*General Directions: This model SE provides the format and content to be used when preparing the plant-specific SE of an LAR to adopt TSTF-542. The **bolded** bracketed information shows text that should be filled in for the specific amendment; individual licensees would furnish site-specific nomenclature or values for these bracketed items. The italicized wording provides guidance on what should be included in each section and should not be included in the SE.*

# DRAFT MODEL SAFETY EVALUATION

# BY THE OFFICE OF NUCLEAR REACTOR REGULATION

# TECHNICAL SPECIFICATIONS TASK FORCE TRAVELER

# TSTF-542, REVISION 2

# "REACTOR PRESSURE VESSEL WATER INVENTORY CONTROL"

## 1.0 INTRODUCTION

By application dated **[enter date]** (Agencywide Documents Access and Management System (ADAMS) Accession No. **[MLXXXXXXXXX]**), **[name of licensee]** (the licensee) requested to adopt Technical Specifications Task Force (TSTF) Traveler TSTF-542, "Reactor Pressure Vessel Water Inventory Control," Revision 2, which changes to the technical specifications (TS) for **[PLANT]**. Traveler TSTF-542, Revision 2, was approved by the NRC on **[enter date]** (ADAMS Accession No. **[MLXXXXXXXXX]**).

The proposed changes would replace the existing requirements in the TS related to "operations which have the potential for draining the reactor vessel" (OPDRVs) with revised TS providing an alternative for Reactor Pressure Vessel Water Inventory Control (RPV WIC). These alternative requirements would protect Technical Specification Safety Limit 2.1.1.3, which requires reactor pressure vessel (RPV) water level to be greater than the top of the active fuel (TAF).

*Choose applicable paragraphs based on information provided in the LAR:*
**[The 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 of TSTF-542.]**

**[The licensee is proposing the following variations from the TS changes described in the TSTF-542 or the applicable parts of TSTF-542 or the NRC staff's safety evaluation.]**

**[**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]** TS limiting condition for operation (LCO) 3.5.2 does do not contain a Note regarding realignment to the Low Pressure Coolant Injection mode. This has no effect on the adoption of the TSTF-542 and is an acceptable variation.**]**

## 2.0 REGULATORY EVALUATION

### 2.1 TECHNICAL SPECIFICATIONS

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

> The purpose of Technical Specifications is to impose those conditions or limitations upon reactor operation necessary to obviate the possibility of an abnormal situation or event giving rise to an immediate threat to the public health and safety by identifying those features that are of controlling importance to safety and establishing on them certain conditions of operation which cannot be changed without prior Commission approval.
>
> [T]he Commission will also entertain requests to adopt portions of the improved STS [(e.g., TSTF-542)], even if the licensee does not adopt all STS improvements…
>
> The Commission encourages all licensees who submit Technical Specification related submittals based on this Policy Statement to emphasize human factors principles…
>
> In accordance with this Policy Statement, improved STS have been developed and will be maintained for [the BWR/4 and BWR/6 designs]. The Commission encourages licensees to use the STS as the basis for plant-specific Technical Specifications…
>
> [I]t is the Commission intent that the wording and Bases of the improved STS be used [] to the extent practicable.

### 2.2 SYSTEM DESCRIPTION

The boiling water reactor (BWR) RPV have a number of penetrations located below the TAF. These penetrations provide entry for control blades, recirculation flow, and shutdown cooling. Since these penetrations are below the TAF, this gives potential to drain the reactor vessel water inventory and thus lose effective core cooling. The loss of water inventory and effective core cooling can potentially lead to fuel cladding failure and radioactive release.

During operation in Modes 1 (Power Operation with reactor mode switch position in run), 2 (Startup with reactor mode switch position in refuel or startup/hot standby) and 3 (Hot Standby with reactor mode switch position in shutdown), the TS for instrumentation and emergency core cooling systems (ECCS) require operability of sufficient equipment to ensure large quantities of water can be injected into the vessel should level decrease below the preselected value. These requirements are designed to mitigate the effects of a loss-of-coolant accident (LOCA), but also provide protection for other accidents and transients that involve a water inventory loss.

During BWR 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 that could cause a LOCA are not present. During certain phases of refueling (Mode 5) a large volume of water is available above the RPV (i.e., the RPV head is removed, the water level is ≥ **[23 feet]** over the top of the RPV flange, and **[***for BWR/4 plants enter* **"the spent fuel storage pool gates are removed"** *or for BWR/6 plants enter* **"the upper containment pool is connected to the RPV"]**.

The large volume of water available in and above the RPV (during much of the time when in Mode 5) provides time for operator detection and manual operator action to stop and mitigate an RPV draining event. However, typically at other times during a refueling outage, during cold shutdown (Mode 4) or refueling (Mode 5), there may be a potential for significant drainage paths from certain outage activities, human error, and other events when it is more likely to have some normally available equipment, instrumentation, and systems inoperable due to maintenance and outage activities. There may not be as much time for operator action as compared to times when there are large volumes of water above the RPV.

In comparison to Modes 1, 2, and 3, with typical high temperatures and pressures (especially in Modes 1 and 2), Modes 4 and 5 generally do not have the high pressure and temperature considered necessary for a LOCA envisioned from a high energy pipe failure. Thus, while the potential sudden loss of large volumes of water from a LOCA are not expected, operators monitor for BWR RPV water level decrease from potential significant or even unexpected drainage paths. These potential drainage paths in Modes 4 and 5 generally would require less water replacement capability to maintain water above TAF.

To address the drain down potential during Modes 4 and 5, the current TS contain specifications that are applicable during an OPDRV, or require suspension of OPDRVs if certain equipment is inoperable. The term OPDRV is not specifically defined in the TS and historically has been subject to inconsistent application by licensees. The changes discussed in this safety evaluation (SE) are intended to resolve any ambiguity by creating a new RPV WIC TS with attendant equipment operability requirements, required actions and surveillance requirements, and deleting references to OPDRVs throughout the TS.

## 2.3 CHANGES TO THE TS

The proposed changes would (1) provide a definition of a new term, DRAIN TIME; (2) revise and rename TS 3.5.2 as "Reactor Pressure Vessel Water Inventory Control;" (3) provide a new TS 3.3.5.2, "Reactor Pressure Vessel Water Inventory Control Instrumentation;" and (4) delete existing references to "operations with the potential to drain the reactor pressure vessel" throughout the TS. The descriptions of the proposed changes are provided in this section.

A summary statement of the bases or reasons for such specifications, other than those covering administrative controls, were also included in the application, but these bases shall not become part of the technical specifications.

### 2.3.1 Insertion of New Definition of DRAIN TIME

The following definition of "DRAIN TIME" would be added to the TS Section 1.1, "Definitions":

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 are locked, sealed, or otherwise secured in the closed position, blank flanges, or other devices that prevent flow or 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 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.

2.3.2 Changes to TS Section 3.5:

2.3.2.1 Title of TS 3.5

The title of Section 3.5 is being revised from "Emergency Core Cooling System (ECCS) and Reactor Core Isolation Cooling System (RCIC)" to "Emergency Core Cooling Systems (ECCS), RPV Water Inventory Control, and Reactor Core Isolation Cooling (RCIC) System."

2.3.2.2 Title of TS 3.5.2

The title of TS 3.5.2 is being revised from "ECCS – Shutdown" to "Reactor Pressure Vessel (RPV) Water Inventory Control."

2.3.2.3 LCO 3.5.2

TS limiting condition for operation (LCO) 3.5.2 currently states "Two low pressure ECCS injection/spray subsystems shall be OPERABLE." The LCO note currently states: "One LPCI subsystem may be considered OPERABLE during alignment and operation for decay heat removal if capable of being manually realigned and not otherwise inoperable."

*For BWR/4 plants choose:*
**[LCO 3.5.2 would be revised to state:**

> **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.**

**The note for LCO 3.5.2 would be revised to state:**

> **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.]**

*For BWR/6 plants choose:*
**[The phrase "low pressure" in LCO 3.5.2 is omitted because the high pressure core spray system is used to satisfy this requirement.]**

2.3.2.4 Applicability of TS LCO 3.5.2

*For BWR/4 plants choose:* **[**LCO 3.5.2 is currently applicable in MODE 4 and in MODE 5, except with the spent fuel storage pool gates removed and water level ≥ **[23 ft]** over the top of the reactor pressure vessel flange.**]**

*For BWR/6 plants choose:* **[**LCO 3.5.2 is currently applicable in Mode 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.**]**

The applicability would be revised to be Modes 4 and 5, with no exceptions.

2.3.2.5 Actions Table of TS 3.5.2

The existing Actions Table of TS 3.5.2 contains requirements to restore at least one train of ECCS injection/spray systems to operable status if the LCO is not met.

The revised TS 3.5.2 Actions Table would provide increasingly stringent requirements on **[secondary]** containment, **[secondary]** containment isolation valves, the standby gas treatment system 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.

2.3.2.6 TS 3.5.2 Surveillance Requirements

TS 3.5.2 currently contains Surveillance Requirements (SRs) to verify the availability of a suction source, the availability of an appropriate flow path, and proper functioning of the ECCS injection/spray system pump(s).

The revised SRs would verify the Drain Time is greater than or equal to 36 hours and verify the availability of a suction source, appropriate flow path and proper functioning of the required ECCS injection/spray system pump.

The existing and proposed TS 3.5.2 Surveillances provide the option to perform the Surveillances at a fixed interval or in accordance with the Surveillance Frequency Control Program (SFCP), for those plants that have adopted an SFCP.

2.3.3 <u>Changes to TS Section 3.3:</u>

*NOTE: The STS contain two versions of certain specifications in Section 3.3, Instrumentation. One is applicable for licensees that have not adopted a Setpoint Control Program (the "A" version) and the other is applicable for licensees that have adopted a Setpoint Control Program (the "B" version). In the "A" version of the STS, the Allowable Value column is retained in the Instrumentation Table, and the Instrumentation Table contains footnotes that provide details regarding SRs. In the "B" version of the STS, the Allowable Value has been relocated to the Setpoint Control Program, and this column does not appear in the Instrumentation Table. Additionally, in the "B" version, the footnotes that provide details regarding SRs are not necessary. Choose the A or B version below to correspond with the plant-specific TS.*

2.3.3.1 Changes to TS LCOs **[3.3.5.1A** *or* **3.3.5.1B]**, Emergency Core Cooling System (ECCS) Instrumentation (**[Without** *or* **With Setpoint Control Program]**)

The TS LCO **[3.3.5.1A** *or* **3.3.5.1B]** states that "the ECCS instrumentation for each Function in Table 3.3.5.1-1, shall be OPERABLE" with the applicability as stated in the table. Table 3.3.5.1-1 currently contains requirements for function operability during Modes 4 and 5 when associated ECCS subsystem(s) are required to be operable per LCO 3.5.2, "ECCS –

Shutdown." Throughout this table, the applicability in Modes 4 and 5 is being deleted because the instrumentation requirements during shutdown are being consolidated into the new TS 3.3.5.2. Conforming changes are made to the Actions Table of TS LCO **[3.3.5.1A** *or* **3.3.5.1B]**.

2.3.3.2 Insertion of new TS **[3.3.5.2A or 3.3.5.2B]**, Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation (**[Without** *or* **With Setpoint Control Program]**)

A new TS 3.3.5.2 is proposed to provide alternative instrumentation requirements to support manual initiation of the ECCS injection/spray subsystem required in new TS 3.5.2 and automatic isolation of penetration flow paths that may be credited in the determination of drain time. The current TS contain instrumentation requirements related to OPDRVs in four TS. These requirements are being consolidated into new TS 3.3.5.2.

The existing TS 3.3.5.2, "Reactor Core Isolation Cooling (RCIC) System Instrumentation," is being renumbered to 3.3.5.3 in order to maintain the TS numbering conventions.

2.3.3.2.1 New TS 3.3.5.2**[A** *or* **B]** 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."

The following sections describe the instrumentation functions contained in the new Table 3.3.5.2-1.

2.3.3.2.2 New Table 3.3.5.2-1, RPV Water Inventory Control Instrumentation

*For BWR/4 choose 2.3.3.2.2.1 through 2.3.3.2.2.5:*

2.3.3.2.2.1 Function 1.a, Core Spray System, Reactor Steam Dome Pressure - Low (Injection Permissive)
Function 2.a, Low Pressure Coolant Injection (LPCI) System, Reactor Steam Dome Pressure - Low (Injection Permissive)

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

- The applicability is changed. The existing 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 revised applicability is Modes 4 and 5 without exception, to be consistent with the applicability of new LCO 3.5.2, "RPV Water Inventory Control."

- The number of required channels per function is unchanged.

- In the new table, 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.

- In new 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 pressure is well below the lower limit in Modes 4 and 5, so the low pressure limit is not needed.

2.3.3.2.2.2 Functions 1.b and 2.b, Core Spray and Low Pressure Coolant Injection (LPCI) Systems, Core Spray and Low Pressure Coolant Injection Pumps Discharge Flow - Low (Bypass)

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

- The applicability is changed. The current 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 current LCO 3.5.2, "ECCS - Shutdown." The revised applicability is Modes 4 and 5 without exception, to be consistent with the applicability of new 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.'"

- In the new table, 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.

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

2.3.3.2.2.3 Function 1.c, Core Spray System, Manual Initiation, and Function 2.c, Low Pressure Coolant Injection (LPCI) System, Manual Initiation

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

- The applicability is changed. The current 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 current LCO 3.5.2, "ECCS - Shutdown." The revised applicability is Modes 4 and 5 without exception, to be consistent with the applicability of new 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.'" New LCO 3.5.2 only requires a single ECCS subsystem and the change in required channels reflects that requirement.

- Both the existing TS 3.3.5.1 and the revised 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.

2.3.3.2.2.4 Function 3.a, RHR System Isolation, Reactor Vessel Water Level - Low, Level 3

This function was moved from current 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 [RHR] System Isolation Reactor Vessel Water Level - Low, Level 3." The current title is a misnomer in the TSs as the Level 3 instruments isolate more than shutdown cooling isolation valves.

- The applicability is changed. The existing TS 3.3.6.1 applicability for this function in Modes 4 and 5 is being deleted. The revised applicability is "when automatic isolation of the associated penetration flow path is credited in calculating Drain Time."

- 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.

- In the new table, 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.

- The allowable value is unchanged.

2.3.3.2.2.5 Function 4.a, Reactor Water Cleanup (RWCU) System Isolation, Reactor Vessel Water Level - Low Low, Level 2

This function exists in the current TS 3.3.6.1, Function 5.e. The function is inserted into new STS 3.3.5.2 as follows:

- The current TS 3.3.6.1 applicability for this function is Modes 1, 2, and 3. The applicability in STS 3.3.5.2 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.

- 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.

- The allowable value is unchanged.

*For BWR/6 choose 2.3.3.2.2.1 through 2.3.3.2.2.9:*

2.3.3.2.2.1 Function 1.a, Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core Spray (LPCS) Subsystems, Reactor Steam Dome Pressure - Low (Injection Permissive), and
Function 2.a, LPCI B and LPCI C Subsystems, Reactor Steam Dome Pressure - Low (Injection Permissive)

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

- The applicability is changed. The current 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 current LCO 3.5.2, "ECCS - Shutdown." The revised applicability is Modes 4 and 5 without exception, to be consistent with the applicability of new LCO 3.5.2, "RPV Water Inventory Control."

- In the new table, 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.'" New TS 3.5.2 only requires a single ECCS subsystem to be operable and the change reflects that requirement.

- 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.

- In new LCO 3.3.5.2A, the allowable value is revised to eliminate the low pressure limit and to retain the high pressure limit.

2.3.3.2.2.2 Functions 1.b and 1.c, Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core Spray (LPCS) Subsystems, LPCS Pump Discharge Flow - Low (Bypass) and LPCI Pump A Discharge Flow – Low (Bypass), and
Function 2.b, LPCI B and LPCI C Subsystems, LPCI Pump B and LPCI Pump C Discharge Flow – Low (Bypass)

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

- The applicability is changed. The current 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 revised Applicability is Modes 4 and 5 without exception, to be consistent with the Applicability of new 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'." New TS 3.5.2 only requires a single ECCS subsystem and the change in required channels reflects that requirement.

- 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.

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

2.3.3.2.2.3 Function 1.d, Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core Spray (LPCS) Subsystems, Manual Initiation, and Function 2.c, LPCI B and LPCI C Subsystems, Manual Initiation

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

- The applicability is changed. The current 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 current LCO 3.5.2, "ECCS - Shutdown." The revised applicability is Modes 4 and 5 without exception, to be consistent with the applicability of new 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'." New TS 3.5.2 only requires a single ECCS subsystem and the change in required channels reflects that requirement.

- Both the existing TS 3.3.5.1 and the revised 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.

2.3.3.2.2.4 Function 3.a, High Pressure Core Spray (HPCS) System, Reactor Vessel Water Level - High, Level 8

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

- The applicability is changed. The current 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 existing LCO 3.5.2, "ECCS - Shutdown." The revised applicability is Modes 4 and 5 without exception, to be consistent with the applicability of new 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'." New TS 3.5.2 only requires a single ECCS subsystem and the change in required channels reflects that requirement.

- 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.

- The allowable value in new LCO 3.3.5.2A is unchanged.

2.3.3.2.2.5 Function 3.b, High Pressure Core Spray (HPCS) System, Condensate Storage Tank Level – Low

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

- The applicability is changed. The current 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 current LCO 3.5.2, "ECCS - Shutdown." The revised applicability is Modes 4 and 5 when HPCS is operable for compliance with new LCO 3.5.2 and aligned to the Condensate Storage Tank. If HPCS is not being credited for meeting the new 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]**. New TS 3.5.2 only requires a single ECCS subsystem to be operable, and the change in required channels reflects that requirement.

- 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.

- The allowable value in new LCO 3.3.5.2A is unchanged.

2.3.3.2.2.6 Functions 3.c and 3.d, High Pressure Core Spray (HPCS) System, HPCS Pump Discharge Pressure - High (Bypass) and HPCS System Flow Rate - Low (Bypass)

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

- The applicability is changed. The current 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 current LCO 3.5.2, "ECCS - Shutdown." The revised applicability is Modes 4 and 5 without exception, to be consistent with the applicability of new 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'." New TS 3.5.2 only requires a single ECCS subsystem and the change in required channels reflects that requirement.

- 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.

- The allowable value is unchanged.

2.3.3.2.2.7 Function 3.e, High Pressure Core Spray (HPCS) System, Manual Initiation

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

- The applicability is changed. The current 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 existing LCO 3.5.2, "ECCS - Shutdown." The revised applicability is Modes 4 and 5 without exception, to be consistent with the applicability of new 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'." New TS 3.5.2 only requires a single ECCS subsystem and the change in required channels reflects that requirement.

- Both the existing TS 3.3.5.1 and the revised 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.

2.3.3.2.2.8 Function 4.a, RHR System Isolation Reactor Vessel Water Level - Low, Level 3

This function was moved from current 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."

- The applicability is changed. The current TS 3.3.6.1 applicability for this function is Modes 4 and 5. The revised applicability is "when automatic isolation of the associated penetration flow path is credited in calculating drain time.

- 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.

- 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.

- The existing allowable value is retained in new TS 3.3.5.2.

2.2.3.2.2.9 Function 5.a, Reactor Water Cleanup (RWCU) System Isolation, Reactor Vessel Water Level - Low Low, Level 2

This function exists in the current STS 3.3.6.1 as Function 4.k. The function is inserted into new STS 3.3.5.2 as follows:

- The current STS 3.3.6.1 applicability for this function is Modes 1, 2, and 3. The applicability in STS 3.3.5.2 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 new 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.

- 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.

- The existing allowable value is retained in LCO 3.3.5.2A.**]**

2.3.3.2.3 New TS 3.3.5.2**[A** *or* **B]** Actions Table

Condition A is applicable when one or more instrument channels are inoperable from Table 3.3.5.2-1. Required Action A.1 directs immediate entry into the condition referenced in Table 3.3.5.2-1 for that channel.

Condition B is entered when the RHR system isolation and RWCU system isolation functions operability requirements are not met 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 an immediate calculation of drain time.

Condition C is entered when the Low Reactor Steam Dome Pressure Injection Permissive Functions necessary for ECCS subsystem manual initiation operability requirements are not met. The channel must be placed in the trip condition within one hour.

*For BWR/4 plants choose:*
**[**Condition D is entered when the operability requirements for the Core Spray Pump Discharge Flow – Low Bypass, Low Pressure Coolant Injection Pump Discharge Flow – Low Bypass, or manual initiation of these functions operability requirements are not met. The Required Action is to restore the channel to operable status within 24 hours.

Condition E is entered if the required Action and associated Completion Time of Condition C or D, are not met. Required Action E.1 requires the associated low pressure ECCS injection/spray subsystem to be declared inoperable immediately.**]**

*For BWR/6 plants choose:*
**[**Condition D is entered when the Condensate Storage Tank Level –Low operability requirements are not met. Required Action D requires declaring the HPCS inoperable and aligning the HPCS pump suction to the suppression pool within one hour.

Condition E is entered if the Reactor Vessel Water Level – High Level 8 instrumentation operability requirements are not met. Action E.1 requires declaring the HCPS system inoperable in 1 hour and restoring the channel to Operable status within 24 hours.

Condition F is entered if the LPCS Pump Discharge Flow Low (Bypass), LPCI Pump A Discharge Flow Low (Bypass), LPCI Pump B and LPCI Pump C Discharge Flow – Low (Bypass), HPCS Pump Discharge Pressure – High (Bypass) HPCS System Flow Rate – Low – (Bypass) or Manual Initiation associated with these Functions operability requirements are not met. The required action is to restore the channel to OPERABLE status within 24 hours.

Condition G is entered if the required action and associated completion time of Condition C, D, E, or F is not met. Required Action G.1 requires the associated ECCS injection/spray subsystem to be declared inoperable immediately.**]**

2.3.3.2.4 New Surveillance Requirements 3.3.5.2.1, 3.3.5.2.2 and 3.3.5.3

New Table 3.3.5.2-1 specifies which SRs apply for each ECCS function.

SR 3.3.5.2.1 requires the performance of a Channel Check at a Frequency of **[12 hours or in accordance with the Surveillance Frequency Control Program.]**

SR 3.3.5.2.2 requires the performance of a Channel Functional Test at a Frequency of **[[92] days or in accordance with the Surveillance Frequency Control Program.]**

SR 3.3.5.2.3 requires the performance of a Logic System Functional Test at a Frequency of **[[18] months or in accordance with the Surveillance Frequency Control Program.]**

2.3.3.3 Changes to Containment, Containment Isolation Valve 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:

*For BWR/4 plants choose*:
**[**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**]**

*For BWR/6 plants choose:*
**[**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**]**

For each of these TS, the applicability and required action sections are being revised to delete references to OPDRVs.

2.3.3.4 Changes to Control Room Habitability and Temperature Control Requirements

The following LCOs are applicable during OPDRVs and contain required actions to immediately initiate action to suspend OPDRVs when certain conditions of the LCO are not met:

*For BWR/4 plants choose:*
**[**3.7.4, **[Main Control Room Environmental Control (MCREC)]** System
3.7.5, **[Control Room Air Conditioning (AC)]** System**]**

*For BWR/6 plants choose:*
**[**3.7.3, **[Control Room Fresh Air (CRFA)]** System
3.7.4, **[Control Room AC]** System**]**

The references to OPDRVs are being deleted from the applicability and required actions of these TS.

2.3.3.5 Changes to Electrical Sources Requirements

The following TS are applicable in Modes 4 and 5 and currently contain a required action to initiate action to suspend operations with a potential for draining the reactor vessel immediately if certain conditions are not met:

3.8.2, AC Sources - Shutdown
3.8.5, DC Sources - Shutdown

3.8.8, Inverters - Shutdown
3.8.10, Distribution Systems - Shutdown

TS 3.8.2 currently requires, in part, with one required offsite circuit inoperable or one required diesel generator inoperable, to initiate action to suspend operations with a potential for draining the reactor vessel immediately.

TS 3.8.5 currently requires, in part, with one **[or more**] required DC electrical power subsystem[**s**] inoperable for reasons other than an inoperable battery charger, to initiate action to suspend operations with a potential for draining the reactor vessel immediately

TS 3.8.3 currently requires, in part, with one **[or more] [required]** inverter**[s]** inoperable, to initiate action to suspend operations with a potential for draining the reactor vessel immediately.

TS 3.8.10 currently requires, in part, with one or more required AC, DC, **[or AC vital bus]** electrical power distribution subsystems inoperable, to initiate action to suspend operations with a potential for draining the reactor vessel immediately.

These required actions are being deleted.

*Note: Insert description of any licensee specific TS changes.*

## 2.4 APPLICABLE REGULATORY REQUIREMENTS

Pursuant to 10 CFR 50.90, whenever a holder of an operating license desires to amend the license, application for an amendment must be filed with the Commission fully describing the changes desired, and following as far as applicable, the form prescribed for original applications. The technical information to be included in an application for an operating license is governed in particular by 10 CFR 50.34(b).

10 CFR 50.36(a)(1) requires each applicant for a license authorizing operation of a utilization facility to include in the application proposed technical specifications in accordance with the requirements of 10 CFR 50.36. The regulation at 10 CFR Section 50.36(a)(1) requires an applicant to submit, as part of the application, a “summary statement of the bases or reasons for such specifications, other than those covering administrative controls.” However, per 10 CFR 50.36(a)(1), these technical specification bases “shall not become part of the technical specifications.”

As described in 10 CFR 50.92(a), in determining whether an amendment to a license will be issued to the applicant, the Commission will be guided by the considerations which govern the issuance of initial licenses applicable and appropriate. The general considerations that guide the Commission include, as stated in 10 CFR 50.40(a), how the technical specifications provide reasonable assurance the health and safety of the public will not be endangered. Also, to issue an operating license, of which technical specifications are a part, the Commission must make the findings of 10 CFR 50.57, including finding the 10 CFR 50.57(a)(3)(i) finding that there is reasonable assurance that the activities authorized by the operating license can be conducted without endangering the health and safety of the public.

As required by 10 CFR 50.36(b), the TS "will be derived from the analyses and evaluation included in the safety analysis report, and amendments thereto, submitted pursuant to 10 CFR 50.34 ["Contents of applications; technical information"]. The Commission may include such additional technical specifications as the Commission finds appropriate."

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

The regulations at 10 CFR 50.36(c)(2)(ii) state that LCO's must be established for each item meeting one of four criteria:

> *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 fission product barrier integrity.
>
> *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 safety assessment has shown to be significant to public health and safety.

The regulation at 10 CFR 50.36(c)(3) requires TSs to include items in the category of SRs, which 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 LCOs will be met. Also, the regulation at 10 CFR 50.36(a)(1) states that 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 TSs.

The NRC staff's guidance for review of TSs is in Chapter 16, *Technical Specifications*, of NUREG-0800, Revision 3, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants" (SRP), dated March 2010, (ADAMS Accession No. ML100351425). As described therein, as part of the regulatory standardization effort, the NRC staff has prepared STS for each of the light-water reactor nuclear designs. *Choose applicable NUREG:* **[NUREG-1433, Revision 4, contains the STS for BWR/4 plants]** *or* **[NUREG 1434, Revision 4, contains the STS for BWR/6 plants]]**.

## 3.0 TECHNICAL EVALUATION

3.1 DRAIN TIME DEFINITION

The proposed drain time 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 penetrations 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 NRC staff reviewed the proposed drain time definition. For the purpose of NRC staff considerations, the term "break" describes a pathway for water to drain from the RPV that has not been prescribed in the proposed "DRAIN TIME" definition. All RPV penetrations below the TAF are included in the determination of drain time as potential pathways. 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. The discharge point will depend on the lowest potential drain point for each RPV penetration flow path on a plant-specific basis. This calculation provides a conservative approach to determining the drain time of the RPV.

3.2 WATER SOURCES

*For BWR/4 plants choose:*
**[**The proposed LCO 3.5.2 states that, one low pressure Emergency Core Cooling System (ECCS) injection/spray subsystem shall be OPERABLE.**]**

*For BWR/6 plants choose:*
**[**The proposed LCO 3.5.2 states that, one ECCS injection/spray subsystem shall be OPERABLE.**]**

The NRC staff reviewed the water sources that would be applicable to the proposed TS 3.5.2. The ECCS pumps are high-capacity pumps, with flow rates of thousands of gallons per minute (gpm). Most RPV penetration flow paths would have a drain rate on the order of tens or hundreds of gpm. The automatic initiation of an ECCS pump would provide the necessary water source to counter these expected drain rates. The LPCI subsystem is to be considered operable during alignment and operation for decay heat removal if capable of being manually realigned and not otherwise inoperable. Decay heat removal in MODEs 4 and 5 is not affected by the proposed change as these 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 are unchanged. *For BWR/4 plants choose:* **[These requirements can be found 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."]** *For the BWR/6 plants choose:* **[These requirements can be found 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."]** Based on these considerations, the NRC staff finds the water sources provide assurances that the lowest functional capability required for safe operation is maintained and supports the safety limit.

3.3 TS 3.5.2 – REACTOR PRESSURE VESSEL (RPV) WATER INVENTORY CONTROL

The proposed TS 3.5.2, "Reactor Pressure Vessel (RPV) Water Inventory Control," LCO contains two parts. The first part states that drain time of RPV water inventory to the TAF shall be ≥ 36 hours. *For BWR/4 choose:* **[The second part states, one low pressure ECCS injection/spray subsystem shall be OPERABLE.]** *For BWR/6 plants choose:* **[The second part states, one ECCS injection/spray subsystem shall be OPERABLE.]** The proposed applicability for TS 3.5.2 is MODEs 4 and 5.

The NRC staff reviewed the proposed TS 3.5.2, focusing on ensuring the fuel remains covered with water and the changes made compared to the current TS. The proposed TS 3.5.2 contains Conditions A through E based on either required ECCS injection/spray subsystem operability or drain time.

The current TS LCO states that two ECCS injection/spray subsystems shall be operable, whereas the proposed LCO 3.5.2 states that only one ECCS injection/spray subsystem shall be operable. This change is reflected in Condition A. The change from two ECCS injection/spray subsystem to one ECCS injection/spray subsystem is because this redundancy is not required. With one ECCS injection/spray subsystem and non-safety related injection sources, defense-in-depth will be maintained. The defense-in-depth measure is consistent with other events considered during shutdown with no additional single failure 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.

The proposed Condition A states that if the required ECCS injection/spray subsystem is inoperable, it is to be restored to operable status within 4 hours. Proposed Condition B states that if Condition A is not met, a method of water injection capable of operating without offsite electrical power should be established immediately. The proposed Condition B provides adequate assurance of an available water source should Condition A not be met within the 4-hour completion time.

The proposed Condition C states that for a drain time < 36 hours and ≥ 8 hours, to (1) verify **[secondary containment]** boundary is capable of being established in less than 4 hours, and (2) verify each **[secondary containment]** penetration flow path is capable of being isolated in less than 4 hours, and (3) verify one standby gas treatment subsystem is capable of being placed in operation in less than 4 hours. The proposed Condition C provides adequate protection should the DRAIN TIME be < 36 hours and ≥ 8 hours because of the ability to establish secondary containment, isolate additional flow paths, and have the standby gas treatment subsystem operable.

The proposed Condition D states that when drain time < 8 hours to (1) immediately initiate action to establish an additional method of water injection with water sources capable of maintaining RPV water level > TAF for ≥ 36 hours, (2) immediately initiate action to establish **[secondary]** containment boundary, (3) immediately initiate action to isolate each **[secondary]** containment penetration flow path or verify it can be manually isolated from the control room, and (4) immediately initiate action to verify one standby gas treatment subsystem is capable of being placed in operation. Additionally, there is a note stating that required ECCS injection/spray subsystem or additional method of water injection shall be capable of operating

without offsite electrical power, which is similar to proposed Condition B. The current TS for Condition D are similar to the proposed for when Required Action C.2 is not met. The proposed Condition D provides adequate protection should the DRAIN TIME be < 8 hours because of the ability to establish secondary containment, isolate additional flow paths, and have the standby gas treatment subsystem operable.

The proposed Condition E states that when the required action and associated completion time of Condition C or D is not met, or the drain time is < 1 hour, then initiate action to restore drain time to ≥ 36 hours immediately. The proposed Condition E is new, as it is not present in the current TS. The proposed Condition E is acceptable as it provides the necessary step to restore the drain time to ≥ 36 hours should the other conditions not be met, or if the drain time is < 1 hour.

Based on the NRC staff's review, the proposed changes to TS 3.5.2 are acceptable based on the actions taken to mitigate the water level reaching the TAF with the water sources available and maintaining drain time ≥ 36 hours. The LCO correctly specifies the lowest functional capability or performance levels of equipment required for safe operation of the facility. There is reasonable assurance that the required actions to be taken when the LCO is not met can be conducted without endangering the health and safety of the public

The existing TS 3.3.5.2, "RCIC System Instrumentation," is renumbered as TS 3.3.5.3. This increases consistency within the TS as the Reactor Core Isolation Cooling (RCIC) System is discussed in the section on TS 3.5.3. *NOTE: Some licensees may choose to assign a different number to this new TS. This is an acceptable alternative.*

## 3.4 TS 3.3.5.2, REACTOR PRESSURE VESSEL WATER INVENTORY CONTROL INSTRUMENTATION

The purpose of the RPV Water Inventory Control Instrumentation is to support the requirements of new TS LCO 3.5.2, and the definition of drain time. There are instrumentation and controls that are required for manual initiation or required as a permissive or operational controls on the equipment of the systems that provide water injection capability, certain start commands, and isolation functions. These instruments are required to be operable if the systems that provide water injection and isolation functions are to be considered operable as described in the safety evaluation of new TS 3.5.2. In some cases the reactor operators have alternate, often more complex means, of starting and injecting water than the preferred simple push button start.

*For BWR/4 plants choose:*
**[Specifically, the RPV Water Inventory Control Instrumentation supports operation of the Core Spray and LPCI including manual initiation when needed as well as the system isolation of the RHR system and the RWCU system. The equipment involved with each of these systems is described in the evaluation of TS 3.5.2 and the Bases for LCO 3.5.2.]**

*For BWR/6 plants choose:*
**[Specifically, the RPV Water Inventory Control Instrumentation supports operation of the LPCI with subsystems LPCI A, LPCI B, and LPCI C, LPCS, and HPCS, including manual initiation when needed as well as the system isolation of the RHR system and the RWCU system. The equipment involved with each of these systems is described in the evaluation of TS 3.5.2 and the Bases for LCO 3.5.2.]**

3.4.1 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."

Section 3.3.1 of TSTF-542, states:

> 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.

3.4.2 Proposed TS 3.3.5.2 Actions

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

TSTF-542, Section 3.3.2, “Proposed TS 3.3.5.2 Actions,” discusses the actions of TS 3.3.5.2 and LCO 3.3.5.2. The NRC staff finds these actions are sufficient and necessary, because when one or more instrument channels are inoperable the equipment and function controlled by these instruments cannot complete the required function in the normal manner and these actions direct the licensee to take appropriate actions as necessary and enter immediately into the Conditions referenced in Table 3.3.5.2-1. These actions satisfy the requirements of 10 CFR 50.36(c)(3) by providing a remedial action permitted by the TS until the LCO can be met. The remedial actions provide reasonable assurance that an unexpected draining event can be prevented or mitigated before the RPV water level would be lowered to the TAF.

*For BWR/4 plants choose the following Section 3.4.3:*

3.4.3 Proposed TS 3.3.5.2 Actions

TSTF-542, Section 3.3.2, “Proposed TS 3.3.5.2 Actions,” discusses the actions of TS 3.3.5.2 and LCO 3.3.5.2. The NRC staff finds these actions are sufficient and necessary, because when one or more instrument channels are inoperable the equipment and function controlled by these instruments cannot complete the required function in the normal way, and these actions

direct the licensee to take appropriate actions as required. The actions provide reasonable assurance that an unexpected draining event can be prevented or mitigated before the RPV water level would be lowered to the TAF.

Action A is applicable when one or more instrument channels are inoperable from Table 3.3.5.2-1 and directs the licensee to immediately enter the Condition referenced in Table 3.3.5.2-1 for that channel.

Action B (concerning the RHR system Isolation and RWCU system Isolation functions) are applicable when automatic isolation of the associated penetration flow path is credited as not having to be considered as a path for potential drainage 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 a re-calculation of drain time, but automatic isolation of the affected penetration flow paths cannot be credited.

Action C (concerning low reactor steam dome pressure permissive Functions necessary for ECCS subsystem manual initiation) addresses an event in which the permissive is inoperable and manual initiation of ECCS using the control board pushbuttons is prevented. The function must be placed in the trip condition within one hour. With the permissive function instrument in the trip condition, manual initiation may now be performed using the preferred control board pushbuttons. This one-hour completion time is acceptable, because despite the preferred start method being prevented, the reactor operator can take manual control of the pump and the injection valve to inject water into the RPV and achieve the safety function. The time of one hour also provides reasonable time for evaluation and placing the channel in trip.

Action D (concerning pump discharge flow bypass Functions and the manual initiation Functions) addresses actions when the bypass is inoperable and then 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. Similar to justification in Action C, while this is not the preferred method, if a manual initiation function is inoperable, the ECCS subsystem pumps can be started manually and the valves can be opened manually. The 24-hour completion time is acceptable, because the functions can be performed manually and it allows time for the operator to evaluate and have necessary repairs completed. Unlike the failure of a pushbutton that may concern electronic component repairs, mechanical components may be involved in repairs, testing, and return to service of pumps and valves. This further justifies a 24-hour completion time as appropriate.

Action E is needed and becomes necessary, if the required action and associated completion time of Condition C or D, are not met. If they are not met, then 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.**]**

*For BWR/6 plants choose the following Section 3.4.3:*

3.4.3 Proposed TS 3.3.5.2 Actions

TSTF-542, Section 3.3.2, “Proposed TS 3.3.5.2 Actions,” discusses the actions of TS 3.3.5.2 and LCO 3.3.5.2. The NRC staff finds these actions are sufficient and necessary, because

when one or more instrument channels are inoperable the equipment and function controlled by these instruments cannot complete the required function in the normal way and these actions direct the licensee to take appropriate actions as required. The remedial actions provide reasonable assurance that an unexpected draining event can be prevented or mitigated before the RPV water level would be lowered to the TAF.

Action A is applicable when one or more instrument channels are inoperable from Table 3.3.5.2 and directs the licensee to immediately enter the condition referenced in Table 3.3.5.2-1 for that channel.

Action B (concerning the RHR system isolation and RWCU system isolation functions) are applicable when automatic isolation of the associated penetration flow path is credited as not having to be considered as a path for potential drainage 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 a re-calculation of drain time, but automatic isolation of the affected penetration flow paths cannot be credited.

Action C (concerning low reactor steam dome pressure permissive Functions necessary for ECCS subsystem manual initiation) addresses an event in which the permissive is inoperable and manual initiation of ECCS using the control board pushbuttons is prevented. The function must be placed in the trip condition within one hour. With the permissive function instrument in the trip condition, manual initiation may now be performed using the preferred control board pushbuttons. This one hour completion time is acceptable, because despite the preferred start method being prevented, the reactor operator can take manual control of the pump and the injection valve to inject water into the RPV and achieve the safety function. The time of one hour also provides reasonable time for evaluation and placing the channel in trip.

Action D (concerning loss of adequate water supply for the HPCS System), addresses an event in which there is an inadequate water supply. The instrumentation functions have the ability to detect low-water setpoint in the Condensate Storage Tank and actuate valves to realign HPCS suction water source to the Suppression Pool. The Condensate Storage Tank Level - Low Function indicates multiple, inoperable channels within the same Function resulting in a loss of the automatic ability to swap suction to the Suppression Pool. The HPCS system must be declared inoperable within one hour or the HPCS pump suction must be realigned to the Suppression Pool, since, if realigned, the Function is already performed. This one hour is acceptable, because it provides sufficient time to take the action in order to minimize the risk of HPCS being needed without an adequate water source by allowing time for restoration or alignment of the HPCS pump suction to the suppression pool.

Action E (concerning HPCS high water level Function in the RPV) addresses actions when this instrument function is inoperable. HPCS Reactor Vessel Water Level - High, Level 8 function 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 that case the HPCS System must be declared inoperable within one hour, and the function must be restored to operable status within 24 hours. The one hour completion time is acceptable, because of the ability to manually start the HPCS pumps and open the discharge valve. The 24-hour

completion time is acceptable, because it allows time for the operator to evaluate and arrange for repairs.

Action F (concerning pump discharge flow bypass Functions and the manual initiation Functions) addresses an event in which the bypass is inoperable and 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. Similar to justification in Action C, while this is not the preferred method, if a manual initiation function is inoperable, the ECCS subsystem pumps can be started manually and the valves can be opened manually. The 24-hour completion time is acceptable, because the functions can be performed manually and it allows time for the operator to evaluate and have necessary repairs completed. Unlike the failure of a pushbutton that may concern electronic component repairs, mechanical components may be involved in repairs, testing, and return to service of pumps and valves further justifying a 24-hour completion time as appropriate.

Action G is needed and becomes necessary, if the required action and associated completion time of Condition C, D, E, or F are not met. If they are not met, then 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.

3.4.4 Proposed TS 3.3.5.2 Surveillances

The TS 3.3.5.2 SR include Channel Checks, Channel Functional Tests, and Logic System Functional Tests. There are three SRs numbered SR 3.3.5.2.1, SR 3.3.5.2.2, and SR 3.3.5.2.3. The NRC staff finds these tests are sufficient and adequate, because they are essential to ensure the Functions of TS 3.3.5.2 are operable (i.e., capable of performing the specified safety function in support of TS 3.5.2, Drain Time, and the protection from a potential drain down of the RPV in Modes 4 and 5). The NRC staff finds the proposed TS 3.3.5.2 surveillances of LCO 3.5.2 as described in Section 3.3.3 satisfies 10 CFR 50.36(c)(3) by providing the specific SRs relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained.

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 related channels. A Channel Check is significant in assuring that there is a low probability of an undetected complete channel failure and is a key safety practice 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 and supports operating shift situational awareness.

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. It is performed on each required channel to ensure that the entire channel will perform the intended function. The frequency is in accordance with the Surveillance Frequency Control Program or 92 days. The applicant states, “This is acceptable

because it is consistent with the existing requirements for these Functions and is based upon operating experience that demonstrates channel failure is rare." Since periods in MODEs 4 and 5 as refueling outages are often in the order of 30 days or less, licensees could include this SR, if desired, as part of a refueling activity.

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 TSTF-542, Section 3.2.4.6, states:

> 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.

There are no SRs included to verify or adjust the instrument setpoint derived from the allowable value using a Channel Calibration or a surveillance to calibrate the trip unit. TSTF-542, Section 3.3.3, states,

> 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.

And:

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

This is acceptable, because this is adequate to ensure the channel responds with the required pumping systems to inject water when needed and isolation equipment to perform when commanded.

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. TS 3.3.5.2 does not include SRs to participate in any ECCS Response Time testing and Isolation System Response Time testing. This is acceptable because the purpose of these tests are to ensure that the individual channel response times are less than or equal to the maximum values assumed in the accident analysis, but a draining event in Mode 4 or 5 is not an analyzed accident and, therefore, there are no accident analysis assumptions on response time and there are alternate manual methods for achieving the safety function. A potential draining event in MODEs 4 and 5 is a slower event than a LOCA. More significant protective actions are required as the calculated drain time decreases.

3.4.5 Conclusion of NRC Staff Review of TS 3.3.5.2

The NRC staff finds that proposed TS 3.3.5.2 and LCO 3.3.5.2 satisfies Criterion 4 of 10 CFR 50.36(c)(3), because specific instrumentation is provided that helps prevent or mitigate a potential RPV drain down event. 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 draining event in Mode 4 Instrumentation in BWRs," May 1993.

The NRC staff finds that proposed LCO 3.3.5.2 correctly specifies the lowest functional capability or performance levels of equipment required for safe operation of the facility. There is reasonable assurance that the required actions to be taken when the LCO is not met can be conducted without endangering the health and safety of the public.

3.5 TABLE 3.3.5.2-1, "RPV WATER INVENTORY CONTROL INSTRUMENTATION"

In order to support the requirements of TS 3.5.2, and LCO 3.5.2, “Reactor Pressure Vessel (RPV) Water Inventory Control,” and the definition of “DRAIN TIME”; the instrumentation requirements are designated in Table 3.3.5.2-1. These instruments are required to be operable if the systems that provide water injection and isolation functions are to be considered operable as described in the NRC staff’s evaluation of TS 3.5.2.

Table 3.3.5.2-1 specifies the instrumentation that shall be operable for each function in the table for Modes 4 and 5 (or other specified conditions), the required number of channels per function, conditions referenced from required action A.1, SR for the functions, **[the allowable value** (*removed this if version B*)**]**, and footnotes concerning items of the table.

*Note: Table 3.3.5.2-1 version A has a column for the allowable value. Version A has the allowable value in brackets. The brackets indicate that a plant-specific value should be used in*

*the LAR to adopt TSTF-542. Table 3.3.5.2-1 version B does not have a column for the allowable value.*

Proposed Table TS 3.3.5.2-1, 'RPV Water Inventory Control Instrumentation,' presents details on the functions required to support the equipment and functions of TS 3.5.2. The NRC staff finds the presentation in this table acceptable, because this section sufficiently discusses the purpose of the functions, the applicability, the number of required channels, the references to the Condition to be entered by letter (e.g., A, B, C) if the function is inoperable, the applicable SRs, **[the selection of the allowable value]**, and justification of differences between the existing and proposed TS functions. This RPV Water Inventory Control Instrumentation set is acceptable, because it is adequate to ensure the instruments of the channels responds with the required accuracy permitting pumps systems to operate to inject water when needed and isolation of equipment when commanded to support the prevention of or mitigate a potential RPV draining event.

Each of the ECCS subsystems in MODEs 4 and 5 are initiated by manual pushbutton. Automatic initiation of an ECCS injection/spray subsystem may be undesirable because it could lead to overflowing the RPV cavity, due to injection rates of thousands of gallons per minute. Thus, there is adequate time to take manual actions (e.g., hours versus minutes). Considering the action statements as the drain time decreases (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 reactor 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 as needed. Consequently, there is no need for automatic initiation of ECCS to respond to an unexpected draining event. This is acceptable, because a draining event is a slow evolution when compared to a design basis LOCA assumed to occur at a significant power level.

*For BWR/4 choose the following Section 3.5.1:*

3.5.1 Proposed Table 3.3.5.2-1, Functions

For the Table 3.3.5.2-1 Functions 1.a and 2.a, BWR/4 CS and LPCI Systems, Reactor Steam Dome Pressure - Low (Injection Permissive), these signals are used as permissives and protection for these low pressure ECCS injection/spray subsystem manual initiation functions. This function ensures that the reactor pressure has fallen to a value below these subsystems' maximum design pressure before permitting the operator to open the injection valves of the low pressure ECCS subsystems. Even though during MODEs 4 and 5 the reactor steam dome pressure is expected to virtually always be below the ECCS maximum design pumping pressure, the Reactor Steam Dome Pressure - Low signals are required to be operable and capable of permitting initiation of the ECCS.

For the Table 3.3.5.2-1 Functions 1.b and 2.b, CS and LPCI Systems, Pump Discharge Flow - Low (Bypass), these minimum flow instruments are provided to protect the associated low pressure ECCS pumps 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. *Use for Version "A" TS:* **[**Where applicable, allowable values specified 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.**]** The LPCI minimum flow valves are time delayed such that the valves will not open for 10 seconds after

the switches detect low flow. This time delay is acceptable, because it is provided to limit reactor vessel inventory loss during the startup of the RHR shutdown cooling mode.

For the Table 3.3.5.2-1 Functions 1.c and 2.c, CS System Manual Initiation and LPCI, System Manual Initiation, the manual initiation pushbutton 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. An instrument 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.

For the Table 3.3.5.2-1 Function 3.a, RHR System Isolation, Reactor Vessel Water Level - Low, Level 3, the function is only required to be operable when automatic isolation of the associated penetration flow path is credited in the drain time calculation. The number of required instrument channels is **[2 in one trip system]**, which retains the requirement that the two instrument channels must be associated with the same trip system. Each trip system isolates one of two redundant isolation valves, and only one trip system is required to be operable to ensure that automatic isolation of one of the two isolation valves will occur on low reactor vessel water level indication. *Use for Version "A" TS:* **[**The allowable value was chosen to be the same as the Primary Containment Isolation Instrumentation Reactor Vessel Water Level - Low, Level 3 Allowable Value from LCO 3.3.6.1.**]**

For the Table 3.3.5.2-1 Function 4.a, RWCU, System Isolation, Reactor Vessel Water Level - Low Low, Level 2, the function is only required to be operable when automatic isolation of the associated penetration flow path is credited in the drain time calculation. The number of required channels is **[2 in one trip system]**, which retains the requirement that the two instrument channels must be associated with the same trip system. Only one trip system is required to be operable to ensure that automatic isolation of one of the two isolation valves will occur on low reactor vessel water level. *Use for Version "A" TS:* **[**Allowable value was chosen to be the same as the ECCS Reactor Vessel Water Level - Low Low, Level 2 Allowable Value from LCO 3.3.5.1.**]**

*For BWR/6 choose the following Section 3.5.2:*

3.5.2 Proposed Table 3.3.5.2.-1, Functions

For the Table 3.3.5.2-1 Functions 1.a and 2.a, LPCS and LPCI Systems, Reactor Steam Dome Pressure - Low (Injection Permissive), these signals are used as permissives and protection for these low pressure ECCS injection/spray subsystem manual initiation functions. This function ensures that the reactor pressure has fallen to a value below these subsystems' maximum design pressure before permitting the operator from opening the injection valves of the low pressure ECCS subsystems. Even though during MODEs 4 and 5 the reactor steam dome pressure is expected to virtually always be below the ECCS maximum design pumping pressure, the Reactor Steam Dome Pressure - Low signals are required to be operable and capable of permitting initiation of the ECCS.

For the Table 3.3.5.2-1 Functions 1.b, 1.c, and 2.b, LPCS and LPCI Systems Low Pressure Coolant Injection and Low Pressure Core Spray Pump Discharge Flow - Low (Bypass), these 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. *Use for Version "A" TS:* **[**Where applicable allowable values specified 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.**]**

For the Table 3.3.5.2-1 Functions 1.d and 2.c, LPCS and LPCI Systems, Manual Initiation, the manual initiation pushbutton channels introduce signals into the appropriate ECCS logic to provide manual initiation capability. There is one pushbutton for each subsystem in the two divisions of low pressure ECCS (i.e., Division 1 ECCS, LPCS and LPCI A; Division 2 ECCS, LPCI B and LPCI C). There are four subsystems, thus four pushbuttons for the low pressure ECCS. The only manual initiation function required to be operable is that associated with the ECCS subsystem that is required to be operable by LCO 3.5.2. *Use for Version "A" TS:* **[**Since the channels are mechanically actuated based solely on the position of the pushbuttons, there is no allowable value for this function.**]** When this instrument function is inoperable, manual initiation with the control board push buttons is inoperable. However, the ECCS pumps can be started manually and valves can be opened manually by the reactor operator. This is not the preferred condition.

For the Table 3.3.5.2-1 Functions 3.a, HPCS 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). One instrument channel associated with the HPCS system is required to be operable to support LCO 3.5.2. *Use for Version "A" TS:* **[**The LCO 3.3.5.2 allowable value is chosen to isolate flow from the HPCS system prior to water overflowing into the MSLs.**]**

For the Table 3.3.5.2-1 Functions 3.b, HPCS System, Condensate Storage Tank Level – Low, the low level signal in the Condensate Storage Tank (CST) indicates the lack of an adequate supply of makeup water from this primary source for HPCS. Normally, the water source for the suction for HPCS is the CST. If the water level in the CST falls below a preselected level, instrumentation logic controls valves so suction is then pulled from the Suppression Pool. First the Suppression Pool suction valve is automatically opened and then the CST suction valve is automatically closed in a manner to ensure that an adequate supply of makeup water is available to the HPCS pump. The Condensate Storage Tank Level - Low signals are initiated from two level transmitters. 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.

For the Table 3.3.5.2-1 Functions 3.c and 3.d, HPCS 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).

For the Table 3.3.5.2-1 Function 3.e, HPCS System, Manual Initiation, the Manual Initiation push button channel introduces a signal into the HPCS logic to provide manual initiation capability. There is one pushbutton for the HPCS system.

For the Table 3.3.5.2-1 Function 4.a, BWR/6 RHR System Isolation, Reactor Vessel Water Level - Low, Level 3, the Function is only required to be operable when automatic isolation of the associated RHR system penetration flow path is credited in calculating drain time. 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 dropping below the TAF, but if the instrument function is inoperable, a closed path cannot be credited and a drain time calculation must be re-performed.

For the Table 3.3.5.2-1 Function 5.a, RWCU System Isolation, Reactor Vessel Water Level - Low Low, Level 2, the Function is only required to be Operable when automatic isolation of the associated RWCU system penetration flow path is credited in calculating drain time. 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 dropping below the TAF, but if the instrument function is inoperable, a closed path cannot be credited and a drain time calculation must be re-performed. 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.

## 3.6 OTHER DIFFERENCES BETWEEN THE CURRENT AND PROPOSED TS REQUIREMENTS

Sections **[2.3.3.3 through 2.3.3.5]** *[NOTE: If there are licensee specific changes, adjust section reference as needed]* of this SE describe additional changes to the TSs in which references to OPDRVs are deleted. The NRC staff has determined that deletion of these references is appropriate because the specifications governing Reactor Pressure Vessel Water Inventory Control and associated Instrumentation specifications provide an acceptable alternative set of controls for ensuring water level is maintained above the TAF.

## 3.7 TS 3.5.2 – REACTOR PRESSURE VESSEL (RPV) WATER INVENTORY CONTROL REVIEW CONCLUSIONS

Safety Limit 2.1.1.3 requires that reactor vessel water level shall be greater than the top of active irradiated fuel. Maintaining water level above the TAF ensures that the fuel cladding fission product barrier is protected during shutdown conditions. The changes to the TS establish new LCO requirements that address the preventive and mitigative equipment and associated instrumentation that provide an alternative means to support Safety Limit 2.1.1.3 during MODE 4 and 5 operations.

*NOTE: NRC staff shall confirm statements in this paragraph are true for the plant. This information should be available in the plant's LAR or FSAR.*
LOCAs are 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. During operation in Modes 4 and 5, the reactor coolant system is at a low operating temperature (<200 degrees Fahrenheit) and is depressurized. An event involving a loss of inventory while in the shutdown condition is judged to not exceed the

capacity of one ECCS subsystem. The accidents that are postulated to occur during shutdown conditions, the Fuel Handling Accident and the Waste Gas Decay Tank Rupture, do not involve a loss of inventory. The equipment and instrumentation associated with the Reactor Vessel Water Inventory Control TS do not provide detection or mitigation related to these design basis accidents.

The revised TS LCO 3.5.2 contains requirements for operability of one ECCS subsystem along with requirements to maintain a sufficiently long drain time that plant operators would have time to diagnose and mitigate an unplanned draining event. The NRC staff has determined that the LCO 3.5.2 and 3.3.5.2 provide for the lowest functional capability or performance levels of equipment required for safe operation of the facility, and therefore, meet the LCO requirements of 10 CFR 50.36(c)(2)(i).

Additionally, the revised TS LCOs 3.5.2 and 3.3.5.2 provide remedial actions to be taken in the event the LCO is not satisfied, therefore meeting the requirements of 10 CFR 50.36(c)(2)(i). The NRC staff has found that the remedial actions provide reasonable assurance that an unexpected draining event can be prevented or mitigated before the RPV water level would be lowered to the TAF.

The regulation at 10 CFR 50.36(c)(3) requires TSs to include items in the category of SRs, which 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 LCOs will be met. The NRC staff reviewed the SRs associated with the new LCOs 3.5.2 and 3.3.5.2. The NRC staff reviewed the revised SRs and determined that they are appropriate for ensuring the operability of the equipment and instrumentation specified in LCOs 3.5.2. Therefore, the NRC staff concludes that the requirements of 10 CFR 50.36(c)(3) are met.

*NOTE: NRC staff shall confirm that the licensee did provide TS Bases consistent with the STS Bases changes approved in TSTF-542 and that the any bracketed information in the STS Bases has been filled in with plant-specific information.*

The regulation at 10 CFR 50.36(a)(1) states that 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 TSs. In accordance with the 10 CFR 50.36(a)(1) requirement, the licensee provided TS Bases changes in Attachment 4 of the licensee's amendment request. The NRC staff has concluded that the TS Bases changes provided describe the basis for the affected TS and follow the Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors (58 Federal Register 39132).

The NRC staff's guidance for review of TSs is in Chapter 16, *Technical Specifications*, of NUREG-0800, Revision 3, *Standard Review Plan* (March 2010) (ADAMS Accession No. ML100351425). As described therein, as part of the regulatory standardization effort, the NRC staff has prepared STS for each of the light–water reactor nuclear designs. *For BWR/4 plants:* **[NUREG-1433, Revision 4, contains the STS for BWR/4 plants.]** *For BWR/6 plants:* **[NUREG 1434, Revision 4, contains the STS for BWR/6 plants.]** The changes to the TS were reviewed for technical clarity and consistency with customary terminology and format with the existing requirements. The staff found that the proposed changes were consistent with TSTF-542 and **[NUREG-1433]** *or* **[NUREG-1434]**.

3.8 TECHNICAL CONCLUSION

The NRC staff evaluated the proposed changes to the TS of proposed drain time definition and TS 3.5.2 related to RPV WIC and TS 3.3.5.2 which contains the instrumentation necessary to support TS 3.5.2. Based on the considerations discussed above, the NRC staff concludes that the proposed revisions to the TS via adding a “DRAIN TIME” definition and TS 3.5.2 and TS 3.3.5.2 respectively are acceptable.

*NOTE: Include other TS changes as necessary.*

## 4.0 STATE CONSULTATION

*This section is to be prepared by the PM.*

*The requirements with respect to State consultation are contained in 10 CFR 50.91(b). 10 CFR 50.91(b)(3) and (b)(4) require that: (1) the NRC make a good faith effort to telephone the State official, prior to amendment issuance, to determine if the State has any comments; and (2) consider any comments of the State official. If there are State comments, they should be addressed in this section. Comments received from members of the public should be addressed within the technical evaluation section or in a separate section of the safety evaluation. See ADAMS Accession No. ML102710156 (Safety Evaluation Section 5.0, “Public Comments”) for an example of a safety evaluation which addresses public comments.*

In accordance with the Commission's regulations, the **[Name of State]** State official was notified of the proposed issuance of the amendment. The State official had **[no]** comments. **[If comments were provided, they should be addressed here.]**

## 5.0 ENVIRONMENTAL CONSIDERATION

*This section is to be prepared by the PM in accordance with current procedures.*

## 6.0 CONCLUSION

*This section is to be prepared by the PM.*

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

## 7.0 REFERENCES

*Optional section to be prepared by the PM and primary reviewers. If document is publicly available, the ADAMS Accession No. should be listed.*

Principal Contributor:

Date: October 6, 2016