remain in service while actions are being taken to restore the valve.]

SURVEILLANCE REQUIREMENTS

[SR 3.6.1.3.1

Each [ ] inch primary containment purge valve is required to be verified sealed closed. This SR is intended to apply to primary containment purge valves that are not fully qualified to open under accident conditions. This SR is designed to ensure that a gross breach of primary containment is not caused by an inadvertent or spurious opening of a primary containment purge valve. Detailed analysis of the purge valves failed to conclusively demonstrate their ability to close during a LOCA in time to limit offsite doses. Primary containment purge valves that are sealed closed must have motive power to the valve operator removed. This can be accomplished by de-energizing the source of electric power or removing the air supply to the valve operator. In this application, the term "sealed" has no connotation of leak tightness. [The 31 day Frequency is a result of an NRC initiative, Generic Issue B-24, (Ref. 6) related to primary containment purge valve use during unit operations.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

LCO

A limit that suppression pool water level be ≥ [18 ft 4.5 inches] and ≤ [18 ft 9.75 inches] is required to ensure that the primary containment conditions assumed for the safety analysis are met. Either the high or low water level limits were used in the safety analysis, depending upon which is conservative for a particular calculation.

APPLICABILITY

In MODES 1, 2, and 3, a DBA could cause significant loads on the primary containment. In MODES 4 and 5, the probability and consequences of these events are reduced because of the pressure and temperature limitations in these MODES. The requirements for maintaining suppression pool water level within limits in MODE 4 or 5 is addressed in LCO 3.5.2, "*RPV Water Inventory Control*~~ECCS-Shutdown~~."

ACTIONS

A.1

With suppression pool water level outside the limits, the conditions assumed for the safety analysis are not met. If water level is below the minimum level, the pressure suppression function still exists as long as main vents are covered, RCIC turbine exhausts are covered, and S/RV quenchers are covered. If suppression pool water level is above the maximum level, protection against overpressurization still exists due to the margin in the peak containment pressure analysis or as long as the drywell sprays are OPERABLE. Prompt action to restore the suppression pool water level to within the normal range is prudent, however, to retain the margin to weir wall overflow from an inadvertent upper pool dump and reduce the risks of increased pool swell and dynamic loading. Therefore, continued operation for a limited time is allowed. The 2 hour Completion Time is sufficient to restore suppression pool water level to within specified limits. Also, it takes into account the low probability of an event impacting the suppression pool water level occurring during this interval.

B.1 and B.2

If suppression pool water level cannot be restored to within limits within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 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.

BASES

LCO

An OPERABLE [secondary containment] provides a control volume into which fission products that bypass or leak from primary containment, or are released from the reactor coolant pressure boundary components located in [secondary containment], can be diluted and processed prior to release to the environment. For the [secondary containment] to be considered OPERABLE, it must have adequate leak tightness to ensure that the required vacuum can be established and maintained.

APPLICABILITY

In MODES 1, 2, and 3, a LOCA could lead to a fission product release to primary containment that leaks to [secondary containment]. Therefore, [secondary containment] OPERABILITY is required during the same operating conditions that require primary containment OPERABILITY.

In MODES 4 and 5, the probability and consequences of the LOCA are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining [secondary containment] OPERABLE is not required in MODE 4 or 5 to ensure a control volume, except for other situations for which significant releases of radioactive material can be postulated, such as during ~~operations with a potential for draining the reactor vessel (OPDRVs) or during~~ movement of [recently] irradiated fuel assemblies in the [primary or secondary containment].

[Due to radioactive decay, secondary containment is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days).]

-----------------------------------REVIEWER'S NOTE-----------------------------------
The addition of the term "recently" associated with handling irradiated fuel in all of the containment function Technical Specification requirements is only applicable to those licensees who have demonstrated by analysis that after sufficient radioactive decay has occurred, off-site doses resulting from a fuel handling accident remain below the Standard Review Plan limits (well within 10 CFR 100).

Additionally, licensees adding the term "recently" must make the following commitment which is consistent with NUMARC 93-01, Revision 4, Section 11.3.6.5, "Safety Assessment for Removal of Equipment from Service During Shutdown Conditions," subheading "Containment - Secondary (BWR)."

"The following guidelines are included in the assessment of systems removed from service during movement of irradiated fuel:

BASES

ACTIONS (continued)

If the [secondary containment] cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which overall plant risk is minimized. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours.

Remaining in the Applicability of the LCO is acceptable because the plant risk in MODE 3 is similar to or lower than the risk in MODE 4 (Ref. 4), because the time spent in MODE 3 to perform the necessary repairs to restore the system to OPERABLE status will be short. However, voluntary entry into MODE 4 may be made as it is also an acceptable low-risk state.

Required Action B.1 is modified by a Note that states that LCO 3.0.4.a is not applicable when entering MODE 3. This Note prohibits the use of LCO 3.0.4.a to enter MODE 3 during startup with the LCO not met. However, there is no restriction on the use of LCO 3.0.4.b, if applicable, because LCO 3.0.4.b requires performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering MODE 3, and establishment of risk management actions, if appropriate. LCO 3.0.4 is not applicable to, and the Note does not preclude, changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS or that are part of a shutdown of the unit.

The allowed Completion Time is reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

[C.1 ~~and C.2~~

Movement of [recently] irradiated fuel assemblies in the [primary or secondary containment] ~~and OPDRVs~~ can be postulated to cause significant fission product release to the [secondary containment]. In such cases, the [secondary containment] is the only barrier to release of fission products to the environment. Therefore, movement of [recently] irradiated fuel assemblies must be immediately suspended if the [secondary containment] is inoperable.

Suspension of these activities shall not preclude completing an action that involves moving a component to a safe position. ~~Also, action must be immediately initiated to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.~~

BASES

APPLICABLE SAFETY ANALYSES (continued)

Maintaining SCIVs OPERABLE with isolation times within limits ensures that fission products will remain trapped inside secondary containment so that they can be treated by the SGT System prior to discharge to the environment.

SCIVs satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

SCIVs form a part of the secondary containment boundary. The SCIV safety function is related to control of offsite radiation releases resulting from DBAs.

The power operated, automatic isolation valves are considered OPERABLE when their isolation times are within limits and the valves actuate on an automatic isolation signal. The valves covered by this LCO, along with their associated stroke times, are listed in Reference 5.

The normally closed isolation valves or blind flanges are considered OPERABLE when manual valves are closed or open in accordance with appropriate administrative controls, automatic SCIVs are de-activated and secured in their closed position, and blind flanges are in place. These passive isolation valves or devices are listed in Reference 5.

APPLICABILITY

In MODES 1, 2, and 3, a DBA could lead to a fission product release to the primary containment that leaks to the secondary containment. Therefore, OPERABILITY of SCIVs is required.

In MODES 4 and 5, the probability and consequences of these events are reduced due to pressure and temperature limitations in these MODES. Therefore, maintaining SCIVs OPERABLE is not required in MODE 4 or 5, except for other situations under which significant releases of radioactive material can be postulated, such as ~~during operations with a potential for draining the reactor vessel (OPDRVs) or~~ during movement of [recently] irradiated fuel assemblies. Moving [recently] irradiated fuel assemblies in the [primary or secondary containment] may also occur in MODES 1, 2, and 3. [Due to radioactive decay, SCIVs are only required to be OPERABLE during fuel handling involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days).]

ACTIONS

The ACTIONS are modified by three Notes. The first Note allows penetration flow paths to be unisolated intermittently under administrative controls. These controls consist of stationing a dedicated operator, who is in continuous communication with the control room, at the controls of the isolation device. In this way, the penetration can be rapidly isolated when the need for [secondary containment] isolation is indicated.

BASES

ACTIONS (continued)

of a component to a safe position. ~~Also, if applicable, action must be immediately initiated to suspend OPDRVs in order to minimize the probability of a vessel draindown and the subsequent potential for fission product release. Actions must continue until OPDRVs are suspended.~~

Required Action D.1 has been modified by a Note stating that LCO 3.0.3 is not applicable. If moving [recently] irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving [recently] irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of [recently] irradiated fuel assemblies would not be a sufficient reason to require a reactor shutdown.

SURVEILLANCE REQUIREMENTS

SR 3.6.4.2.1

This SR verifies each secondary containment isolation manual valve and blind flange that is not locked, sealed, or otherwise secured and is required to be closed during accident conditions is closed. The SR helps to ensure that post accident leakage of radioactive fluids or gases outside of the [secondary containment] boundary is within design limits. This SR does not require any testing or valve manipulation. Rather, it involves verification that those SCIVs in [secondary containment] that are capable of being mispositioned are in the correct position.

[Since these SCIVs are readily accessible to personnel during normal unit operation and verification of their position is relatively easy, the 31 day Frequency was chosen to provide added assurance that the SCIVs are in the correct positions.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

This SR does not apply to valves that are locked, sealed, or otherwise secured in the closed position, since these were verified to be in the correct position upon locking, sealing, or securing.

BASES

BACKGROUND (continued)

gaseous elemental iodine and organic iodides, and the final HEPA filter is provided to collect any carbon fines exhausted from the charcoal adsorber.

The SGT System automatically starts and operates in response to actuation signals indicative of conditions or an accident that could require operation of the system. Following initiation, both enclosure building recirculation fans and both charcoal filter train fans start. SGT System flows are controlled by modulating inlet vanes installed on the charcoal filter train exhaust fans and two position volume control dampers installed in branch ducts to individual regions of the secondary containment.

APPLICABLE SAFETY ANALYSES

The design basis for the SGT System is to mitigate the consequences of a loss of coolant accident and fuel handling accidents. [Due to radioactive decay, the SGT System is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days).] (Ref. 3). For all events analyzed, the SGT System is shown to be automatically initiated to reduce, via filtration and adsorption, the radioactive material released to the environment.

The SGT System satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Following a DBA, a minimum of one SGT subsystem is required to maintain the secondary containment at a negative pressure with respect to the environment and to process gaseous releases. Meeting the LCO requirements for two operable subsystems ensures operation of at least one SGT subsystem in the event of a single active failure.

APPLICABILITY

In MODES 1, 2, and 3, a DBA could lead to a fission product release to primary containment that leaks to secondary containment. Therefore, SGT System OPERABILITY is required during these MODES.

In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining the SGT System OPERABLE is not required in MODE 4 or 5, except for other situations under which significant releases of radioactive material can be postulated, such as ~~during operations with a potential for draining the reactor vessel (OPDRVs) or~~ during movement of [recently] irradiated fuel assemblies in the [primary or secondary containment]. [Due to radioactive decay, the SGT System is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days).]

BASES

ACTIONS (continued)

results, determination of the acceptability of entering MODE 3, and establishment of risk management actions, if appropriate. LCO 3.0.4 is not applicable to, and the Note does not preclude, changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS or that are part of a shutdown of the unit.

The allowed Completion Time is reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

C.1~~,~~ *and*C.2~~.1, and C.2.2~~

During movement of [recently] irradiated fuel assemblies in the [primary or secondary containment]~~ or during OPDRVs~~, when Required Action A.1 cannot be completed within the required Completion Time, the OPERABLE SGT subsystem should be immediately placed in operation. This Required Action ensures that the remaining subsystem is OPERABLE, that no failures that could prevent automatic actuation have occurred, and that any other failure would be readily detected.

An alternative to Required Action C.1 is to immediately suspend activities that represent a potential for releasing a significant amount of radioactive material to the secondary containment, thus placing the unit in a Condition that minimizes risk. If applicable, movement of [recently] irradiated fuel assemblies must be immediately suspended. Suspension of these activities shall not preclude completion of movement of a component to a safe position. ~~Also, if applicable, action must be immediately initiated to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Action must continue until OPDRVs are suspended.~~

The Required Actions of Condition C have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving [recently] irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving [recently] irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of [recently] irradiated fuel assemblies would not be a sufficient reason to require a reactor shutdown.

BASES

ACTIONS (continued)

D.1

-----------------------------------REVIEWER'S NOTE ----------------------------------
Adoption of a MODE 3 end state requires the licensee to make the following commitments:

1. [LICENSEE] will follow the guidance established in Section 11 of NUMARC 93-01, "Industry Guidance for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Nuclear Management and Resource Council, Revision 3, July 2000.

2. [LICENSEE] will follow the guidance established in TSTF-IG-05-02, Implementation Guidance for TSTF-423, Revision 2, "Technical Specifications End States, NEDC-32988-A," November 2009.

If both SGT subsystems are inoperable in MODE 1, 2, or 3, the SGT system may not be capable of supporting the required radioactivity release control function. Therefore, the plant must be brought to a MODE in which the overall plant risk is minimized. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours.

Remaining in the Applicability of the LCO is acceptable because the plant risk in MODE 3 is similar to or lower than the risk in MODE 4 (Ref. 4) and because the time spent in MODE 3 to perform the necessary repairs to restore the system to OPERABLE status will be short. However, voluntary entry into MODE 4 may be made as it is also an acceptable low-risk state.

Required Action D.1 is modified by a Note that states that LCO 3.0.4.a is not applicable when entering MODE 3. This Note prohibits the use of LCO 3.0.4.a to enter MODE 3 during startup with the LCO not met. However, there is no restriction on the use of LCO 3.0.4.b, if applicable, because LCO 3.0.4.b requires performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering MODE 3, and establishment of risk management actions, if appropriate. LCO 3.0.4 is not applicable to, and the Note does not preclude, changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS or that are part of a shutdown of the unit.

The allowed Completion Time is reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

BASES

ACTIONS (continued)

E.1 ~~and E.2~~

When two SGT subsystems are inoperable, if applicable, movement of [recently] irradiated fuel assemblies in the [primary and secondary containment] must be immediately suspended. Suspension of these activities shall not preclude completion of movement of a component to a safe position. ~~Also, if applicable, actions must be immediately initiated to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Action must continue until OPDRVs are suspended.~~

Required Action E.1 has been modified by a Note stating that LCO 3.0.3 is not applicable. If moving [recently] irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving [recently] irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of [recently] irradiated fuel assemblies would not be sufficient reason to require a reactor shutdown.

SURVEILLANCE REQUIREMENTS

SR 3.6.4.3.1

Operating each SGT subsystem for ≥ [10] continuous hours ensures that both subsystems are OPERABLE and that all associated controls are functioning properly. It also ensures that blockage, fan or motor failure, or excessive vibration can be detected for corrective action. Operation [with the heaters on (automatic heater cycling to maintain temperature)] for ≥ [10] continuous hours eliminates moisture on the adsorbers and HEPA filters. [The 31 day Frequency was developed in consideration of the known reliability of fan motors and controls and the redundancy available in the system.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

BASES

LCO (continued)

In order for the [CRFA] subsystems to be considered OPERABLE, the CRE boundary must be maintained such that the CRE occupant dose from a large radioactive release does not exceed the calculated dose in the licensing basis consequence analyses for DBAs, and that CRE occupants are protected from hazardous chemicals and smoke.

The LCO is modified by a Note allowing the CRE boundary to be opened intermittently under administrative controls. This Note only applies to openings in the CRE boundary that can be rapidly restored to the design condition, such as doors, hatches, floor plugs, and access panels. For entry and exit through doors, the administrative control of the opening is performed by the person(s) entering or exiting the area. For other openings, these controls should be proceduralized and consist of stationing a dedicated individual at the opening who is in continuous communication with the operators in the CRE. This individual will have a method to rapidly close the opening and to restore the CRE boundary to a condition equivalent to the design condition when a need for CRE isolation is indicated.

APPLICABILITY

In MODES 1, 2, and 3, the [CRFA] System must be OPERABLE to ensure that the CRE will remain habitable during and following a DBA, since the DBA could lead to a fission product release.

In MODES 4 and 5, the probability and consequences of a DBA are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining the [CRFA] System OPERABLE is not required in MODE 4 or 5, except ~~for the following situations under which significant radioactive releases can be postulated:~~

~~a. During operations with a potential for draining the reactor vessel (OPDRVs) and~~

~~b.~~ *d*~~D~~uring movement of [recently] irradiated fuel assemblies in the [primary or secondary containment]. [Due to radioactive decay, the CRFA System is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days).]

ACTIONS

A.1

With one [CRFA] subsystem inoperable for reasons other than an inoperable CRE boundary, the inoperable [CRFA] subsystem must be restored to OPERABLE status within 7 days. With the unit in this condition, the remaining OPERABLE [CRFA] subsystem is adequate to perform the CRE occupant protection function. However, the overall reliability is reduced because a failure in the OPERABLE subsystem

BASES

ACTIONS (continued)

D.1~~,~~ *and* D.2~~.1 and D.2.2~~

The Required Actions of Condition D are modified by a Note indicating that LCO 3.0.3 does not apply. If moving [recently] irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, inability to suspend movement of [recently] irradiated fuel assemblies is not sufficient reason to require a reactor shutdown.

During movement of [recently] irradiated fuel assemblies in the [primary or secondary containment]~~ or during OPDRVs~~, if the inoperable [CRFA] subsystem cannot be restored to OPERABLE status within the required Completion Time, the OPERABLE [CRFA] subsystem may be placed in the isolation mode. This action ensures that the remaining subsystem is OPERABLE, that no failures that would prevent automatic actuation will occur, and that any active failure will be readily detected.

[Required Action D.1 is modified by a Note alerting the operator to [place the system in the toxic gas protection mode if the toxic gas protection mode, automatic transfer capability is inoperable.]

An alternative to Required Action D.1 is to immediately suspend activities that present a potential for releasing radioactivity that might require isolation of the CRE. This places the unit in a condition that minimizes the accident risk.

If applicable, movement of [recently] irradiated fuel assemblies in the [primary and secondary containment] must be suspended immediately. Suspension of these activities shall not preclude completion of movement of a component to a safe position. ~~Also, if applicable, actions must be initiated immediately to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until the OPDRVs are suspended.~~

E.1

If both [CRFA] subsystems are inoperable in MODE 1, 2, or 3 for reasons other than an inoperable CRE boundary (i.e., Condition B), the [CRFA] System may not be capable of performing the intended function and the unit is in a condition outside of the accident analyses. Therefore, the plant must be brought to a MODE in which the overall plant risk is minimized. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours.

BASES

ACTIONS (continued)

Remaining in the Applicability of the LCO is acceptable because the plant risk in MODE 3 is similar to or lower than the risk in MODE 4 (Ref. 5) and because the time spent in MODE 3 to perform the necessary repairs to restore the system to OPERABLE status will be short. However, voluntary entry into MODE 4 may be made as it is also an acceptable low-risk state.

Required Action E.1 is modified by a Note that states that LCO 3.0.4.a is not applicable when entering MODE 3. This Note prohibits the use of LCO 3.0.4.a to enter MODE 3 during startup with the LCO not met. However, there is no restriction on the use of LCO 3.0.4.b, if applicable, because LCO 3.0.4.b requires performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering MODE 3, and establishment of risk management actions, if appropriate. LCO 3.0.4 is not applicable to, and the Note does not preclude, changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS or that are part of a shutdown of the unit.

The allowed Completion Time is reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

F.1 ~~and F.2~~

The Required Actions of Condition F are modified by a Note indicating that LCO 3.0.3 does not apply. If moving [recently] irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, inability to suspend movement of [recently] irradiated fuel assemblies is not sufficient reason to require a reactor shutdown.

During movement of [recently] irradiated fuel assemblies in the [primary or secondary containment]~~ or during OPDRVs~~, with two [CRFA] subsystems inoperable or with one or more [CRFA] subsystems inoperable due to an inoperable CRE boundary, action must be taken immediately to suspend activities that present a potential for releasing radioactivity that might require isolation of the CRE. This places the unit in a condition that minimizes the accident risk.

If applicable, movement of [recently] irradiated fuel assemblies in the [primary and secondary containment] must be suspended immediately. Suspension of these activities shall not preclude completion of movement

BASES

ACTIONS (continued)

of a component to a safe position.~~ If applicable, actions must be initiated immediately to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until the OPDRVs are suspended~~.

SURVEILLANCE REQUIREMENTS

SR 3.7.3.1

This SR verifies that a subsystem in a standby mode starts on demand and continues to operate. Standby systems should be checked periodically to ensure that they start and function properly. As the environmental and normal operating conditions of this system are not severe, testing each subsystem once every month provides an adequate check on this system. Monthly heater operation dries out any moisture accumulated in the charcoal from humidity in the ambient air. [Systems with heaters must be operated for ≥ 10 continuous hours with the heaters energized. Systems without heaters need only be operated for ≥ 15 minutes to demonstrate the function of the system.] [Furthermore, the 31 day Frequency is based on the known reliability of the equipment and the two subsystem redundancy available.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

SR 3.7.3.2

This SR verifies that the required CRFA testing is performed in accordance with the [Ventilation Filter Testing Program (VFTP)]. The [VFTP] includes testing HEPA filter performance, charcoal adsorber efficiency, minimum system flow rate, and the physical properties of the activated charcoal (general use and following specific operations). Specific test Frequencies and additional information are discussed in detail in the [VFTP].

BASES

LCO (continued)

The [Control Room AC] System is considered OPERABLE when the individual components necessary to maintain the control room temperature are OPERABLE in both subsystems. These components include the cooling coils, fans, chillers, compressors, ductwork, dampers, and associated instrumentation and controls.

APPLICABILITY

In MODE 1, 2, or 3, the [Control Room AC] System must be OPERABLE to ensure that the control room temperature will not exceed equipment OPERABILITY limits following control room isolation.

In MODES 4 and 5, the probability and consequences of a Design Basis Accident are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining the [Control Room AC] System OPERABLE is not required in MODE 4 or 5, except ~~for the following situations under which significant radioactive releases can be postulated:~~

~~a. During operations with a potential for draining the reactor vessel (OPDRVs) and~~

~~b.~~ *d*~~D~~uring movement of [recently] irradiated fuel assemblies in the [primary or secondary containment]. [Due to radioactive decay, the Control Room AC System is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days).]

ACTIONS

A.1

With one [control room AC] subsystem inoperable, the inoperable [control room AC] subsystem must be restored to OPERABLE status within 30 days. With the unit in this condition, the remaining OPERABLE [control room AC] subsystem is adequate to perform the control room air conditioning function. However, the overall reliability is reduced because a single failure in the OPERABLE subsystem could result in loss of the control room air conditioning function. The 30 day Completion Time is based on the low probability of an event occurring requiring control room isolation, the consideration that the remaining subsystem can provide the required protection, and the availability of alternate cooling methods.

B.1 and B.2

If both [control room AC] subsystems are inoperable, the [Control Room AC] System may not be capable of performing its intended function. Therefore, the control room area temperature is required to be monitored to ensure that temperature is being maintained low enough that

BASES

ACTIONS (continued)

other specified conditions in the Applicability that are required to comply with ACTIONS or that are part of a shutdown of the unit.

The allowed Completion Time is reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

D.1~~,~~ *and* D.2~~.1, and D.2.2~~

The Required Actions of Condition D are modified by a Note indicating that LCO 3.0.3 does not apply.

If moving [recently] irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, inability to suspend movement of [recently] irradiated fuel assemblies is not sufficient reason to require a reactor shutdown.

During movement of [recently] irradiated fuel assemblies in the [primary or secondary containment]~~ or during OPDRVs~~, if Required Action A.1 cannot be completed within the required Completion Time, the OPERABLE [control room AC] subsystem may be placed immediately in operation. This action ensures that the remaining subsystem is OPERABLE, that no failures that would prevent actuation will occur, and that any active failure will be readily detected.

An alternative to Required Action D.1 is to immediately suspend activities that present a potential for releasing radioactivity that might require isolation of the control room. This places the unit in a condition that minimizes risk.

If applicable, movement of [recently] irradiated fuel assemblies in the [primary and secondary containment] must be suspended immediately. Suspension of these activities shall not preclude completion of movement of a component to a safe position. ~~Also, if applicable, actions must be initiated immediately to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until the OPDRVs are suspended.~~

E.1 ~~and E.2~~

The Required Actions of Condition E.1 are modified by a Note indicating that LCO 3.0.3 does not apply. If moving [recently] irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, inability to suspend movement of

BASES

ACTIONS (continued)

[recently] irradiated fuel assemblies is not sufficient reason to require a reactor shutdown.

During movement of [recently] irradiated fuel assemblies in the [primary or secondary containment] ~~or during OPDRVs~~ if Required Actions B.1 and B.2 cannot be met within the required Completion Times, action must be taken to immediately suspend activities that present a potential for releasing radioactivity that might require isolation of the control room. This places the unit in a condition that minimizes risk.

If applicable, handling of [recently] irradiated fuel in the [primary or secondary containment] must be suspended immediately. Suspension of these activities shall not preclude completion of movement of a component to a safe position. ~~Also, if applicable, actions must be initiated immediately to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until the OPDRVs are suspended.~~

SURVEILLANCE REQUIREMENTS

SR 3.7.4.1

This SR verifies that the heat removal capability of the system is sufficient to remove the control room heat load assumed in the [safety analyses]. The SR consists of a combination of testing and calculation. [The [18] month Frequency is appropriate since significant degradation of the [Control Room AC] System is not expected over this time period.

OR

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
--]

REFERENCES

1. FSAR, Section [6.4].
2. FSAR, Section [9.4.1].
3. NEDC-32988-A, Revision 2, Technical Justification to Support Risk-Informed Modification to Selected Required End States for BWR Plants, December 2002.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.2 AC Sources - Shutdown

BASES

BACKGROUND

A description of the AC sources is provided in the Bases for LCO 3.8.1, "AC Sources - Operating."

APPLICABLE SAFETY ANALYSES

The OPERABILITY of the minimum AC sources during MODES 4 and 5 and during movement of [recently] irradiated fuel assemblies ensures that:

a. The unit can be maintained in the shutdown or refueling condition for extended periods,

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status, and

c. Adequate AC electrical power is provided to mitigate events postulated during shutdown, such as ~~an inadvertent draindown of the vessel or~~ a fuel handling accident [involving handling recently irradiated fuel. Due to radioactive decay, AC electrical power is only required to mitigate fuel handling accidents involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days)].

In general, when the unit is shut down the Technical Specifications (TS) requirements ensure that the unit has the capability to mitigate the consequences of postulated accidents. However, assuming a single failure and concurrent loss of all offsite or loss of all onsite power is not required. The rationale for this is based on the fact that many Design Basis Accidents (DBAs) that are analyzed in MODES 1, 2, and 3 have no specific analyses in MODES 4 and 5. Worst case bounding events are deemed not credible in MODES 4 and 5 because the energy contained within the reactor pressure boundary, reactor coolant temperature and pressure, and the corresponding stresses result in the probabilities of occurrence significantly reduced or eliminated, and minimal consequences. These deviations from DBA analysis assumptions and design requirements during shutdown conditions are allowed by the LCO for required systems.

During MODES 1, 2, and 3, various deviations from the analysis assumptions and design requirements are allowed within the ACTIONS. This allowance is in recognition that certain testing and maintenance

BASES

APPLICABLE SAFETY ANALYSES (continued)

activities must be conducted provided an acceptable level of risk is not exceeded. During MODES 4 and 5, performance of a significant number of required testing and maintenance activities is also required. In MODES 4 and 5, the activities are generally planned and administratively controlled. Relaxations from typical MODE 1, 2, and 3 LCO requirements are acceptable during shutdown MODES based on:

a. The fact that time in an outage is limited. This is a risk prudent goal as well as utility economic consideration.

b. Requiring appropriate compensatory measures for certain conditions. These may include administrative controls, reliance on systems that do not necessarily meet typical design requirements applied to systems credited in operating MODE analyses, or both.

c. Prudent utility consideration of the risk associated with multiple activities that could affect multiple systems.

d. Maintaining, to the extent practical, the ability to perform required functions (even if not meeting MODE 1, 2, and 3 OPERABILITY requirements) with systems assumed to function during an event.

In the event of an accident during shutdown, this LCO ensures the capability of supporting systems necessary to avoid immediate difficulty, assuming either a loss of all offsite power or a loss of all onsite (diesel generator (DG)) power.

The AC sources satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

One offsite circuit capable of supplying onsite Class 1E power distribution subsystem(s) of LCO 3.8.10, "Distribution Systems - Shutdown," ensures that all required Division 1 loads, Division 2 loads, or both, are powered from offsite power. An OPERABLE DG, associated with a Division 1 or Division 2 Distribution System Engineered Safety Feature (ESF) bus required OPERABLE by LCO 3.8.10, ensures a diverse power source is available to provide electrical power support, assuming a loss of the offsite circuit. Similarly, when the high pressure core spray (HPCS) is required to be OPERABLE, a separate offsite circuit to the Division 3 Class 1E onsite electrical power distribution subsystem, or an OPERABLE Division 3 DG, ensures an additional source of power for the HPCS. This additional source for Division 3 is not necessarily required to be connected to be OPERABLE. Either the circuit required by LCO

BASES

LCO (continued)

Item a., or a circuit required to meet LCO Item c. may be connected, with the second source available for connection. Together, OPERABILITY of the required offsite circuit(s) and DG(s) ensure the availability of sufficient AC sources to operate the plant in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents [involving handling recently irradiated fuel]~~, reactor vessel draindown~~). Automatic initiation of the required DG during shutdown conditions is specified in ~~LCO 3.3.5.1, "ECCS Instrumentation," and~~ LCO 3.3.8.1, "LOP Instrumentation."

The qualified offsite circuit(s) must be capable of maintaining rated frequency and voltage while connected to their respective ESF bus(es), and of accepting required loads during an accident. Qualified offsite circuits are those that are described in the FSAR and are part of the licensing basis for the plant. [The offsite circuit consists of incoming breaker and disconnect to the respective service transformers 11 and 21, the 11 and 21 service transformers, the ESF transformers 11 and 21, and the respective circuit path including feeder breakers to all 4.16 kV ESF buses required by LCO 3.8.10.]

The required DG must be capable of starting, accelerating to rated speed and voltage, and connecting to its respective ESF bus on detection of bus undervoltage, and accepting required loads. This sequence must be accomplished within [10] seconds. Each DG must also be capable of accepting required loads within the assumed loading sequence intervals, and must continue to operate until offsite power can be restored to the ESF buses. These capabilities are required to be met from a variety of initial conditions such as: DG in standby with the engine hot and DG in standby with the engine at ambient conditions. Additional DG capabilities must be demonstrated to meet required Surveillances, e.g., capability of the DG to revert to standby status on an ECCS signal while operating in parallel test mode.

Proper sequencing of loads, including tripping of nonessential loads, is a required function for DG OPERABILITY. [In addition, proper sequencer operation is an integral part of offsite circuit OPERABILITY since its inoperability impacts on the ability to start and maintain energized loads required OPERABLE by LCO 3.8.10.]

It is acceptable for divisions to be cross tied during shutdown conditions, permitting a single offsite power circuit to supply all required divisions. [No fast transfer capability is required for offsite circuits to be considered OPERABLE.]

BASES

LCO (continued)

As described in Applicable Safety Analyses, in the event of an accident during shutdown, the TS are designed to maintain the plant in a condition such that, even with a single failure, the plant will not be in immediate difficulty.

APPLICABILITY

The AC sources required to be OPERABLE in MODES 4 and 5 and during movement of [recently] irradiated fuel assemblies in the [primary or secondary] containment provide assurance that:

a. Systems *that provide core cooling* ~~to provide adequate coolant inventory makeup~~ are available ~~for the irradiated fuel in the core in case of an inadvertent draindown of the reactor vessel~~,

b. Systems needed to mitigate a fuel handling accident [involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days)] are available,

c. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available, and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

The AC power requirements for MODES 1, 2, and 3 are covered in LCO 3.8.1.

ACTIONS

LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Entering LCO 3.0.3, while in MODE 1, 2, or 3 would require the unit to be shutdown unnecessarily.

A.1

An offsite circuit is considered inoperable if it is not available to one required ESF division. If two or more ESF 4.16 kV buses are required per LCO 3.8.10, division(s) with offsite power available may be capable of supporting sufficient required features to allow continuation of CORE

BASES

ACTIONS (continued)

ALTERATIONS, *and movement of* [recently] irradiated fuel ~~movement, and operations with a potential for draining the reactor vessel~~. By the allowance of the option to declare required features inoperable with no offsite power available, appropriate restrictions can be implemented in accordance with the affected required feature(s) LCOs' ACTIONS.

A.2.1, A.2.2, A.2.3, ~~A.2.4,~~ B.1, B.2, ~~B.3,~~ and B.~~3~~*4*

With the offsite circuit not available to all required divisions, the option still exists to declare all required features inoperable. Since this option may involve undesired administrative efforts, the allowance for sufficiently conservative actions is made. With the required DG inoperable, the minimum required diversity of AC power sources is not available. It is, therefore, required to suspend CORE ALTERATIONS, *and* movement of [recently] irradiated fuel assemblies in the [primary or secondary containment]~~, and activities that could potentially result in inadvertent draining of the reactor vessel~~.

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize probability of the occurrence of postulated events. It is further required to initiate action immediately to restore the required AC sources and to continue this action until restoration is accomplished in order to provide the necessary AC power to the plant safety systems.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required AC electrical power sources should be completed as quickly as possible in order to minimize the time during which the plant safety systems may be without sufficient power.

Pursuant to LCO 3.0.6, the Distribution System ACTIONS are not entered even if all AC sources to it are inoperable, resulting in de-energization. Therefore, the Required Actions of Condition A have been modified by a Note to indicate that when Condition A is entered with no AC power to any required ESF bus, ACTIONS for LCO 3.8.10 must be immediately entered. This Note allows Condition A to provide requirements for the loss of the offsite circuit whether or not a division is de-energized. LCO 3.8.10 provides the appropriate restrictions for the situation involving a de-energized division.

BASES

ACTIONS (continued)

C.1

When the HPCS is required to be OPERABLE, and the additional required Division 3 AC source is inoperable, the required diversity of AC power sources to the HPCS is not available. Since these sources only affect the HPCS, the HPCS is declared inoperable and the Required Actions of the affected Emergency Core Cooling Systems LCO entered.

In the event all sources of power to Division 3 are lost, Condition A will also be entered and direct that the ACTIONS of LCO 3.8.10 be taken. If only the Division 3 additional required AC source is inoperable, and power is still supplied to HPCS, 72 hours is allowed to restore the additional required AC source to OPERABLE. This is reasonable considering HPCS will still perform its function, absent an additional single failure.

SURVEILLANCE REQUIREMENTS

SR 3.8.2.1

SR 3.8.2.1 requires the SRs from LCO 3.8.1 that are necessary for ensuring the OPERABILITY of the AC sources in other than MODES 1, 2, and 3. SR 3.8.1.8 is not required to be met since only one offsite circuit is required to be OPERABLE. SR 3.8.1.17 is not required to be met because the required OPERABLE DG(s) is not required to undergo periods of being synchronized to the offsite circuit. SR 3.8.1.20 is excepted because starting independence is not required with the DG(s) that is not required to be OPERABLE. Refer to the corresponding Bases for LCO 3.8.1 for a discussion of each SR.

This SR is modified by two Notes. The reason for Note 1 is to preclude requiring the OPERABLE DG(s) from being paralleled with the offsite power network or otherwise rendered inoperable during the performance of SRs. With limited AC sources available, a single event could compromise both the required circuit and the DG, and to preclude deenergizing a required 4160 V ESF bus or disconnecting a required offsite circuit during performance of SRs. It is the intent that these SRs must still be capable of being met, but actual performance is not required during periods when the DG and offsite circuit is required to be OPERABLE. Note 2 states that SRs 3.8.1.12 and 3.8.1.19 are not

BASES

SURVEILLANCE REQUIREMENTS (continued)

required to be met when its associated ECCS subsystem(s) are not required to be OPERABLE. These SRs demonstrate the DG response to an ECCS signal (either alone or in conjunction with a loss-of-power signal). This is consistent with the ECCS instrumentation requirements that do not require the ECCS signals when the ECCS System is not required to be OPERABLE ~~per LCO 3.5.2, "ECCS-Shutdown~~."

REFERENCES None.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.5 DC Sources - Shutdown

BASES

BACKGROUND

A description of the DC sources is provided in the Bases for LCO 3.8.4, "DC Sources - Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident and transient analyses in the FSAR, Chapter [6] (Ref. 1) and Chapter [15] (Ref. 2), assume that Engineered Safety Feature systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the diesel generators, emergency auxiliaries, and control and switching during all MODES of operation.

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the minimum DC electrical power sources during MODES 4 and 5 and during movement of [recently] irradiated fuel assemblies ensures that:

a. The facility can be maintained in the shutdown or refueling condition for extended periods,

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status, and

c. Adequate DC electrical power is provided to mitigate events postulated during shutdown, such as ~~an inadvertent draindown of the vessel or~~ a fuel handling accident [involving handling recently irradiated fuel. Due to radioactive decay, DC electrical power is only required to mitigate fuel handling accidents involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days)].

In general, when the unit is shut down, the Technical Specifications requirements ensure that the unit has the capability to mitigate the consequences of postulated accidents. However, assuming a single failure and concurrent loss of all offsite or all onsite power is not required. The rationale for this is based on the fact that many Design Basis Accidents (DBAs) that are analyzed in MODES 1, 2, and 3 have no specific analyses in MODES 4 and 5. Worst case bounding events are deemed not credible in MODES 4 and 5 because the energy contained

BASES

APPLICABLE SAFETY ANALYSES (continued)

within the reactor pressure boundary, reactor coolant temperature and pressure, and the corresponding stresses result in the probabilities of occurrence being significantly reduced or eliminated, and in minimal consequences. These deviations from DBA analysis assumptions and design requirements during shutdown conditions are allowed by the LCO for required systems.

The shutdown Technical Specification requirements are designed to ensure that the unit has the capability to mitigate the consequences of certain postulated accidents. Worst case DBAs which are analyzed for operating MODES are generally viewed not to be a significant concern during shutdown MODES due to the lower energies involved. The Technical Specifications therefore require a lesser complement of electrical equipment to be available during shutdown than is required during operating MODES. More recent work completed on the potential risks associated with shutdown, however, have found significant risk associated with certain shutdown evolutions. As a result, in addition to the requirements established in the Technical Specifications, the industry has adopted NUMARC 91-06, "Guidelines for Industry Actions to Assess Shutdown Management," as an industry initiative to manage shutdown tasks and associated electrical support to maintain risk at an acceptable low level. This may require the availability of additional equipment beyond that required by the shutdown Technical Specifications.

The DC sources satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The DC electrical power subsystems, [each required] [the required] consisting of [two] battery banks, [one or two] battery charger[s], and the corresponding control equipment and interconnecting cabling within the subsystem, are required to be OPERABLE to support [required] [one] subsystem[s] of Distribution System [subsystems required OPERABLE by LCO 3.8.10, "Distribution Systems - Shutdown."][.] This ensures the availability of sufficient DC electrical power sources to operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents [involving handling recently irradiated fuel] ~~and inadvertent reactor vessel draindown~~).

APPLICABILITY

The DC electrical power sources required to be OPERABLE in MODES 4 and 5 and during movement of [recently] irradiated fuel assemblies in the [primary or secondary containment] provide assurance that:

a. Required features to provide *core cooling* ~~adequate coolant inventory makeup~~ are available ~~for the irradiated fuel assemblies in the core in case of an inadvertent draindown of the reactor vessel~~,

BASES

ACTIONS (continued)

been fully recharged. If at the expiration of the initial [12] hour period the battery float current is not less than or equal to [2] amps this indicates there may be additional battery problems and the battery must be declared inoperable.

----------------------------------REVIEWER'S NOTE---------------------------------
Any licensee wishing to adopt a Completion Time greater than 72 hours for Required Action A.3 will need to demonstrate that the Completion Time is appropriate for the plant in accordance with the guidance in Regulatory Guide (RG) 1.177, "An Approach for Plant-Specific, Risk Informed Decisionmaking: Technical Specifications." Otherwise, the 72 hour Completion Time must be adopted.

Required Action A.3 limits the restoration time for the inoperable battery charger to [72] hours. This action is applicable if an alternate means of restoring battery terminal voltage to greater than or equal to the minimum established float voltage has been used (e.g., balance of plant non-Class 1E battery charger). The [72] hour Completion Time reflects a reasonable time to effect restoration of the qualified battery charger to OPERABLE status.

B.1, B.2.1, B.2.2~~, B.2.3,~~ and B.2.~~3~~*4*

[If more than one DC distribution subsystem is required according to LCO 3.8.10, the DC subsystems remaining OPERABLE with one or more DC power sources inoperable may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS, *and* [recently] irradiated fuel movement~~, and operations with a potential for draining the reactor vessel.~~] By allowing the option to declare required features inoperable with associated DC power source(s) inoperable, appropriate restrictions are implemented in accordance with the affected system LCOs' ACTIONS. In many instances this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made (i.e., to suspend CORE ALTERATIONS, *and* movement of [recently] irradiated fuel assemblies~~, and any activities that could result in inadvertent draining of the reactor vessel~~).

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required DC electrical power subsystem[s] and to continue this action until restoration is accomplished in order to provide the necessary DC electrical power to the plant safety systems.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.8 Inverters - Shutdown

BASES

BACKGROUND

A description of the inverters is provided in the Bases for LCO 3.8.7, "Inverters - Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient accident analyses in the FSAR, Chapter [6] (Ref. 1) and Chapter [15] (Ref. 2), assume Engineered Safety Feature systems are OPERABLE. The DC to AC inverters are designed to provide the required capacity, capability, redundancy, and reliability to ensure the availability of necessary power to the Reactor Protection System and Emergency Core Cooling Systems instrumentation and controls so that the fuel, Reactor Coolant System, and containment design limits are not exceeded.

The OPERABILITY of the inverters is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the minimum inverters to each AC vital bus during MODES 4 and 5 ensures that:

a. The facility can be maintained in the shutdown or refueling condition for extended periods,

b. Sufficient instrumentation and control capability are available for monitoring and maintaining the unit status, and

c. Adequate power is available to mitigate events postulated during shutdown, such as ~~an inadvertent draindown of the vessel or~~ a fuel handling accident [involving handling recently irradiated fuel. Due to radioactive decay, the DC to AC inverters are only required to mitigate fuel handling accidents involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days)].

In general, when the unit is shut down, the Technical Specifications requirements ensure that the unit has the capability to mitigate the consequences of postulated accidents. However, assuming a single failure and concurrent loss of all offsite or all onsite power is not required. The rationale for this is based on the fact that many Design Basis

BASES

APPLICABLE SAFETY ANALYSES (continued)

Accidents (DBAs) that are analyzed in MODES 1, 2, and 3 have no specific analyses in MODES 4 and 5. Worst case bounding events are deemed not credible in MODES 4 and 5 because the energy contained within the reactor pressure boundary, reactor coolant temperature and pressure, and the corresponding stresses result in the probabilities of occurrence being significantly reduced or eliminated, and in minimal consequences. These deviations from DBA analysis assumptions and design requirements during shutdown conditions are allowed by the LCO for required systems.

The shutdown Technical Specification requirements are designed to ensure that the unit has the capability to mitigate the consequences of certain postulated accidents. Worst case DBAs which are analyzed for operating MODES are generally viewed not to be a significant concern during shutdown MODES due to the lower energies involved. The Technical Specifications therefore require a lesser complement of electrical equipment to be available during shutdown than is required during operating MODES. More recent work completed on the potential risks associated with shutdown, however, have found significant risk associated with certain shutdown evolutions. As a result, in addition to the requirements established in the Technical Specifications, the industry has adopted NUMARC 91-06, "Guidelines for Industry Actions to Assess Shutdown Management," as an Industry initiative to manage shutdown tasks and associated electrical support to maintain risk at an acceptable low level. This may require the availability of additional equipment beyond that required by the shutdown Technical Specifications.

The inverters were previously identified as part of the Distribution System and, as such, satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The inverter[s] ensure the availability of electrical power for the instrumentation for systems required to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence or postulated DBA. The battery powered inverter[s] provide[s] uninterruptible supply of AC electrical power to the AC vital bus[es] even if the 4.16 kV safety buses are de-energized. OPERABLE inverters require the AC vital bus be powered by the inverter through inverted DC voltage. This ensures the availability of sufficient inverter power sources to operate the plant in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents [involving handling recently irradiated fuel] ~~and inadvertent reactor vessel draindown~~).

BASES

APPLICABILITY

The inverter[s] required to be OPERABLE in MODES 4 and 5 and also any time during movement of [recently] irradiated fuel assemblies in the [primary or secondary] containment provide assurance that:

a. Systems *that provide core cooling* ~~to provide adequate coolant inventory makeup~~ are available ~~for the irradiated fuel in the core in case of an inadvertent draindown of the reactor vessel~~,

b. Systems needed to mitigate a fuel handling accident [involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days)] are available,

c. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available, and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

Inverter requirements for MODES 1, 2, and 3 are covered in LCO 3.8.7.

ACTIONS

LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Entering LCO 3.0.3, while in MODE 1, 2, or 3 would require the unit to be shutdown unnecessarily.

A.1, A.2.1, A.2.2, ~~A.2.3,~~ and A.2.*3*~~4~~

[If two divisions are required by LCO 3.8.10, "Distribution Systems - Shutdown," the remaining OPERABLE inverters may be capable of supporting sufficient required feature(s) to allow continuation of CORE ALTERATIONS, *and* [recently] irradiated fuel movement~~, and operations with a potential for draining the reactor vessel.~~] By the allowance of the option to declare required feature(s) inoperable with the associated inverter(s) inoperable, appropriate restrictions are implemented in accordance with the affected required feature(s) of the LCOs' ACTIONS. In many instances, this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made (i.e., to suspend CORE ALTERATIONS, *and* movement of [recently] irradiated fuel assemblies in the [primary or secondary] containment~~, and any activities that could result in inadvertent draining of the reactor vessel~~).

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.10 Distribution Systems - Shutdown

BASES

BACKGROUND	A description of the AC, DC, and AC vital bus electrical power distribution systems is provided in the Bases for LCO 3.8.9, "Distribution Systems - Operating."
APPLICABLE SAFETY ANALYSES	The initial conditions of Design Basis Accident and transient analyses in the FSAR, Chapter [6] (Ref. 1) and Chapter [15] (Ref. 2), assume Engineered Safety Feature (ESF) systems are OPERABLE. The AC, DC, and AC vital bus electrical power distribution systems are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System, and containment design limits are not exceeded.

The OPERABILITY of the AC, DC, and AC vital bus electrical power distribution system is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the minimum AC, DC, and AC vital bus electrical power sources and associated power distribution subsystems during MODES 4 and 5, and during movement of [recently] irradiated fuel assemblies in the primary or secondary containment ensures that:

a. The facility can be maintained in the shutdown or refueling condition for extended periods,

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status, and

c. Adequate power is provided to mitigate events postulated during shutdown, such as ~~an inadvertent draindown of the vessel or~~ a fuel handling accident [involving handling recently irradiated fuel. Due to radioactive decay, AC and DC electrical power is only required to mitigate fuel handling accidents involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days)].

The AC and DC electrical power distribution systems satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

BASES

LCO

Various combinations of subsystems, equipment, and components are required OPERABLE by other LCOs, depending on the specific plant condition. Implicit in those requirements is the required OPERABILITY of necessary support required features. This LCO explicitly requires energization of the portions of the electrical distribution system necessary to support OPERABILITY of Technical Specifications' required systems, equipment, and components - both specifically addressed by their own LCOs, and implicitly required by the definition of OPERABILITY.

Maintaining these portions of the distribution system energized ensures the availability of sufficient power to operate the plant in a safe manner to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents [involving handling recently irradiated fuel] ~~and inadvertent reactor vessel draindown~~).

APPLICABILITY

The AC and DC electrical power distribution subsystems required to be OPERABLE in MODES 4 and 5 and during movement of [recently] irradiated fuel assemblies in the [secondary] containment provide assurance that:

a. Systems *that provide core cooling* ~~to provide adequate coolant inventory makeup~~ are available ~~for the irradiated fuel in the core in case of an inadvertent draindown of the reactor vessel~~,

b. Systems needed to mitigate a fuel handling accident [involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous [X] days)] are available,

c. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available, and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown or refueling condition.

The AC, DC, and AC vital bus electrical power distribution subsystem requirements for MODES 1, 2, and 3 are covered in LCO 3.8.9.

ACTIONS

LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Entering LCO 3.0.3, while in MODE 1, 2, or 3 would require the unit to be shutdown unnecessarily.

BASES

ACTIONS (continued)

A.1, A.2.1, A.2.2, A.2.3, ~~A.2.4,~~ and A.2.*45*

Although redundant required features may require redundant divisions of electrical power distribution subsystems to be OPERABLE, one OPERABLE distribution subsystem division may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS, *and* [recently] irradiated fuel movement~~, and operations with a potential for draining the reactor vessel~~. By allowing the option to declare required features associated with an inoperable distribution subsystem inoperable, appropriate restrictions are implemented in accordance with the affected distribution subsystem LCO's Required Actions. In many instances, this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made (i.e., to suspend CORE ALTERATIONS, *and* movement of [recently] irradiated fuel assemblies in the [primary or secondary] containment ~~and any activities that could result in inadvertent draining of the reactor vessel~~).

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required AC and DC electrical power distribution subsystems and to continue this action until restoration is accomplished in order to provide the necessary power to the plant safety systems.

Notwithstanding performance of the above conservative Required Actions, a required residual heat removal - shutdown cooling (RHR-SDC) subsystem may be inoperable. In this case, Required Actions A.2.1 through A.2.4 do not adequately address the concerns relating to coolant circulation and heat removal. Pursuant to LCO 3.0.6, the RHR-SDC ACTIONS would not be entered. Therefore, Required Action A.2.5 is provided to direct declaring RHR-SDC inoperable, which results in taking the appropriate RHR-SDC ACTIONS.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required distribution subsystems should be completed as quickly as possible in order to minimize the time the plant safety systems may be without power.

BASES

BACKGROUND (continued)

The hydrostatic [[and/or] RCS System leakage] tests require increasing pressure to approximately [ ] psig. Scram time testing required by SR 3.1.4.1 and SR 3.1.4.4 requires reactor pressures ≥ [800] psig.

Other testing may be performed in conjunction with the allowances for inservice leak or hydrostatic tests and control rod scram time tests.

APPLICABLE SAFETY ANALYSES

Allowing the reactor to be considered in MODE 4 when the reactor coolant temperature is > 200°F, during, or as a consequence of, hydrostatic or leak testing, or as a consequence of control rod scram time testing initiated in conjunction with an inservice leak or hydrostatic test, effectively provides an exception to MODE 3 requirements, including OPERABILITY of primary containment and the full complement of redundant Emergency Core Cooling Systems (ECCS). Since the tests are performed nearly water solid, at low decay heat values, and near MODE 4 conditions, the stored energy in the reactor core will be very low. Under these conditions, the potential for failed fuel and a subsequent increase in coolant activity above the limits of LCO 3.4.8, "Reactor Coolant System (RCS) Specific Activity," are minimized. In addition, the secondary containment will be OPERABLE, in accordance with this Special Operations LCO, and will be capable of handling any airborne radioactivity or steam leaks that could occur during the performance of hydrostatic or leak testing. The required pressure testing conditions provide adequate assurance that the consequences of a steam leak will be conservatively bounded by the consequences of the postulated main steam line break outside of primary containment described in Reference 2. Therefore, these requirements will conservatively limit radiation releases to the environment.

In the *unlikely* event of *any* ~~a large~~ primary system leak *that could result in draining of the RPV*, the reactor vessel would rapidly depressurize~~, allowing the low pressure core cooling systems to operate~~. The *make-up* capability ~~of the low pressure coolant injection and low pressure core spray subsystems, as~~ required in MODE 4 by LCO 3.5.2, "*RPV WIC*~~ECCS - Shutdown~~," would be more than adequate to keep the *RPV water level above the TAF*~~core flooded~~ under this low decay heat load condition. Small system leaks would be detected by leakage inspections before significant inventory loss occurred.

For the purposes of this test, the protection provided by normally required MODE 4 applicable LCOs, in addition to the secondary containment requirements required to be met by this Special Operations LCO, will ensure acceptable consequences during normal hydrostatic test conditions and during postulated accident conditions.