November 2, 2016

TSTF-16-10
PROJ0753

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

SUBJECT: TSTF Comments on Draft Safety Evaluation for Traveler TSTF-542, Revision 2, "Reactor Pressure Vessel Water Inventory Control," and Transmittal of Editorial Corrections to TSTF-542, Revision 2.

REFERENCE: Letter from Kevin Hsueh (NRC) to the TSTF, "Draft Safety Evaluation of Technical Specifications Task Force Traveler TSTF-542, Revision 2, 'Reactor Pressure Vessel Water Inventory Control'," dated October 6, 2016 (ADAMS Accession No. ML16175A394).

On March 14, 2016, the TSTF submitted traveler TSTF-542, Revision 2, "Reactor Pressure Vessel Water Inventory Control," to the Nuclear Regulatory Commission (NRC) for review (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16074A448). In the referenced letter, the NRC provided the draft Safety Evaluation (SE) for TSTF-542 for comment.

Attachment 1 contains a summary table and mark-up providing the TSTF's comments on the draft SE for TSTF-542. Attachment 2 contains a summary table and mark-up providing the TSTF's comments on the draft model SE for plant-specific adoption. Attachment 3 contains a summary table and revised pages of editorial corrections for TSTF-542, Revision 2, identified during the SE review. A complete copy of TSTF-542, Revision 2, with the editorial corrections incorporated is enclosed.

11921 Rockville Pike, Suite 100, Rockville, MD 20852
Phone: 301-984-4400, Fax: 301-984-7600
Administration by EXCEL Services Corporation

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

James R. Morris (PWROG/W)

Ryan Joyce for Lisa L. Williams (BWROG)

Otto W. Gustafson (PWROG/CE)

Michael K. Leisure (PWROG/B&W)

Jason Redd (APOG)

Attachment 1 TSTF Comments on the TSTF-542 Draft Safety Evaluation
Attachment 2 TSTF Comments on the TSTF-542 Draft Model Safety Evaluation for Plant-Specific Adoption
Attachment 3 Editorial Corrections to TSTF-542, Revision 2
Enclosure TSTF-542, Revision 2 (with editorial corrections incorporated)

cc: Michelle Honcharik, Technical Specifications Branch, NRC
Alex Klein, Technical Specifications Branch, NRC

Attachment 1

TSTF Comments on the TSTF-542 Draft Safety Evaluation

Summary Table of TSTF Comments

Section and Location	Comment
--	Generic Comment 1: The traveler revises NUREG-1433, BWR/4 STS, and NUREG-1434, BWR/6 STS. However, the NUREGs are also applicable to BWR/2, BWR/3, and BWR/5 plants. For clarity, the TSTF-542 SE, which considers only the changes to the STS NUREGs, is revised in multiple locations to refer only to the NUREGs and not to BWR/4 and BWR/6 plants.
1, page 1, lines 10-14	Revised the introduction to refer to a "Traveler" instead of a "Change Traveler," consistent with the traveler titles.
1, page 1, line 24	Made "specifications" lower case
2.2, page 2, line 34	Added missing word "fuel"
2.2, page 2, line 34	Changed from "control blades" to "control rods" to be consistent with the STS nomenclature.
2.2, page 2, line 35-36	Revised the sentence to not imply that a potential to drain will result in loss of core cooling.
2.2, page 2, line 40-44	The Modes for BWRs are combinations of reactor mode switch position and reactor coolant temperature. Changes are made to be consistent with Table 1-1 of the STS. Mode 3 for a BWR is Hot Shutdown, not Hot Standby.
2.2, page 3, line 1	Changed "can" to "will" to be consistent with the system design.
2.2, page 3, line 6-8	The Modes for BWRs are combinations of reactor mode switch position and reactor coolant temperature. Changes are made to be consistent with Table 1-1 of the STS.
2.3.1, page 4, lines 25 and 27	Revised the definition to be consistent with TSTF-542.
2.3.2.6, page 11	Formatted Note b to SR 3.5.2.2 to be consistent with TSTF-542.
2.3.2.6, page 14	Revised SR 3.5.2.3 to number subparts a and b vice c and d.
2.3.3, page 15, line 10	Added "licensee-controlled" Setpoint Control Program for accuracy. The Allowable Value is in the licensee-controlled program, not the TS program.
2.3.3.2, page 16, line 22	Changed "current TS" to "current STS" as the SE is evaluating a change to the STS.

Section and Location	Comment
2.3.3.2.2.1, page 17, line 25	Added missing word "pressure"
2.3.3.2.4, page 25, lines 5, 8, 22-23	Change capitalization of "Required Actions" and "Completion Times" to be consistent with the rest of the document. Missing word "Required" added.
3.1, page 29, line23	Clarifies that the Drain Time assumes that the licensee takes no action to mitigate the event.
3.4.3, page 34, lines 15-17	Clarified the discussion of Action B. Note (b) under Applicability for these functions specifically says they are required when credited in calculating Drain Time.
3.4.3, page 34, lines 46-47	Change capitalization of "Required Actions" and "Completion Times" to be consistent with the rest of the document.
3.4.4, page 35, lines 21-23	Clarified the discussion of Action B. Note (b) under Applicability for these functions specifically says they are required when credited in calculating Drain Time.
3.4.4, page 36, lines 28-29	Change capitalization of "Required Actions" and "Completion Times" to be consistent with the rest of the document.
3.5, page 39, line 14	Change capitalization of "Required Action" to be consistent with the rest of the document.
3.7, page 44, line 8	The 200°F temperature for Modes 4 and 5 is bracketed in the STS. Brackets are added to the discussion.
Bases discussion, 3.1, page 4, lines 16-18, 25-26	Revised discussion to match the Bases.
Bases discussion, 3.1, page 4, line 21	Capitalized the initial letter in "Pump" to reflect the function title.
Bases discussion, 3.1, page 4, line 41and page 5, line 1	Changed "valves" to "valve." There is only a single suction valve for CST and for Suppression Pool.

Section and Location	Comment
Bases discussion, 3.1, page 5, lines 10-12	Revised discussion to match the Bases.
Bases discussion, 3.1, page 5, line 41	Revised Function numbers to match the Bases.
Bases discussion, 3.1, page 6, line 14 and page 7, line 8	Corrected reference from "minimum flow valves" to "injection valves." The Bases do not describe the minimum flow valves for this action.
Bases discussion, 3.1, page 7, line 38	Corrected document title capitalization.
Bases discussion, 3.2, page 10, line 40	Corrected capitalization of 10 CFR 50.54(f).
Bases discussion, 3.3.4, page 12, lines 22-26	Revised introduction as not all Bases changes on the list were related to the two listed topics. 3.3.6.1, Primary Containment Isolation Instrumentation, was discussed in Section 3.2.2. 3.3.6.2, Secondary Containment Isolation Instrumentation, was not discussed and should be listed. TS 3.3.7.1, MCREC System Instrumentation, should be listed.

Draft Safety Evaluation Mark-Up

Technical Specifications Task Force
11921 Rockville Pike, Suite 100
Rockville, MD 20852

SUBJECT: DRAFT SAFETY EVALUATION OF TECHNICAL SPECIFICATIONS TASK FORCE TRAVELER TSTF-542, REVISION 2, "REACTOR PRESSURE VESSEL WATER INVENTORY CONTROL" (TAC NO. MF3487)

Dear Members of the Technical Specifications Task Force:

By letter dated March 14, 2016 (Agencywide Documents Access and Management System Accession No. ML16074A448), the Technical Specifications Task Force submitted to the U.S. Nuclear Regulatory Commission (NRC) for review and approval traveler TSTF-542, Revision 2, “Reactor Pressure Vessel Water Inventory Control.” The NRC staff's draft safety evaluation (SE) of the traveler and a draft model SE are enclosed.

Twenty working days are provided to you to comment on any factual errors or clarity concerns contained in the draft SE. The final SE will be issued after making any necessary changes. The NRC staff's disposition of your comments on the draft SE will be discussed in the final SE. To facilitate the NRC staff's review of your comments, please provide a marked-up copy of the draft SE showing proposed changes and provide a summary table of the proposed changes.

If you have any questions, please contact Michelle Honcharik at 301-415-1774 or via e-mail at Michelle.Honcharik@nrc.gov.

Sincerely,

Kevin Hsueh, Chief
Licensing Processes Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Project No. 753

Enclosures:
As stated

cc: See next page

Technical Specifications Task Force
11921 Rockville Pike, Suite 100
Rockville, MD 20852

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If you have any questions, please contact Michelle Honcharik at 301-415-1774 or via e-mail at Michelle.Honcharik@nrc.gov.

Sincerely,

Kevin Hsueh, Chief
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ADAMS Accession No.: Package: ML16250A231, Cover letter and draft traveler SE: ML16175A394, draft model SE: ML16250A206; *concurred via e-mail **NRR-106**

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DRAFT 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 letter dated December 31, 2013 (Agencywide Document Access and Management System (ADAMS) Accession No. ML14002A112), the Technical Specifications (TS) Task Force (TSTF) submitted ~~Change~~ Traveler TSTF-542, "Reactor Pressure Vessel Water Inventory Control," Revision 0, for U.S. Nuclear Regulatory Commission review and approval. By letter dated September 15, 2015, the TSTF submitted Revision 1 to ~~Change~~ Traveler TSTF-542 (ADAMS Accession No. ML15258A850), and by letter dated March 14, 2016, submitted Revision 2 to ~~Change~~ Traveler ~~TSTF~~ *TSTF-*542 (ADAMS Accession No. ML16074A448). Traveler TSTF-542 proposes changes to the Standard Technical Specifications (STS) and Bases for boiling water reactor (BWR) designs BWR/4 and BWR/6.[1] The changes would be incorporated into future revisions of NUREG-1433, Volumes 1 and 2 and NUREG-1434, Volumes 1 and 2. *NUREG-1433 is based on the BWR/4 plant design, but is also representative of the BWR/2, /3, and, in some cases, BWR/5 designs. NUREG-1434 is based on the BWR/6 plant design, and is representative, in many cases, of the BWR/5 design.*

The proposed changes would replace the existing ~~BWR/4 and BWR/6~~ Specifications related to "operations with a potential for draining the reactor vessel" (OPDRVs) with revised ~~Specifications~~ *specifications* for Reactor Pressure Vessel Water Inventory Control (RPV WIC).

Throughout this safety evaluation (SE), items that are enclosed in square brackets signify plant-specific nomenclature or values. Individual licensees would furnish site-specific nomenclature or values for bracketed items when submitting a license amendment request (LAR) to adopt the changes described in this SE.

[1] U.S. Nuclear Regulatory Commission, "Standard Technical Specifications, General Electric BWR/4 Plants," NUREG-1433, Vol. 1, "Specifications," Rev. 4.0, April 2012, ADAMS Accession No. ML12104A192.

U.S. Nuclear Regulatory Commission, "Standard Technical Specifications, General Electric BWR/4 Plants," NUREG-1433, Vol. 2, "Bases," Rev. 4.0, April 2012, ADAMS Accession No. ML12104A193.

U.S. Nuclear Regulatory Commission, "Standard Technical Specifications, General Electric BWR/6 Plants," NUREG-1434, Vol. 1, "Specifications," Rev. 4.0, April 2012, ADAMS Accession No. ML12104A195.

U.S. Nuclear Regulatory Commission, "Standard Technical Specifications, General Electric BWR/6 Plants," NUREG-1434, Vol. 2, "Bases," Rev. 4.0, April 2012, ADAMS Accession No. ML12104A196.

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 BWR reactor pressure vessels have a number of penetrations located below the top of active *fuel* (TAF). These penetrations provide entry for control ~~blades~~*rods*, recirculation flow, and shutdown cooling. Since these penetrations are below the TAF, this *creates a* ~~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~~ *Reactor Mode Switch* in ~~run~~*Run*), 2 (Startup ~~with reactor mode switch position~~ *Reactor Mode Switch* in ~~refuel~~*Refuel (with all reactor vessel head closure bolts fully tensioned)* or ~~startup/hot standby~~*Startup/Hot Standby*), and 3 (Hot ~~Standby with reactor mode switch position~~*Shutdown - Reactor Mode Switch* in ~~shutdown),~~ *Run and average reactor coolant temperature > [200] ºF),* the TS for instrumentation and emergency core cooling systems (ECCS) require operability of

sufficient equipment to ensure large quantities of water ~~can~~ *will* 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 *– Reactor Mode Switch in Shutdown with all reactor vessel head closure bolts fully tensioned and* ~~with~~ average reactor coolant temperature ≤ *[*200*]* °F), and Mode 5 (Refueling ~~- with o~~*O*ne or more reactor vessel head closure bolts less than fully tensioned *and Reactor Mode Switch in Shutdown or Refuel*), 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 the spent fuel storage pool gates are removed ~~for BWR/4 plants~~*in NUREG-1433*, or the upper containment pool is connected to the RPV ~~for BWR/6 plants~~*in NUREG-1434*.

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 BWR STS 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 SE are intended to resolve any ambiguity by creating a new RPV water inventory control TS with attendant equipment operability requirements, required actions and surveillance requirements (SR) and deleting references to OPDRVs throughout the TS.

2.3 CHANGES TO THE STS

The proposed changes would (1) provide a definition of a new term, DRAIN TIME; (2) revise and rename STS 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 STS. The descriptions of the proposed changes are provided in this section.

Corresponding changes are proposed to the STS Bases. A summary of the revised STS Bases and the staff's evaluation of the revised Bases are provided in an attachment of this SE.

2.3.1 Insertion of New Definition of DRAIN TIME

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

> The DRAIN TIME is the time it would take for the water inventory in and above the Reactor Pressure Vessel (RPV) to drain to the top of the active fuel (TAF) seated in the RPV assuming:
>
> a) The water inventory above the TAF is divided by the limiting drain rate;
>
> b) The limiting drain rate is the larger of the drain rate through a single penetration flow path with the highest flow rate, or the sum of the drain rates through multiple penetration flow paths susceptible to a common mode failure (e.g., seismic event, loss of normal power, single human error), for all penetration flow paths below the TAF except:
>
> 1. Penetration flow paths connected to an intact closed system, or isolated by manual or automatic valves *that* are locked, sealed, or otherwise secured in the closed position, blank flanges, or other devices that prevent flow ~~or~~ *of* reactor coolant through the penetration flow paths;
>
> 2. Penetration flow paths capable of being isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the TAF when actuated by RPV water level isolation instrumentation; or
>
> 3. Penetration flow paths with isolation devices that can be closed prior to the RPV water level being equal to the TAF by a dedicated operator trained in the task, who is in continuous communication with the control room, is stationed at the controls, and is capable of closing the penetration flow path isolation 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 STS 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

STS 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."

STS LCO 3.5.2 for NUREG-1433 ~~(BWR/4 STS)~~ 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 NUREG-1434 ~~(BWR/6) STS~~, the phrase “low pressure” is omitted because the ~~BWR/6~~ high pressure core spray system may be used to satisfy this requirement.

2.3.2.4 Applicability of TS LCO 3.5.2

For NUREG-1433 ~~(BWR/4)~~, 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 NUREG-1434 ~~(BWR/6)~~, 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 for NUREG-1433 ~~(BWR/4)~~ states:

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required ECCS injection/spray subsystem inoperable.	A.1 Restore required ECCS injection/spray subsystem to OPERABLE status.	4 hours
B. Required Action and associated Completion Time of Condition A not met	B.1 Initiate action to suspend operations with a potential for draining the reactor vessel (OPDRVs).	Immediately
C. Two required ECCS injection/spray subsystems inoperable.	C.1 Initiate action to suspend OPDRVs AND C.2 Restore one ECCS injection/spray subsystem to OPERABLE status	Immediately 4 hours
D. Required Action C.2 and associated Completion Time not met	D.1 Initiate action to restore [secondary] containment to OPERABLE status. AND D.2 [Initiate action to restore one standby gas treatment subsystem to OPERABLE status. AND	Immediately Immediately] Immediately

	D.3 Initiate action to restore isolation capability in each required [secondary] containment penetration flow path not isolated.	

The revised TS 3.5.2 Actions Table for NUREG-1433 ~~(BWR/4)~~ would state:

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required ECCS injection/spray subsystem inoperable.	A.1 Restore required ECCS injection/spray subsystem to OPERABLE status.	4 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Initiate action to establish a method of water injection capable of operating without offsite electrical power.	Immediately
C. DRAIN TIME < 36 hours and ≥ 8 hours.	C.1 Verify [secondary] containment boundary is capable of being established in less than the DRAIN TIME. <u>AND</u> C.2 Verify each [secondary] containment penetration flow path is capable of being isolated in less than the DRAIN TIME. <u>AND</u> C.3 Verify one standby gas treatment subsystem is capable of being placed in operation in less than the DRAIN TIME.	4 hours 4 hours 4 hours
D. DRAIN TIME < 8 hours.	D.1 ----------NOTE---------- Required ECCS injection/spray subsystem or additional method of water injection shall be capable of operating without offsite electrical power. ---------- Initiate action to establish an additional method of water injection with water sources capable of maintaining RPV water level > TAF for ≥ 36 hours.	 Immediately

	AND D.2 Initiate action to establish [secondary] containment boundary AND D.3 Initiate action to isolate each [secondary] containment penetration flow path or verify it can be manually isolated from the control room. AND D.4 Initiate action to verify one standby gas treatment subsystem is capable of being placed in operation.	Immediately Immediately Immediately
E. Required Action and associated Completion Time of Condition C or D not met. OR DRAIN TIME < 1 hour	E.1 Initiate action to restore DRAIN TIME to ≥ 36 hours	Immediately

The existing Actions Table of TS 3.5.2 for NUREG-1434 ~~(BWR/6)~~ states:

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required ECCS injection/spray subsystem inoperable.	A.1 Restore required ECCS injection/spray subsystem to OPERABLE status.	4 hours
B. Required Action and associated Completion Time of Condition A not met	B.1 Initiate action to suspend operations with a potential for draining the reactor vessel (OPDRVs).	Immediately
C. Two required ECCS injection/spray subsystems inoperable.	C.1 Initiate action to suspend OPDRVs AND C.2 Restore one ECCS injection/spray subsystem to OPERABLE status	Immediately 4 hours

D. Required Action C.2 and associated Completion Time not met	D.1 Initiate action to restore [secondary containment] to OPERABLE status. AND D.2 [Initiate action to restore one standby gas treatment subsystem to OPERABLE status. AND D.3 Initiate action to restore isolation capability in each required [secondary containment] penetration flow path not isolated.	Immediately Immediately] Immediately

The revised TS 3.5.2 ACTIONS Table for NUREG-1434 ~~(BWR/6)~~ would state:

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required ECCS injection/spray subsystem inoperable.	A.1 Restore required ECCS injection/spray subsystem to OPERABLE status.	4 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Initiate action to establish a method of water injection capable of operating without offsite electrical power..	Immediately
C. DRAIN TIME < 36 hours and ≥ 8 hours.	C.1 Verify [secondary containment] boundary is capable of being established in less than the DRAIN TIME. AND C.2 Verify each [secondary containment] penetration flow path is capable of being isolated in less than the DRAIN TIME. AND C.3 [Verify one standby gas treatment subsystem is capable of being placed in operation in less than the DRAIN TIME.	4 hours 4 hours 4 hours]

D. DRAIN TIME < 8 hours.	D.1 ----------NOTE---------- Required ECCS injection/spray subsystem or additional method of water injection shall be capable of operating without offsite electrical power. ---------- Initiate action to establish an additional method of water injection with water sources capable of maintaining RPV water level > TAF for ≥ 36 hours. <u>AND</u> D.2 Initiate action to establish [secondary containment] boundary <u>AND</u> D.3 Initiate action to isolate each [secondary containment] penetration flow path or verify it can be manually isolated from the control room. <u>AND</u> D.4 [Initiate action to verify one standby gas treatment subsystem is capable of being placed in operation.	 Immediately Immediately Immediately Immediately]
E. Required Action and associated Completion Time of Condition C or D not met. <u>OR</u> DRAIN TIME < 1 hour	E.1 Initiate action to restore DRAIN TIME to ≥ 36 hours.	Immediately

2.3.2.6 TS 3.5.2 Surveillance Requirements

The NUREG-1433 ~~(BWR/4)~~ TS 3.5.2 currently contains the following SRs:

SURVEILLANCE	FREQUENCY

SR 3.5.2.1	Verify, for each required low pressure coolant injection (LPCI) subsystem, the suppression pool water level is ≥ [12 ft 2 inches].	[12 hours OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.2	Verify, for each required core spray (CS) subsystem, the: a. Suppression pool water level is ≥ [12 ft 2 inches] or *b.* ----------NOTE---------- Only one required CS subsystem may take credit for this option during OPDRVS. ---------- Condensate storage tank water level is ≥ [12 ft].	[12 hours OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.3	Verify, for each required ECCS injection/spray subsystem, the piping is filled with water from the pump discharge valve to the injection valve.	[31 days OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.4	Verify each required ECCS injection/spray subsystem manual, power operated, and automatic valve in the flow path, that is not locked sealed, or otherwise secured in position, is in the correct position.	[31 days OR In accordance with the Surveillance Frequency Control Program]

The revised SRs for NUREG-1433 ~~(BWR/4)~~ would be:

SURVEILLANCE		FREQUENCY
SR 3.5.2.1	Verify DRAIN TIME ≥ 36 hours.	[12 hours OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.2	Verify, for a required low pressure ECCS injection/spray subsystem, the suppression pool water level is ≥ [12 ft 2 inches].	[12 hours OR

		In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.3	Verify, for a required Core Spray (CS) System, the: a. Suppression pool water level is ≥ [12 ft 2 inches] or b. Condensate storage tank water level is ≥ [12 ft].	[12 hours OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.4	Verify, for the required ECCS injection/spray subsystem, the piping is filled with water from the pump discharge valve to the injection valve.	[31 days OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.5	Verify, for the required ECCS injection/spray subsystem each manual, power operated, and automatic valve in the flow path, that is not locked sealed, or otherwise secured in position, is in the correct position.	[31 days OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.6	Operate the required ECCS injection/spray subsystem through the recirculation line for ≥ 10 minutes.	[92 days OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.7	Verify each valve credited for automatically isolating a penetration flow path actuates to the isolation position on an actual or simulated isolation signal.	[[18] months OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.8	----------NOTE---------- Vessel injection/spray may be excluded. ---------- Verify the required ECCS injection/spray subsystem actuates on a manual initiation signal.	[[18] months OR In accordance with the Surveillance Frequency Control Program]

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The corresponding NUREG-1434 ~~(BWR/6)~~ TS 3.5.2 currently contains the following SRs:

SURVEILLANCE		FREQUENCY
SR 3.5.2.1	Verify, for each required low pressure ECCS injection/spray subsystem, the suppression pool water level is ≥ [12.67 ft].	[12 hours OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.2	Verify, for the required High Pressure Core Spray (HPCS) subsystem, the: a. Suppression pool water level is ≥ [12.67 ft] or b. Condensate storage tank water level is ≥ [18 ft]	[12 hours OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.3	Verify, for the required ECCS injection/spray subsystem, the piping is filled with water from the pump discharge valve to the injection valve.	[31 days OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.4	Verify each required ECCS injection/spray subsystem manual, power operated, and automatic valve in the flow path, that is not locked sealed, or otherwise secured in position, is in the correct position.	[31 days OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.5	Verify each required ECCS pump develops the specified flow rate [against a system head corresponding to the specified reactor pressure] System / Flow Rate / [System Head Corresponding to A Reactor Pressure of] LPCS ≥[7115]gpm ≥[290]psig LPCI ≥[7450]gpm ≥[125]psig HPCS ≥[7115]gpm ≥[445]psig	[In accordance with the Inservice Testing Program OR [92 days] OR In accordance with the Surveillance

		Frequency Control Program]
SR 3.5.2.6	----------NOTE---------- Vessel injection/spray may be excluded. ---------- Verify each required ECCS injection /spray subsystem actuates on an actual or simulated automatic initiation signal.	[18months OR In accordance with the Surveillance Frequency Control Program]

The revised SRs for NUREG-1434 ~~(BWR/6)~~ would be:

SURVEILLANCE		FREQUENCY
SR 3.5.2.1	Verify DRAIN TIME ≥ 36 hours.	[12 hours OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.2	Verify, for a required low pressure ECCS injection/spray subsystem, the suppression pool water level is ≥ [12.67 ft].	[12 hours OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.3	Verify, for a required High Pressure Core Spray (HPCS) System, the: ~~a~~c. Suppression pool water level is ≥ [12.67 ft] or ~~b~~d. Condensate storage tank water level is ≥ [18 ft].	[12 hours OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.4	Verify, for the required ECCS injection/spray subsystem, the piping is filled with water from the pump discharge valve to the injection valve.	[31 days OR In accordance with the Surveillance Frequency Control Program]

SR 3.5.2.5	Verify, for the required ECCS injection/spray subsystem each manual, power operated, and automatic valve in the flow path, that is not locked sealed, or otherwise secured in position, is in the correct position.	[31 days OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.6	Operate the required ECCS injection/spray subsystem through the recirculation line for ≥ 10 minutes.	[92 days OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.7	Verify each valve credited for automatically isolating a penetration flow path actuates to the isolation position on an actual or simulated isolation signal.	[[18] months OR In accordance with the Surveillance Frequency Control Program]
SR 3.5.2.8	----------NOTE---------- Vessel injection/spray may be excluded. ---------- Verify the required ECCS injection/spray subsystem actuates on a manual initiation signal.	[[18] months OR In accordance with the Surveillance Frequency Control Program]

2.3.3 Changes to STS Section 3.3

Both NUREG-1433 ~~(BWR/4)~~ and NUREG-1434 ~~(BWR/6)~~ 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 *licensee-controlled* 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. This convention is retained in the revised STS LCOs discussed in this section.

For simplicity, the description of changes in this section is presented with the A and B versions combined.

2.3.3.1 Changes to STS LCOs 3.3.5.1A and 3.3.5.1B, Emergency Core Cooling System (ECCS) Instrumentation (Without and With Setpoint Control Program), respectively

The STS LCOs 3.3.5.1A and 3.3.5.1B state that "the ECCS instrumentation for each Function in Table 3.3.5.1-1, [Emergency Core Cooling System Instrumentation,] 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 STS 3.3.5.2. Conforming changes are made to the ACTIONS Table of STS LCO 3.3.5.1A and 3.3.5.1B.

2.3.3.2 Insertion of new STS 3.3.5.2A and 3.3.5.2B, Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation (Without and With Setpoint Control Program), respectively

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

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

2.3.3.2.1 New TS 3.3.5.2A and 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 *NUREG-1433* ~~BWR/4~~ New Table 3.3.5.2-1, RPV Water Inventory Control Instrumentation

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

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

- The applicability is changed. The existing STS 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 Function 1.b, Core Spray Pump Discharge Flow - Low (Bypass) and
Function 2.b, Low Pressure Coolant Injection Pump Discharge Flow - Low (Bypass)

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

- The applicability is changed. The current STS 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."

- For Function 1.b, the number of required channels per function is changed from [2] or [1 per pump], to [1 per pump]. For Function 2.b, the number of required channels per function is changed from [4] or [1 per pump], to [1 per pump]. Both are 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 STS 3.3.5.1, Function 1.e and Function 2.h. The following changes are made:

- The applicability is changed. The current STS 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 STS 3.3.5.1 and the revised STS 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 STS 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 STSs as the Level 3 instruments isolate more than shutdown cooling isolation valves.

- The applicability is changed. The existing STS 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 was relocated from current STS 3.3.6.1, Function 5.e. The following changes are made:

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

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

- 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.

2.2.3.2.3 *NUREG-1434* ~~BWR/6~~ New Table 3.3.5.2-1, RPV Water Inventory Control Instrumentation

2.3.3.2.3.1 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 STS 3.3.5.1, Function 1.d and Function 2.d. The following changes are made:

- The applicability is changed. The current STS 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." Note that *NUREG-1434* ~~the BWR/6 STS~~ does not include the Mode 4 and 5 applicability of this function. This apparently was an oversight in development of the NUREG.

- 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 STS 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.

2.3.3.2.3.2 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 STS 3.3.5.1, Function 1.e, 1.f, and 2.e. The following changes are made:

- The applicability is changed. The current STS 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 STS 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.

2.3.3.2.3.3 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 STS 3.3.5.1, Function 1.g and Function 2.f. The following changes are made:

- The applicability is changed. The current STS 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 STS 3.5.2 only requires a single ECCS subsystem and the change in required channels reflects that requirement.

- Both the existing STS 3.3.5.1 and the revised STS 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.

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

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

- The applicability is changed. The current STS 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 STS 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.

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

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

- The applicability is changed. The current STS 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 STS 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.

2.3.3.2.3.6 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 STS 3.3.5.1, Function 3.f and 3.g. The following changes are made:

- The applicability is changed. The current STS 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 STS 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.

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

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

- The applicability is changed. The current STS 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 STS 3.5.2 only requires a single ECCS subsystem and the change in required channels reflects that requirement.
- Both the existing STS 3.3.5.1 and the revised STS 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.

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

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

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

- The applicability is changed. The current STS 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 STS 3.3.5.2.

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

This function was relocated from current STS 3.3.6.1, Function 4.k. The following changes are made:

- The applicability is changed. The current STS 3.3.6.1 applicability is Modes 1, 2, and 3. The applicability is "when automatic isolation of the associated penetration flow path is credited in calculating Drain Time." In other words, if the drain time calculation assumes the RWCU system would be automatically isolated, this function must be operable to perform that function. This is consistent with the definition of drain time and the new STS 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.

2.3.3.2.4 New TS 3.3.5.2A and 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~~*In NUREG-1433* ~~BWR/4s~~, 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.

In ~~For~~ NUREG-1434~~BWR/6s~~, 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.

In ~~For~~ NUREG-1433~~BWR/4s~~, Condition E is entered if the ~~required~~ *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.

In ~~For~~ NUREG-1434~~BWR/6s~~, Condition E is entered if the Reactor Vessel Water Level – High Level 8 instrumentation operability requirements are not met. *Required* Action E.1 requires declaring the HCPS system inoperable in 1 hour and restoring the channel to Operable status within 24 hours.

In ~~For~~ NUREG-1434~~BWR/6s~~, 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.

In ~~For~~ NUREG-1434~~BWR/6s~~, Condition G is entered if the ~~required~~ *Required* ~~action~~ *Actions* and associated ~~completion~~ *Completion T*~~t~~*imes*~~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.

2.3.3.2.5 New Surveillance Requirements SR 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:

NUREG-1433 ~~(BWR/4 plants)~~
3.6.1.3, Primary Containment Isolation Valves (PCIVs)
3.6.4.1, [Secondary] Containment

3.6.4.2, Secondary Containment Isolation Valves (SCIVs)
3.6.4.3, Standby Gas Treatment System

NUREG-1434 ~~(BWR/6 plants)~~
3.6.1.3, Primary Containment Isolation Valves (PCIVs)
3.6.4.1, [Secondary] Containment
3.6.4.2, Secondary Containment Isolation Valves (SCIVs)
3.6.4.3, Standby Gas Treatment System

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

NUREG-1433 ~~(BWR/4 plants)~~
3.7.4, [Main Control Room Environmental Control (MCREC)] System
3.7.5, [Control Room Air Conditioning (AC)] System

NUREG-1434 ~~(BWR/6 plants)~~
3.7.3, [Control Room Fresh Air (CRFA)] System
3.7.4, [Control Room AC] System

These LCO's are currently applicable during OPDRVs and contain required actions to immediately initiate action to suspend OPDRVs when certain conditions of the LCO are not met.

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

NUREG-1433 ~~(BWR/4 plants)~~ and NUREG-1434 ~~(BWR/6 plants)~~
3.8.2, AC Sources - Shutdown
3.8.5, DC Sources - Shutdown
3.8.8, Inverters - Shutdown
3.8.10, Distribution Systems - Shutdown

These 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.

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.

2.4 APPLICABLE REGULATORY REQUIREMENTS

The regulation at 10 CFR Section 50.36(a)(1) requires an applicant for an operating license to include in the application proposed technical specifications in accordance with the requirements of 10 CFR 50.36. The applicant must include in 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." Per 10 CFR 50.90, whenever a holder of a license desires to amend the license, application for an amendment must be filed with the Commission, fully describing the changes desired, and following as far as applicable, the form prescribed for original applications.

Additionally, 10 CFR 50.36(b) requires:

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

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

The 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.

As described in the Commission's Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors, recommendations were made by NRC and industry task groups for new STS that include greater emphasis on human factors principles in order to add clarity and understanding to the text of the STS, and provide improvements to the Bases Section of Technical Specifications, which provides the purpose for each requirement in the specification. Subsequently, improved vendor-specific STS were developed and issued by the NRC in September 1992. The improved STS were published as the following NRC Reports:

- NUREG-1430, "Standard Technical Specifications, Babcock and Wilcox Plants"

- NUREG-1431, "Standard Technical Specifications, Westinghouse Plants"

- NUREG-1432, "Standard Technical Specifications, Combustion Engineering Plants"

- NUREG-1433, "Standard Technical Specifications, General Electric Plants, BWR/4"

- NUREG-1434, "Standard Technical Specifications, General Electric Plants, BWR/6"

These improved STS were the result of extensive technical meetings and discussions among the NRC staff, industry owners' groups, vendors, and NUMARC. The Commission recognizes the advantages of improved technical specifications. Clarification of the scope and purpose of

technical specifications has provided useful guidance to both the NRC and industry and has served as an important incentive for industry participation in a voluntary program to improve technical specifications. It has resulted in improved STS that are intended to focus licensee and plant operator attention on those plant conditions most important to safety. This should also result in more efficient use of agency and industry resources.

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. NUREG-1433, Revision 4, contains the STS for BWR/4 plants*, and is also applicable to BWR/2, BWR/3, and in some cases, BWR/5 plants,* and NUREG 1434, Revision 4, contains the STS for BWR/6 plants*, and is also applicable in some cases to BWR/5 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 *and the licensee took no mitigating action*.

The NRC staff reviewed the proposed drain time definition from the traveler. 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 "DRAIN TIME" definition proposed in TSTF-542. All RPV penetrations below the TAF are included in the determination of drain time as potential pathways. Attachment 2 to the RAI responses dated March 14, 2016 (ADAMS Accession No. ML16074A448), provided an example bounding drain time calculations for three examples: (1) water level at or below the reactor flange; (2) water level above RPV flange with fuel pool gates installed, and; (3) water level above reactor flange with fuel pool gates removed. 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.

Additionally, Attachment 2 to the RAI responses, provides a proposed example table to pair with the drain time calculation. This table correlates the drain time (hours) to the penetration flow path diameter (inches) and the reactor vessel water level (inches above the TAF). The proposed example table is color coded to visually show if LCO 3.5.2 is met, or which LCO condition the licensee would be in. This proposed example table provides operators with a correlation to relate the calculated drain time to the RPV water level and where in the LCO the operators should be. Based on these considerations, the NRC staff finds the proposed drain time definition with supporting calculation and table to be acceptable.

3.2 WATER SOURCES

The proposed LCO 3.5.2 *in NUREG-1433* states ~~that for BWR/4 TSs~~, one low pressure Emergency Core Cooling System (ECCS) injection/spray subsystem shall be OPERABLE. *The NUREG-1434 LCO 3.5.2 LCO states*~~For BWR/6 TSs,~~ one ECCS injection/spray subsystem shall be OPERABLE. It should be noted that the term "low pressure" does not appear in the ~~BWR/6~~*NUREG-1434* LCO because the *BWR/5 and BWR/*6 High Pressure Core Spray (HPCS) System may *also* be used to satisfy the LCO.

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 in TSTF-542 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. These requirements can be found in the ~~BWR/4 STS~~*NUREG-1433* 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 STS~~*NUREG-1434*, the applicable TS are 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 protecting 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 top of active (TAF) shall be ≥ 36 hours, and the second part states *in NUREG-1433*~~that for BWR/4~~, one low pressure ECCS injection/spray subsystem shall be OPERABLE, and *in NURG-1434*~~for BWR/6~~, 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 STS 3.5.2, focusing on ensuring the fuel remains covered with water and the changes made compared to the current STS. The proposed STS 3.5.2 contains Conditions A through E based on either required ECCS injection/spray subsystem operability or drain time.

The current STS LCO for ~~BWR/~~*in NUREG-1433 and NUREG-1434* ~~4 and BWR/6 plants~~ *states*~~state~~ 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 for TS 3.5.2 is different from the STS, which states to initiate action to suspend OPDRVs. 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 current STS Condition C states if two ECCS injection/spray subsystem are inoperable then restore one to operable status within 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 STS 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 ~~BWR/4 or BWR/6~~ STS. 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 BWR TS as the Reactor Core Isolation Cooling (RCIC) System is discussed in the section on TS 3.5.3.

3.4 STS 3.3.5.2, REACTOR PRESSURE VESSEL WATER INVENTORY CONTROL INSTRUMENTATION

The proposed TS and associated LCO in TS Section 3.3, “Instrumentation,” contains A and B versions of TS 3.3.5.2. The A version is for TS without a Setpoint Control Program and Table 3.3.5.2-1 has a column for listing Allowable Value. The B version is for TS with a Setpoint Control Program and Table 3.3.5.2-1 has no allowable value column, because the Setpoint Control Program dictates the setpoint value. In a like manner the associated LCO 3.3.5.2 has A and B versions. The actions and SRs for both versions A and B are the same *in NUREG-1433 and NUREG-1434*~~for BWR/4 and BWR/6~~.

The purpose of the RPV Water Inventory Control Instrumentation is to support the requirements of new STS LCO 3.5.2, and the definition of drain time. There are instrumentation and controls and their signal functions 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 STS 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.

Specifically, the *NUREG-1433* ~~BWR/4 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 safety evaluation of TS 3.5.2 and the Bases for LCO 3.5.2.

Specifically, the *NUREG-1434* ~~BWR/6 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 safety evaluation of TS 3.5.2 and the Bases for LCO 3.5.2.

TSTF-542, Section 3.3, “Proposed TS 3.3.5.2, Reactor Pressure Vessel Water Inventory Control Instrumentation,” describes and justifies the instrumentation requirements associated with and needed to support TS 3.5.2 and LCO 3.5.2, “Reactor Pressure Vessel Water Inventory Control.” Section 3.3.1 addresses the proposed TS 3.3.5.2 LCO and applicability. Section 3.3.2 addresses, presents, discusses, and justifies the proposed actions of TS 3.3.5.2. Section 3.3.3, addresses the proposed TS 3.3.5.2 surveillances. Section 3.3.4 addresses, presents, discusses, and justifies the proposed Table 3.3.5.2-1. The NRC staff finds the instrumentation

and actions required to support TS 3.3.2, as presented in Section 3.3, sufficient and necessary as discussed below.

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 ~~for BWR/4 and BWR/6~~

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

Section 3.3.2, “Proposed TS 3.3.5.2 Actions,” of TSTF-542, presents, discusses, and justifies 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)(2)(i) 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.

3.4.3 Proposed TS 3.3.5.2 Actions for ~~BWR/4~~*NUREG-1433*

The following summarizes the proposed actions of Section 3.3.2 for ~~BWR/4~~*NUREG-1433*.

Section 3.3.2, "Proposed TS 3.3.5.2 Actions," of TSTF-542, Revision 2, presents, discusses, and justifies 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~~*is* 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~~ *Required A*~~a~~*ctions*~~action~~ and associated *C*~~c~~*ompletion T*~~t~~*imes*~~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.

3.4.4 Proposed TS 3.3.5.2 Actions for ~~BWR/6~~*NUREG-1434*

TS 3.3.5.2 contains proposed actions to be followed when the LCO is not met ~~for a~~*in* ~~BWR/6~~*NUREG-1434*.

Section 3.3.2, "Proposed TS 3.3.5.2 Actions," of TSTF-542, Revision 2, presents, discusses, and justifies 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~~*is* 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~~ *Required* ~~action~~ *Actions* and associated *Ccompletion Ttimes*~~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.

3.4.5 Proposed TS 3.3.5.2 Surveillances for ~~BWR/4~~*NUREG-1433* and ~~BWR/6~~*NUREG-1434*

Section 3.3.3, “Proposed TS 3.3.5.2 Surveillances,” of TSTF-542, presents, discusses, and justifies the SR of TS 3.3.5.2. 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.

The following summarizes the notable characteristics of the surveillances described in Section 3.3.3 of TSTF-542, which were reviewed by the NRC staff.

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 traveler 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. The traveler 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.

3.4.6 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 safety 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~~ *Required* ~~action~~ *Action* A.1, SR for the functions, the allowable value (if version A), and footnotes concerning items of the table.

Table 3.3.5.2-1 ~~for~~ *in* ~~BWR/4~~*NUREG-1433* and ~~BWR/6~~*NUREG-1434* differ only in that version A has a column for the allowable value and B does not. Version A has a potential or generic allowable value in brackets. The brackets indicate that a plant-specific value should be used in the LAR to adopt TSTF-542.

Section 3.3.4, “Proposed Table TS 3.3.5.2-1, ‘RPV Water Inventory Control Instrumentation’” of TSTF-542, presents details on the functions required to support the equipment and functions of TS 3.5.2 ~~for~~ *in* ~~BWR/4~~*NUREG-1433* and ~~BWR/6~~*NUREG-1434*. 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, if applicable, 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 ~~the~~ ~~BWR/4~~*NUREG-1433* and ~~BWR/6~~*NUREG-1434* in MODEs 4 and 5 are initiated by manual pushbutton. The traveler states, “… automatic initiation of an ECCS injection/spray subsystem, with injection rates of thousands of gpm, may be undesirable as it can lead to overflowing the RPV cavity.” 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.

3.5.1 Proposed Table 3.3.5.2-1 Functions for ~~BWR/4~~*NUREG-1433*

The following summarizes notable characteristics of the RPV Water Inventory Control Instrumentation as discussed in Section 3.3.4 of TSTF-542, Revision 2.

For the *NUREG-1433* 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 *NUREG-1433* Table 3.3.5.2-1 Functions 1.b and 2.b, ~~BWR/4~~ 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. Where applicable, allowable values (version A) 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. Brackets around allowable value indicate the actual value is to be plant-specific and dependent on actual equipment. 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 *NUREG-1433* Table 3.3.5.2-1 Functions 1.c and 2.c, ~~BWR/4~~ 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 *NUREG-1433* Table 3.3.5.2-1 Function 3.a, ~~BWR/4~~ 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. The allowable value (version A) 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 *NUREG-1433* Table 3.3.5.2-1 Function 4.a, ~~BWR/4~~ 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. Allowable value (version A) 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.

3.5.2 Proposed Table 3.3.5.2.-1 Functions for ~~BWR/6~~*NUREG-1434*

The following summarizes notable characteristics of the RPV Water Inventory Control Instrumentation as discussed in Section 3.3.4 of TSTF-542, Revision 2.

For the *NUREG-1434* Table 3.3.5.2-1 Functions 1.a and 2.a, ~~BWR/6~~ 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 *NUREG-1434* Table 3.3.5.2-1 Functions 1.b, 1.c, and 2.b, ~~BWR/6~~ 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. Where applicable allowable values (version A) 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. Brackets around allowable value indicate the actual value is to be plant-specific and dependent on actual equipment.

For the *NUREG-1434* Table 3.3.5.2-1 Functions 1.d and 2.c, ~~BWR/6~~ 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. Since the channels are mechanically actuated based solely on the position of the pushbuttons, there is no allowable value (version A) 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 *NUREG-1434* Table 3.3.5.2-1 Functions 3.a, ~~BWR/6~~ 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. The LCO 3.3.5.2 allowable value (version A) is chosen to isolate flow from the HPCS system prior to water overflowing into the MSLs.

For the *NUREG-1434* Table 3.3.5.2-1 Functions 3.b, ~~BWR/6~~ 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 *NUREG-1434* Table 3.3.5.2-1 Functions 3.c and 3.d, ~~BWR/6~~ 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 *NUREG-1434* Table 3.3.5.2-1 Function 3.e, ~~BWR/6~~ 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 *NUREG-1434* 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 *NUREG-1434* Table 3.3.5.2-1 Function 5.a, ~~BWR/6~~ 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

Section 3.4., "Evaluation of other Differences between the Current and Proposed TS," of TSTF-542, presents and discusses other differences between the current TS requirements related to OPDRVs and the proposed TS requirements for RPV WIC. The current STS contain requirements related to instrumentation that are applicable during OPDRVs and are applicable when the existing LCO 3.5.2 is applicable. They do not specifically impact the focus on TS 3.3.5.2 and the associated LCO 3.5.2 and Table 3.3.5.2-1.

3.7 STS 3.5.2 – REACTOR PRESSURE VESSEL (RPV) WATER INVENTORY CONTROL

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 LCOs 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.

Technical Specification 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 STS described in traveler TSTF-542 establish specifications for equipment and

associated instrumentation that ensure the reactor vessel water level is maintained above the TAF during MODE 4 and 5 operations.

NUREG-0800, Revision 3, *Standard Review Plan* (March 2010) (ADAMS Accession No. ML100351425), describes LOCAs as postulated accidents that would result from the loss of reactor coolant, at a rate in excess of the capability of the normal reactor coolant makeup system, from piping breaks in the reactor coolant pressure boundary. During operation in MODEs 4 and 5, the reactor coolant system is at a low operating temperature (<*[*200*]* ° 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 STS 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 alternatives for the lowest functional capability or performance levels of equipment required for safe operation of the facility. On this basis, the NRC staff concludes that the requirements of 10 CFR 50.36(c)(2)(i) are met.

Additionally, the revised STS 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 revised LCOs 3.5.2 and 3.3.5.2. The NRC staff reviewed the new 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 10 CFR 50.36(c)(3) is met.

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. Traveler TSTF-542 contains TS Bases changes that describe the basis for the affected TS. A summary of the NRC staff's evaluation of the TS Bases changes is provided in an attachment to this SE.

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. NUREG-1433, Revision 4, contains the STS for BWR/4 plants*, and is applicable to BWR/2, BWR/3, and, in some cases, BWR/5 plants,* and NUREG 1434, Revision 4, contains the STS for BWR/6 plants

and is applicable, in some cases, to BWR/5 plants. ~~.~~ The changes to the STS were reviewed for technical clarity and consistency with customary terminology and format with the existing requirements. The NRC staff found that the proposed changes were consistent with the existing framework.

4.0 CONCLUSION

The NRC staff reviewed traveler TSTF-542, Revision 2, "Reactor Pressure Vessel Water Inventory Control," which proposed changes to NUREG-1433, Volumes 1 (STS for BWR/4) and 2 (Bases) and NUREG-1434 Volumes 1 (STS for BWR/6) and 2 (Bases). The NRC staff determined that the proposed changes to the STS ~~for BWR/4 and the STS for BWR/6~~ met the standards for TS in 10 CFR 50.36(b). The proposed LCOs appropriately specify the lowest functional capability or performance levels of equipment required for safe operation of the facility, as required by 10 CFR 50.36(c)(2)(i). The remedial actions to be taken when an LCO is not met action statements provide adequate protection to the health and safety of the public, thereby satisfy the Act and 10 CFR 50.36(c)(2)(i). The proposed surveillance requirements 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, and satisfy 10 CFR 50.36(c)(3).

The proposed bases, which will be added to future revisions to NUREG-1433, Volume 2, and NUREG-1434, Volume 2, satisfy the Commission's Policy Statement by addressing the questions specified in the policy statement, and cite references to appropriate licensing documentation to support the Bases.

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Attachment: Basis for Accepting the Proposed Changes to the Standard Technical Specification Bases, Volume 2 of NUREGs 1433 and 1434

Date:

ATTACHMENT

BASIS FOR ACCEPTING THE PROPOSED CHANGES TO THE STANDARD TECHNICAL SPECIFICATION BASES, VOLUME 2 OF NUREGS 1433 AND 1434

1.0 INTRODUCTION

Traveler TSTF-542 proposes changes to "Standard Technical Specifications, General Electric BWR/4 Plants, BWR/4" NUREG-1433, Volume 2, "Bases," Revision 4.0, April 2012, ADAMS Accession No. ML12104A193 and "Standard Technical Specifications, General Electric BWR/6 Plants, BWR/6" NUREG-1434, Volume 2, "Bases," Revision 4.0, April 2012, ADAMS Accession No. ML12104A196. The changes would be incorporated into future revisions of NUREG-1433, Volume 2, and NUREG-1434, Volume 2. A summary of the changes and the staff's evaluation of those changes are presented in this Attachment.

2.0 REGULATORY EVALUATION

2.1 Applicable Regulations and Guidance

The regulation at 10 CFR 50.36(a)(1) states that each applicant for a license authorizing operation of a production or utilization facility shall include in his application proposed technical specifications in accordance with the requirements of this section. A summary statement of the bases or reasons for such specifications, other than those covering administrative controls, shall also be included in the application, but shall not become part of the technical specifications.

In its Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors, the Commission presented its policy on the scope and purpose of the Technical Specifications. The Commission explained how implementation of the policy statement through implementation of the improved STS is expected to produce an improvement in the safety of nuclear power plants through the use of more operator-oriented TS, improved TS Bases, reduced action-statement-induced plant transients, and more efficient use of NRC and industry resources.

The Final Policy Statement provides the following description of the scope and the purpose of the Technical Specification Bases:

> Appropriate Surveillance Requirements and Actions should be retained for each LCO which remains or is included in the Technical Specifications. Each LCO, Action, and Surveillance Requirement should have supporting Bases. The Bases should at a minimum address the following questions and cite references to appropriate licensing documentation (e.g., FSAR, Topical Report) to support the Bases.

1. What is the justification for the Technical Specification, i.e., which Policy Statement criterion requires it to be in the Technical Specifications?

2. What are the Bases for each LCO, i.e., why was it determined to be the lowest functional capability or performance level for the system or component in question necessary for safe operation of the facility and, what are the reasons for the Applicability of the LCO?

3. What are the Bases for each Action, i.e., why should this remedial action be taken if the associated LCO cannot be met; how does this Action relate to other Actions associated with the LCO; and what justifies continued operation of the system or component at the reduced state from the state specified in the LCO for the allowed time period?

4. What are the Bases for each Safety Limit?

5. What are the Bases for each Surveillance Requirement and Surveillance Frequency; i.e., what specific functional requirement is the surveillance designed to verify? Why is this surveillance necessary at the specified frequency to assure that the system or component function is maintained, that facility operation will be within the Safety Limits, and that the LCO will be met?

   Note: In answering these questions the Bases for each number (e.g., Allowable Value, Response Time, Completion Time, Surveillance Frequency), state, condition, and definition (e.g., operability) should be clearly specified. As an example, a number might be based on engineering judgment, past experience, or PSA insights; but this should be clearly stated.

The NRC staff used the guidance contained in the Final Policy Statement during its review of the proposed changes to the Bases.

2.2 Description of Changes

Volume 2 NUREGs-1433 and -1434 contain the Bases for each Safety Limit and each LCO contained in Volume 1. The Bases for each LCO is organized into sections:

Background

Applicable Safety Analyses, LCO, and Applicability
Actions
Surveillance Requirements
References

The Bases for LCOs 3.3.5.2 (A and B) and 3.5.2 were rewritten in their entirety to reflect the changes in the associated LCOs. The Bases for the remainder of the affected LCOs were modified to reflect the deletion of OPDRVs.

In the following sections, the discussion is applicable to both NUREG 1433 ~~(for BWR/4 plants)~~ and NUREG 1434 ~~(for BWR/6 plants)~~ unless otherwise noted. The discussion provides a summary of the revised Bases, followed by the NRC staff's evaluation of the revised Bases.

3.0 TECHNICAL EVALUATION

3.1 Evaluation of B 3.3.5.2 (A) and B 3.3.5.2 (B)

B 3.3.5.2(A) is applicable in the absence of a Setpoint Control Program, and B 3.3.5.2(B) is applicable if a Setpoint Control Program is used. For simplicity in presentation, the description provided below applies to both the (A) and (B) versions, unless otherwise stated.

The Background section provides

- a description of the reactor pressure vessel (RPV) design, which includes penetrations below the top of active fuel
- a description of Safety Limit 2.1.1.3, which requires the RPV water level to be above the top of active fuel
- an explanation of the purpose of the RPV water Inventory Control Instrumentation, which is to support the requirements of LCO 3.5.2, Reactor Pressure Vessel Water Inventory Control by ensuring that the functions required for manual initiation of required Emergency Core Cooling System (ECCS) injection/spray subsystem are available and that other functions supporting isolation of flowpath(s) on low RPV level are available.

The Applicable Safety Analyses, LCO and Applicability section provides:

- a statement that indicates that water inventory control is required in Modes 4 and 5 to protect Safety Limit 2.1.1.3 and a discussion that due to the reduced Reactor Coolant System (RCS) pressure in the shutdown condition, a very large break in the RCS is not postulated in the shutdown condition.
- an explanation that this LCO is applicable in Modes 4 and 5 to support operability of subsystems required to be operable in Modes 4 and 5 as specified in LCO 3.5.2.

- a description of why the LCO meets Criterion 4 specified in 10 CFR 50.36(c)(2(ii) as a structure, system or component which operating experience has shown to be significant to public health and safety.
- a detailed discussion regarding each function contained in LCO 3.3.5.2

    - Core Spray and Low Pressure Coolant Injection Systems:
    - Function 1.a, 2.a Reactor Steam Dome Pressure – Low (Injection Permissive) is required to be Operable to ensure the capability of initiating ECCS when pressure is below the injection subsystems design pressure. The actuation logic is one out of two taken twice, four channels are required to be operable.
    - For *NUREG-1433*~~BWR/4s~~:
        - Function 1.b, 2.b Core Spray and Low Pressure Coolant Injection Pump Discharge Flow – Low (Bypass) is required to be operable to ensure minimum flow line is available to protect the associated low pressure ECCS pump from overheating on low discharge and to ensure closure of the minimum flow valve is initiated at the proper ~~point to ensure full injection~~*point when the* flow ~~when required.~~*rate is adequate to protect the pump.* One channel per required pump is required to be operable.
    - For ~~BWR/6~~*NUREG-1434*~~'s6's~~:
        - Function 1.b, 1.c, 2.b Low Pressure Coolant Injection and Low Pressure Core Spray ~~pump~~*Pump* Discharge Flow - Low (Bypass) is required to be operable to ensure minimum flow line is available to protect the associated low pressure ECCS pump from overheating on low discharge and to ensure closure of the minimum flow valve is initiated at the proper point ~~to ensure full injection flow when required.~~ *when the flow rate is adequate to protect the pump.* One channel per required pump is required to be operable.
    - Function 1.c (for ~~BWR/4~~*NUREG-1433*), 1.d (for ~~BWR/6~~*NUREG-1434*) 2.c, Manual Initiation, is required to be operable to provide manual initiation capability. One channel (pushbutton) per required subsystem is required to be operable per ECCS subsystem required to be operable.
    - For ~~BWR/6~~*NUREG-1434*, High Pressure Core Spray System
        - Function 3.a, Reactor Vessel Water Level – High, Level 8 is used to close the HPCS injection valve to prevent overflow into the main steam lines. One channel associated with the HPCS system required by LCO 3.5.2 is required to be operable. The allowable value is chosen to ensure no overflow into the main steam lines.
        - Function 3.b, Condensate Storage Tank (CST) Level, Low indicates low supply of makeup water from this source. HPCS is normally aligned to take suction on the CST. On low CST level, the HPCS pump suction ~~valves~~*valve* from the suppression pool open and then the suction

~~valves~~*valve* from the CST close. One channel is required to be operable when HPCS is required per LCO 3.5.2 and the HPCS is aligned to the CST. The allowable value is selected to ensure adequate pump suction head.

- Function 3.c., 3.d HPCS Pump Discharge Pressure – High (Bypass) and HPCS System Flow Rate – Low (Bypass) is required to be operable to ensure minimum flow line is available to protect the associated HPCS pump from overheating on low discharge. The allowable value is set to ensure the flow is sufficient to protect the pump, but closes when a minimum flow is ~~reached to ensure full injection flow into the core.~~ *adequate to protect the pump or the discharge pressure is low (indicating the HPCS pump is not operating).* One channel is required when HPCS is required to be operable per LOC 3.5.2.
- Function 3.e, Manual Initiation, is required to be operable to ensure manual initiation capability. One channel is required when the associated ECCS subsystem is required by LCO 3.5.2.

- RHR System Isolation:
- Function 3.a (for ~~BWR/4~~*NUREG-1433*) and 4.a (for ~~BWR/6~~*NUREG-1434*), Reactor Vessel Water Level – Low Level 3 may be credited for automatic isolation of penetration flow paths associated with the RHR system. The function is required to be operable when automatic isolation of the associated penetration flow path is assumed in the calculated Drain Time. Two channels in the same trip system are required to be operable.

- Reactor Water Cleanup (RWCU) System Isolation
- Function 4.a (for *NUREG-1433*~~BWR/4~~) and 5.a (for ~~BWR/6~~*NUREG-1434*), Reactor Vessel Water level – Low Low, Level 2 may be credited for automatic isolation of penetration flow paths associated with the RWCU System. This function is required to be operable when automatic isolation of the associated penetration flow path is assumed in the calculated Drain Time. Two channels in the same trip system are required to be operable.
- The Allowable Value selected is the same as the Allowable Value during Power Operation.

- an explanation of each Required Action and Completion Time contained in the Actions Table
  - For *NUREG-1433*~~BWR/4s~~:
    - Condition A is entered when a channel is declared inoperable and Required Action A.1 directs entry into the Appropriate Condition.
    - Condition B is entered when Functions ~~1~~*3*.a~~, 2~~ *and 4*.a~~, 1.b or 2.b~~ are inoperable. The Required Action is to declare the associated penetration

flow path incapable of automatic isolation and to recalculate the Drain Time without taking credit for the automatic isolation of the affect pathway.

- Condition C is entered when the steam dome pressure signal permissive is inoperable. Inoperability of the permissive means that the injection function cannot be manually initiated. The Required Action is to place the permissive in the tripped condition within one hour. This enables manual initiation of the injection function. The one hour allowance provides sufficient time for the operator to place the channel in trip.
- Condition D is entered when the Core Spray or Low Pressure Coolant Injection Pump Discharge Flow – Low bypass functions are unavailable. In this condition, the Required Action is to restore the channel to operable status within 24 hours. The 24 hour is judged to be appropriate because manual operation of the pumps and the ~~minimum flow valves~~*injection valves* is still available, but this is not the preferred condition.
- Condition E is entered when the Required Action and associated Completion Time for Condition C or D is not met. In this case, the associated ECCS subsystem may not be capable of performing its intended function, and is declared inoperable immediately.

o For ~~BWR/6~~*NUREG-1434*~~s6s~~:

- Condition A is entered when a channel is declared inoperable and Required Action A.1 directs entry into the Appropriate Condition.
- Condition B is entered when the RHR System Isolation or RWCU System Isolation functions are inoperable. The Required Action is to declare the associated penetration flow path incapable of automatic isolation and to recalculate the Drain Time without taking credit for the automatic isolation of the affect pathway.
- Condition C is entered when the Steam Dome Low Pressure Signal (Injection Permissive) is inoperable. Inoperability of the permissive means that the injection function cannot be manually initiated. The Required Action is to place the permissive in the tripped condition within one hour. This enables manual initiation of the injection function. The one hour allowance provides sufficient time for the operator to place the channel in trip.
- Condition D is entered when the CST Level – Low function is inoperable. The Required Action is to declare HPCS system inoperable and to align the HPCS pump suction to the suppression pool within 1 hour.
- Condition E is entered when the Reactor Vessel Water Level – High – Level 8 function is inoperable. The Required Action is to declare HPCS system inoperable within 1 hour and to restore the channel to operable status within 24 hours.

- Condition F is entered when 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 any of the required Manual functions are inoperable. The Required Action is to restore the channel to operable status within 24 hours. The 24 hour is judged to be appropriate because manual operation of the pumps and the ~~minimum flow~~ *injection* valves is still available, but this is not the preferred condition.
- Condition G is entered when the Required Action and associated Completion Time for Condition C, D, E or F is not met. In this case, the associated ECCS subsystem may not be capable of performing its intended function, and is declared inoperable immediately.

The Surveillance Requirements section provides:

- a description of the purpose of each Surveillance Requirement and the basis for the surveillance frequency selected. For each function,
  - A channel check is performed to verify that a gross failure of an instrument channel has not occurred. Agreement criteria is established based on channel instrument uncertainties and readability. The surveillance is performed once per 12 hours or in accordance with the Surveillance Frequency Control Program. The frequency was selected based on operating experience that indicates channel failure is rare.
  - A channel functional test is performed to verify the channel is capable of performing its intended function. The surveillance is performed once per 92 days or in accordance with the Surveillance Frequency Control Program. The frequency was selected based on operating experience that indicates channel failure is rare.
  - A logic system functional test is performed to verify proper functioning of the required initiation logic for a channel. The surveillance is performed once per 18 months or in accordance with the Surveillance Frequency Control Program. The frequency was selected because of the preference to perform the surveillance under shutdown conditions.

The References section provides lists Regulatory Guide 1.105, “Setpoints for Safety-Related Instrumentation,” and NEDE-770-06-2, “Addendum to Bases for Changes to Surveillance Test Intervals and Allowed Out-of-Service Times for Selected ~~instrumentation~~*Instrumentation* Technical Specifications.”

The staff reviewed the revised bases to ensure the applicable criteria from 10 CFR 50.36 is identified and justified. The revised bases state that the proposed LCO meets the Criterion 4

specified in 10 CFR 50.36(c)(2(ii) and provides a discussion of why this Criterion applies. The reasons for the selection of each instrument function and required number of channels in the LCO is described and the reason for the applicable modes is stated. Each instrument function is necessary to support operability of the equipment required by LCO 3.5.2, and the applicable modes are consistent with those in LCO 3.5.2. The purpose of each required action is described. The purpose of each instrument surveillance and the basis for the performance frequency is addressed, and appropriate references are cited. The staff concluded that each of the elements of the Final Policy Statement were satisfactorily addressed. Therefore, the staff determined that the revised Bases adheres to the guidance provided in the Final Policy Statement.

3.2 EVALUATION OF B 3.5.2

The Background section provides

- a description of the reactor pressure vessel (RPV) design, which includes penetrations below the top of active fuel
- a description of Safety Limit 2.1.1.3, which requires the RPV water level to be above the top of active fuel

The Applicable Safety Analyses, LCO and Applicability section provides:

- a statement that indicates that water inventory control is required in Modes 4 and 5 to protect Safety Limit 2.1.1.3 and a discussion that due to the reduced RCS pressure in the shutdown condition, a very large break in the RCS is not postulated in the shutdown condition.
- an explanation that one low pressure ECCS injection/spray subsystem can maintain adequate RPV level (explanation retained from previous Bases for LCO 3.5.2)
- a description of why the LCO meets Criterion 4 specified in 10 CFR 50.36(c)(2(ii) as a structure, system or component which operating experience has shown to be significant to public health and safety.
- an explanation that a Drain Time of 36 hours was selected for the LCO because this time period is reasonable for the operator to identify and initiate remedial measures.
- an explanation that the LCO also requires one low pressure ECCS injection/spray subsystem to be operable and capable of being manually started so that it is available should an unexpected drain event occur. The ECCS injection/spray subsystem may be considered operable during alignment for decay heat removal because the restriction on drain time ensures sufficient time is available to initiate LPCI operation to maintain inventory if required.
- an explanation of each Required Action and Completion Time contained in the Actions Table

- Condition A is entered if the required ECCS injection/spray subsystem is inoperable. The Required Action is to restore it to Operable status within 4 hours. The 4 hour Completion Time is judged to be appropriate because of the controls on Drain Time and the low probably of a drain event occurring.
- Condition B is entered if the Required Action and Completion Time of Condition A is not met. Condition B requires establishing an alternate method of water injection capable of injecting without the use of offsite power, with attendant necessary support equipment, and access to water inventory capable of maintaining the RPV water level above TAF for 36 hours. The Completion Time is immediately.
- Condition C is entered if the drain time is less than 36 hours but greater than or equal to 8 hours. The Required Actions associated with this Condition ensure the availability of compensatory actions should an unexpected drain event occur. The Required Actions include actions to ensure the secondary containment boundary can be restored in less than the Drain Time to provide a volume to contain, dilute and process radioactive materials if an unexpected drain event were to occur. The Actions also include verification of the ability to place the Standby Gas Treatment System in service within the Drain Time to provide a means to maintain the secondary containment volume at a negative pressure and to filter the contents prior to release. A Completion Time of 4 hours was selected for these verifications because this ensures that the actions are completed well within the minimum Drain Time of 8 hours.
- Condition D is entered if the drain time is less than 8 hours. When the Drain Time is this short, mitigating actions as well as compensatory actions are needed. The Required Actions include an immediate action to establish an additional method of water injection. This method is in addition to the injection method required by the LCO. The Required Actions include the compensatory actions of immediately establishing the secondary containment boundary, verifying secondary containment penetrations can be isolated, and verifying that at least one Standby Gas Treatment subsystem can be placed into operation. These Actions are performed immediately because of the short Drain Time.
- Condition E is also applicable when Drain Time is less than 1 hour. The Required Action is to immediately restore the Drain Time to greater than 36 hours. Restoration of the Drain Time to 36 hours is necessary to ensure there is adequate time to perform mitigating actions should an unexpected drain event occur.

The Surveillance Requirements section provides:

- a description of the purpose of each Surveillance Requirement and the basis for the surveillance frequency selected

- The Drain Time is required to be verified to be ≥ 36 hours once per 12 hours or in accordance with the Surveillance Frequency Control Program. This Surveillance verifies the LCO for Drain Time is met. The frequency is selected based on the fact that numerous indications of changes in RPV level are available to the operator. Changes in RPV level would necessitate recalculation of the Drain Time.
- The suppression pool water level for a required LPCI subsystem, or suppression pool water level or Condensate Storage Tank level for a required core spray subsystem is required to be verified to ensure net positive suction head is available for the ECCS injection/spray subsystem required to be operable by the LCO. This Surveillance is required to be performed once per 12 hours or in accordance with the Surveillance Frequency Control Program. The frequency was chosen based on the availability of other indications available in the Control Room regarding suppression pool water level and Condensate Storage Tank level.
- The surveillance requirements to verify the piping is full of water and to verify correct valve alignment was retained from the existing TS 3.5.2.
- The required ECCS injection/spray subsystem is required to be operated through its recirculation line for ≥ 10 minutes every 92 days or in accordance with the Surveillance Frequency Control Program. This demonstrates that the subsystem is capable for operation. The time limit is based on engineering judgement. The frequency is consistent with other at-power testing.
- Verification that valves credited for automatically isolating a penetration flow path actuate to a simulated actuation signal is required every 18 months or accordance with the Surveillance Frequency Control Program. The frequency was selected because it is desirable to perform the surveillance during shutdown conditions to avoid operational transients.
- Verification that the required ECCS injection/spray subsystem actuate on a manual actuation signal is required every 18 months or accordance with the Surveillance Frequency Control Program. The frequency was selected because it is desirable to perform the surveillance during shutdown conditions to avoid operational transients.

The References section cites the applicable operating generic correspondence describing operating experience related to inventory control during shutdown conditions. It lists Information Notice 84-81 "Inadvertent Reduction in Primary Coolant Inventory in Boiling Water Reactors During Shutdown and Startup," November 1984; Information Notice 86-74, "Reduction of Reactor Coolant Inventory Because of Misalignment of RHR Valves," August 1986; Generic Letter 92-04, "Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs Pursuant to 10 CFR 50.54(~~F~~*f*), " August 1992; NRC Bulletin 93-03, "Resolution of Issues Related to Reactor Vessel Water Level Instrumentation in BWRs," May 1993; Information Notice 94-52, "Inadvertent Containment Spray and Reactor Vessel Draindown at

Millstone 1," July 1994; and General Electric Service Information Letter No. 388, "RHR Valve Misalignment During Shutdown Cooling Operation for BWR 3/4/5/6," February 1983.

The revised Bases (Volume 2 of NUREG 1434) for TS 3.5.2 ~~for the BWR/6~~ differ from the revised Bases for *NUREG-1433*~~the BWR/4 TS~~. The major difference is that the LCO requires one ECCS injection/spray subsystem to be operable. The ECCS injection/spray subsystem is either one of the three Low Pressure Coolant Injection subsystems, one Low Pressure Core Spray System, or one High Pressure Core Spray System. This difference is reflected throughout the Bases for TS 3.5.2 in NUREG 1434, Volume 2.

The staff reviewed the revised bases to ensure the applicable criterion from 10 CFR 50.36 is identified and justified, the reasons for the selection of each instrument function and required number of channels in the LCO is described, the reason for the applicable modes is stated, the purpose of each required action is described, and the purpose of each surveillance and the basis for the performance frequency is addressed, and appropriate references are cited. The staff concluded that each of the elements of the Final Policy Statement were satisfactorily addressed. Therefore, the staff determined that the revised Bases adheres to the guidance provided in the Final Policy Statement.

3.3 EVALUATION OF ADDITIONAL BASES CHANGES

3.3.1 B 3.3.5.1, ECCS Instrumentation

The Bases for several instrument functions related to automatic ECCS initiation were revised to reflect a revised Applicability. The functions would no longer be required during Modes 4 and 5 because of the relatively slow transient of unexpected drain events. It is judged that sufficient time is permitted for operators to mitigate such a transient. The instrumentation affected *in NUREG-1433 is* ~~for BWR/4s are~~ Reactor Vessel Water Level – Low Low Low, Level 1; Low Pressure Coolant Injection (LPCI) System Reactor Vessel Water Level – Low Low Low, Level 1; and Low Pressure Coolant Injection Pump Start – Time Delay Relay. For ~~BWR/6~~*NUREG-1434*~~'s6's~~, the affected functions are LPCI A and LPCS: Reactor Vessel Water Level – Low Low Low, Level 1; LPCI Pump A Start – Time Delay Relay; LPCI B and C: Reactor Vessel Water Level – Low Low Low, Level 1; LPCI Pump B Start – Time Delay Relay; and HPCS Reactor Vessel Water Level Lo Low, Level 2.

The remainder of the changes to the Bases for this LCO reflect the relocation of instrumentation function requirements to the LCO 3.3.5.2.

3.3.2 B 3.3.6.1, Primary Containment Isolation Instrumentation

The Bases for the Shutdown Cooling Isolation, Reactor Vessel Water Level – Low, Level 3 was revised to reflect the relocation of this requirement to LCO 3.3.5.2.

For ~~BWR/6~~*NUREG-1434's*~~6's~~, the function for Primary Containment Isolation, Containment and Drywell Ventilation Exhaust Radiation – High is revised to reflect the deletion of this requirement.

3.3.2 B 3.5.3, RCIC System

The Applicability was revised to state that in Modes 4 and 5, RPV water inventory control is provided by LCO 3.5.2.

3.3.3 B 3.6.1.3, PCIVs [Primary Containment Isolation Valves]

The Applicability was changed to replace the statement that certain valves are required to be operable to prevent inadvertent drain down to state that certain valves are required to be operable when the associated instrumentation is required to be operable.

The description of the Applicability and Actions is revised to delete the discussion of OPDRVs.

3.3.4 Other Affected Bases

The description of the Applicability, Actions and Applicable Safety Analyses Sections are revised to delete the discussion of OPDRVs ~~or~~*,* inadvertent drain down of the vessel*, or other related administrative changes* for the following LCOs:

- 3.3.6.~~1 Primary~~*2 Secondary* Containment Isolation Instrumentation
- *3.3.7.1 MCREC System Instrumentation*
- 3.5.1 ECCS - Operating
- 3.6.2.2 Suppression Pool Water Level
- 3.6.4.1 [Secondary] Containment
- 3.6.4.2 SCIVs [Secondary Containment Isolation Valves]
- 3.6.4.3 SGT System [Standby Gas Treatment]
- 3.7.4 MCREC [Main Control Room Environmental Control] System
- 3.7.5 Control Room AC [Air Conditioning] System
- 3.8.2 AC Sources – Shutdown
- 3.8.5 DC Sources – Shutdown
- 3.8.8 Inverters – Shutdown
- 3.8.10 Distribution Systems – Shutdown
- 3.10.1 Inservice Leak and Hydrostatic Testing Operation

The NRC staff reviewed the revised Bases sections and concluded that the revisions accurately reflect the changes contained in the associated LCO's. The Applicability, Actions and

Applicable Safety Analyses sections continue to contain information regarding the reasons for each of the LCO requirements. The staff determined that the Bases for the LCO's continue to satisfy the guidance in the Final Policy Statement.

4.0 CONCLUSION

The NRC staff determined that TS Bases changes are consistent with the proposed TS changes and provide an explanation and supporting information for each requirement in the specification. Therefore, the staff determined that the revised Bases are consistent with the Commission's Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors, dated July 2, 1993 (58 FR 39132).

Attachment 2

TSTF Comments on the TSTF-542 Draft Model Safety Evaluation for Plant-Specific Adoption

Summary Table of TSTF Comments

Section and Location	Comment
	Generic Comment 1: The model application applies to changes to plant-specific TS. While NUREG-1433 and NUREG-1434 are titled as the BWR/4 and BWR/6 STS, respectively, they are also representative of BWR/2, BWR/3, and BWR/5 designs. Therefore, plant-type references in the model SE reviewer guidance are revised in multiple locations to include all applicable BWR designs in order to assist the NRC reviewer in selecting the correct description for the plant-specific SE.
	General Comment 2: The NUREG-1433 and NUREG-1434 TS contain "A" and "B" version of the instrumentation TS. The "B" versions are representative of plants with a Setpoint Control Program and the "A" versions are representative of plants that do not have a Setpoint Control Program. In both cases, the plant-specific TS would not include the designation "A" or "B" to the reference to the Setpoint Control Program in the TS titles (for example, the plant TS would include TS 3.3.5.1, not TS 3.3.5.1A or TS 3.3.5.1B.) Therefore, the model SE is revised in many locations to not discuss "A" and "B" versions of instrumentation TS.
1.0, page 1, line 23	Revised the OPDRV definition to be consistent with the STS.
1.0, page 1, line 41	Editorial correction to eliminate the word "do"
2.2, page 2, line 31	Editorial correction from "have" to "has"
2.2, page 2, lines 33-34	Revised the sentence to not imply that a potential to drain will result in loss of core cooling.
2.2, page 2, lines 37-41, page 3, lines 1-5	The Modes for BWRs are combinations of reactor mode switch position and reactor coolant temperature. Changes are made to be consistent with Table 1-1 of the STS.
2.2, page 3, line 10	Added BWR design option.
2.3.1, page 4, lines 20 and 22	Revised the text to be consistent with TSTF-542.

Section and Location	Comment
2.3.2.3, page 5, lines 32-40, 44, and 45	Added brackets to the discussion of the LCO 3.5.2 Note, as many plants have removed this note from their TS.
2.3.2.3, page 5, line 45	Changed "is" to "may be" as other ECCS subsystems besides high pressure core spray may be used to satisfy the LCO.
2.3.2.5, Page 6, lines 19-20	Since this section describes the changes for all BWR plant types, "secondary containment" should be bracketed and the reference to standby gas should also be bracketed.
2.3.2.6, page 6, lines 33-35	The model SE is a written for a specific plant, so only one option applies.
2.3.3, page 6, lines 39-47	Deleted note per General Comment 2.
2.3.3, page 7, lines 1-2	Added a Reviewers Note pointing out that some BWRs do not have the capability to perform channel checks. If the existing TS do not have channel checks, the channel checks are not added to TS 3.3.5.1.
2.3.3.2, page 7, line 22	Changed "four" to "two." The TSTF refers to four TS (3.3.6.2A and B, and 3.3.7.1A and B). However, for an applicant using either the A or B version, there are only two.
2.3.3.2, page 7, lines 25-26	Add a reviewer's note stating that an acceptable variation in the model application is not renumber 3.3.5.2 and to make the new TS 3.3.5.3.
2.3.3.2.2.1 through 2.3.3.2.2.9, pages 8 through 14	The introductory note at the top of page 1 states that plant-specific information is in brackets and in bold text. The plant-specific current function number are in bold, but are not in brackets. Brackets are added.
2.3.3.2.2.9, page 14, line 35	Corrected section number.
2.3.3.2.2.9, page 15, lines 13-25	Added the acceptable deviations regarding plant-specific instruments from the model application.
2.3.3.3, page 17, lines 3-4	Brackets are added to indicate plant-specific information. BWR design differences should be reflected in SE by using the terms "[secondary] containment" and "[secondary containment]." Also, some BWR/6 plants do not have a Standby Gas Treatment System.
2.3.3.3, page 17, lines 10-13	Added the acceptable deviations discussion from the model application.

Section and Location	Comment
2.3.3.5, page 18, lines 10-18	Added the acceptable deviations discussion from the model application.
3.2, page 20, lines 36-42	Simplified the presentation.
3.3, page 21, lines 26-27	There is no discussion of the acceptability of the Applicability. A discussion is added.
3.3, page 21, line 49	Added brackets around discussion of the Standby Gas Treatment System and secondary containment to reflect BWR/6 plant design differences.
3.3, page 22, lines 1-8	Added brackets around discussion of the Standby Gas Treatment System and secondary containment to reflect BWR/6 plant design differences.
3.3, page 22, line 23	There is no discussion of the TS 3.5.2 Surveillance Requirement changes.
3.3, page 22, lines 24-27	This paragraph is misplaced and is moved to Section 3.4.
3.4.2, page 23, line 48	Changed reference from 10 CFR 50.36(c)(3) to 10 CFR 50.36(c)(2)(i). Paragraph (c)(3) discusses SRs, not actions.
3.4.3, page 25, lines 1 and 4	Editorial corrections. Deleted unnecessary comma and bracket.
3.4.3, page 25, line 21	Editorial correction.
3.4.3, page 25, lines 22-23	Note (b) under Applicability for these functions specifically says they are required when credited in calculating Drain Time. The discussion is corrected.
3.4.4, page 26, line 49, and page 27, lines 1, 8, 9	Added missing brackets around plant-specific information.
3.4.4, page 28, line 10	Editorial correction. Changed "ensure" to "ensures"
3.7, page 33, line 7	TS Table 1.1-1 indicates the Mode change temperature is plant-specific. The value 200 is placed in brackets.

Draft Model Safety Evaluation Mark-Up

*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 *with a* ~~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 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 ha~~sve~~ 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~~ *creates a* 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 *- Reactor Mode Switch in Run)* ~~with reactor mode switch position in run)~~, 2 (Startup ~~- with~~ *R*~~r~~eactor *M*~~m~~ode *S*~~s~~witch ~~position~~ in *R*~~r~~efuel *(with all reactor vessel head closure bolts fully tensioned)* or *S*~~s~~tartup/*H*~~h~~ot *S*~~s~~tandby), and 3 (Hot Standby ~~- with~~ *R*~~r~~eactor ~~mode~~ *Mode S*~~s~~witch ~~position~~ in *Run and average reactor coolant temperature > [200] ºF),* ~~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 -~~ *Reactor Mode Switch in Shutdown with all reactor vessel head closure bolts fully tensioned and* average reactor coolant temperature ≤ *[*200*]* °F), and Mode 5 (Refueling ~~with -~~ *One or more reactor vessel head closure bolts less than fully tensioned and Reactor Mode Switch in Shutdown or Refuel~~ ~~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/2, /3, /4, and /5 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"** ***or upper containment cavity to dryer pool gate removed"***]**.

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 *that* are locked, sealed, or otherwise secured in the closed position, blank flanges, or other devices that prevent flow ~~or~~ *of* reactor coolant through the penetration flow paths;
>
> 2. Penetration flow paths capable of being isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the TAF when actuated by RPV water level isolation instrumentation; or
>
> 3. Penetration flow paths with isolation devices that can be closed prior to the RPV water level being equal to the TAF by a dedicated operator trained in the task, who is in continuous communication with the control room, is stationed at the controls, and is capable of closing the penetration flow path isolation 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/2, /3, /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/5 and /6 plants choose:
[The phrase "low pressure" in LCO 3.5.2 is omitted because the high pressure core spray system *may be* ~~is~~ used to satisfy this requirement.]

2.3.2.4 Applicability of TS LCO 3.5.2

For BWR/2, /3, /4 and /5 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 Surveillance~~s~~ *Frequencies [are described below][*~~provide the option to perform the Surveillances at a fixed interval or~~ *are* in accordance with the Surveillance Frequency Control Program (SFCP)~~, for those plants that have adopted an SFCP~~*]*.

2.3.3 Changes to TS Section 3.3:

~~*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.*~~

[Reviewer's Note: Some BWRs do not have the capability to perform Channel Checks. If the existing TS do not include Channel Checks, TS 3.3.5.1 will not add Channel Checks.]

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

The TS LCO [3.3.5.1**A** *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 [3.3.5.1**A** *or* **3.3.5.1B]**.

2.3.3.2 Insertion of new TS [3.3.5.2**A 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~~ *two* TS. These requirements are being consolidated into new TS 3.3.5.2.

*[Reviewer's Note: An acceptable variation in the model application is to not renumber 3.3.5.2 and to number the new TS 3.3.5.3.] [*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/2, /3, or /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 3.3.5.2~~A~~, 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 3.3.5.2~~A~~, 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/5 and /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 3.3.5.2~~A~~, 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 3.3.5.2~~A~~, 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 3.3.5.2~~A~~ 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 3.3.5.2~~A~~ 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.~~3~~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 3.3.5.2~~A.~~**]**

Acceptable variations are the inclusion of any plant-specific instrumentation functions that:

- *Provide automatic initiation of ECCS water injection on low RPV water level.*
- *Provide Residual Heat Removal (RHR) System isolation on low water level and/or, for BWR/6 plants, isolate the primary containment and drywell ventilation exhaust.*
- *Provide manual and automatic isolation of the [Secondary Containment] on low water level.*
- *Provide automatic isolation of the control room on low water level.*
- *Provide automatic isolation of penetration flow paths below the TAF on low RPV water level.*
- *Support manual initiation of an ECCS subsystem.*

Changes to these instrumentation functions is justified by the discussion in Sections 3.3 and 3.4.1 of the TSTF-542 justification and are described in the licensee's application.

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/2, /3, or /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/5 or /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/2, /3, /4 or /54 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.

Acceptable variations are the inclusion of any plant-specific TS that that provide primary or secondary containment, primary or secondary containment isolation valves, or standby gas treatment functions. Changes to the TS controls on these systems is justified by the discussion in Sections 3.4.2 and 3.4.3 of the TSTF-542 justification.

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.

An acceptable deviation is the inclusion of plant-specific systems that provide the electrical power functions in the TS. Changes to the TS controls on these systems is justified by the discussion in Section 3.4.4 of the TSTF-542 justification.

Note: Insert description of any licensee specific TS changes. An acceptable variation from TSTF-542 is the elimination of any plant-specific TS requirements related to OPDRVs, the related concepts such as "RHR integrity maintained," and Required Actions to "suspend OPDRVs" that do not appear in the NUREG-1433 and NUREG 1434. Changes to these TS controls are justified by the discussion in the TSTF-542 justification.

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*, and is also applicable to BWR/2, BWR/3, and in some cases, BWR/5 plants*] *or* [NUREG 1434, Revision 4, contains the STS for BWR/6 plants*, and is also applicable in some cases to BWR/5 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/2, /3 /4, or /5 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/2, /3, of /4 choose:* **[The second part states, one low pressure ECCS injection/spray subsystem shall be OPERABLE.]** *For BWR/5 or /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 Mode 4 and 5 applicability of TS 3.5.2 is appropriate given the unaffected TS requirements on ECCS and RPV water level in Modes 1, 2, and 3.

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 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.

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/2, /3, or /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/5 or /6 plant~~s~~ 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~~2)*(i)* 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/2, /3, or /4 plant~~s~~ 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/5 or /6 plant~~s~~ choose the following Section 3.43:

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-*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) *is* ~~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 ensures 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/2, /3, or /4 plant, 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/5 or /6 plant, 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 10 CFR 50.36(c)(3) is satisfied.

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 [PLANT], the representative STS is in [NUREG-1433][NUREG-1434][for BWR/5: NUREG-1433 and NUREG-1434]*** ~~*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]** ***and/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:

Attachment 3

Editorial Corrections to TSTF-542, Revision 2

Summary Table

Location	Comment
Justification Sections 3.3.4.7, 3.3.4.8, 3.3.4.11, and 3.3.4.12.	The third bullet refers to Action E, but the correct reference is Action F.
Justification Section 3.3.4.8	The title only references function 2.c, but the discussion applies to functions 1.d and 2.c as pointed out in the draft SE.
Justification Sections 3.3.4.10 and 3.3.4.13	The last bullet refers to LCO 3.3.5.1A, but the correct reference is LCO 3.3.5.2A.
NUREG-1433, TS 3.3.5.2A and TS 3.3.5.2B markup	Function 2.b, added the opening parenthesis to the word "Bypass".
NUREG-1434, TS 3.3.5.2B markup	Function 2.c, changed number of channels from "11" to "1"
NUREG-1434, TS 3.3.5.2A Bases, page B 3.3.5.2A-10	The Bases for Required Action G.1 states "Conditions C, D, E, or f..." "F" is capitalized.
NUREG-1433 and NUREG-1434, TS 3.5.2 Bases	Reference section, Reference 3, states "10 CFR 50.54(F)". The "F" is made lower case.

Revised TSTF-542 Pages Showing Editorial Corrections

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

- The allowable value in LCO 3.3.5.~~1A~~ *2A* is unchanged.

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

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

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

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

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

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

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

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

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

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

- The allowable value is unchanged.

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

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

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

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

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

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

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

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

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

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

- The LCO 3.3.5.~~1A~~ *2A* allowable value is unchanged.

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

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

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

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

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

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

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

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

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

Table 3.3.5.2-1 (page 1 of 1)
RPV Water Inventory Control Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Core Spray System					
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[4]	C	SR 3.3.5.2.1 SR 3.3.5.2.2	≤ [500] psig
b. Core Spray Pump Discharge Flow - Low (Bypass)	4, 5	[1 per pump(a)]	D	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [ ] gpm and ≤ [ ] gpm]
c. Manual Initiation	4, 5	[1 per subsystem (a)]	D	SR 3.3.5.2.3	NA
2. Low Pressure Coolant Injection (LPCI) System					
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[4]	C	SR 3.3.5.2.1 SR 3.3.5.2.2	≤ [500] psig
b. Low Pressure Coolant Injection Pump Discharge Flow - Low (Bypass)	4, 5	[1 per pump(a)]	D	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [ ] gpm and ≤ [ ] gpm]
c. Manual Initiation	4, 5	[1](a)	D	SR 3.3.5.2.3	NA
3. RHR System Isolation					
a. Reactor Vessel Water Level - Low, Level 3	(b)	[2 in one trip system]	B	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [10] inches
4. Reactor Water Cleanup (RWCU) System Isolation					
a. Reactor Vessel Water Level - Low Low, Level 2	(b)	[2 in one trip system]	B	SR 3.3.5.2.1 SR 3.3.5.2.2	≥ [-47] inches

(a) Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, "Reactor Pressure Vessel Water Inventory Control."
(b) When automatic isolation of the associated penetration flow path(s) is credited in calculating DRAIN TIME.

Table 3.3.5.2-1 (page 1 of 1)
RPV Water Inventory Control Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
1. Core Spray System				
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[4]	C	SR 3.3.5.2.1 SR 3.3.5.2.2
b. Core Spray Pump Discharge Flow - Low (Bypass)	4, 5	[1 per pump(a)]	D	SR 3.3.5.2.1 SR 3.3.5.2.2
c. Manual Initiation	4, 5	[1 per subsystem s(a)]	D	SR 3.3.5.2.3
2. Low Pressure Coolant Injection (LPCI) System				
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[4]	C	SR 3.3.5.2.1 SR 3.3.5.2.2
b. Low Pressure Coolant Injection Pump Discharge Flow - Low (Bypass)	4, 5	[1 per pump(a)]	D	SR 3.3.5.2.1 SR 3.3.5.2.2
c. Manual Initiation	4, 5	[1](a)	D	SR 3.3.5.2.3
3. RHR System Isolation				
a. Reactor Vessel Water Level - Low, Level 3	(b)	[2 in one trip system]	B	SR 3.3.5.2.1 SR 3.3.5.2.2
4. Reactor Water Cleanup (RWCU) System Isolation				
a. Reactor Vessel Water Level - Low Low, Level 2	(b)	[2 in one trip system]	B	SR 3.3.5.2.1 SR 3.3.5.2.2

(a) Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, "Reactor Pressure Vessel Water Inventory Control."
(b) When automatic isolation of the associated penetration flow path(s) is credited in calculating DRAIN TIME.

Table 3.3.5.2-1 (page 1 of 2)
RPV Water Inventory Control Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS
1. Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core Spray (LPCS) Subsystems				
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[3(a)]	C	SR 3.3.5.2.1 SR 3.3.5.2.2
b. [LPCS Pump Discharge Flow - Low (Bypass)]	4, 5	[1 per pump(a)]	F	SR 3.3.5.2.1 SR 3.3.5.2.2
c. [LPCI Pump A Discharge Flow - Low (Bypass)]	4, 5	[1 per pump(a)]	F	SR 3.3.5.2.1 SR 3.3.5.2.2
d. Manual Initiation	4, 5	[1 per subsystem (a)]	F	SR 3.3.5.2.3
2. LPCI B and LPCI C Subsystems				
a. Reactor Steam Dome Pressure - Low (Injection Permissive)	4, 5	[3(a)]	C	SR 3.3.5.2.1 SR 3.3.5.2.2
b. [LPCI Pump B and LPCI Pump C Discharge Flow - Low (Bypass)]	4, 5	[1 per pump(a)]	F	SR 3.3.5.2.1 SR 3.3.5.21.2
c. Manual Initiation	4, 5	[1 per subsystem (a)]	F	SR 3.3.5.2.3

(a) Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, "Reactor Pressure Vessel Water Inventory Control."

BASES

ACTIONS (continued)

F.1

If an LPCI or LPCS Discharge Flow - Low bypass function or HPCS System Discharge Pressure - High or Flow Rate - Low bypass function is inoperable, there is a risk that the associated ECCS pump could overheat when the pump is operating and the associated injection valve is not fully open. In this condition, the operator can take manual control of the pump and the injection valve to ensure the pump does not overheat. If a manual initiation function is inoperable, the ECCS subsystem pumps can be started manually and the valves can be opened manually, but this is not the preferred condition.

The 24 hour Completion Time was chosen to allow time for the operator to evaluate and repair any discovered inoperabilities. The Completion Time is appropriate given the ability to manually start the ECCS pumps and open the injection valves and to manually ensure the pump does not overheat.

G.1

With the Required Action and associated Completion Time of Conditions C, D, E, or F not met, the associated ECCS injection/spray subsystem may be incapable of performing the intended function, and must be declared inoperable immediately.

SURVEILLANCE REQUIREMENTS

As noted in the beginning of the SRs, the SRs for each RPV Water Inventory Control instrument Function are found in the SRs column of Table 3.3.5.2-1.

SR 3.3.5.2.1

Performance of the CHANNEL CHECK ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the instrument channels could be an indication of excessive instrument drift in one of the channels or something even more serious. A CHANNEL CHECK guarantees that undetected outright channel failure is limited; thus, it is key to verifying the instrumentation continues to operate properly between each CHANNEL FUNCTIONAL TEST.

BASES

REFERENCES

1. ~~FSAR, Section [6.3.2].~~*Information Notice 84-81 "Inadvertent Reduction in Primary Coolant Inventory in Boiling Water Reactors During Shutdown and Startup," November 1984.*

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

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

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

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

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

BASES

REFERENCES

1. ~~FSAR, Section [6.3.3.4].~~*Information Notice 84-81 "Inadvertent Reduction in Primary Coolant Inventory in Boiling Water Reactors During Shutdown and Startup," November 1984.*

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

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

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

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

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