

November 2, 2016

TSTF-16-10  
PROJ0753

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

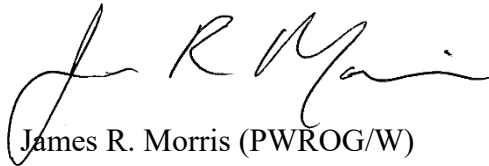
**SUBJECT:** TSTF Comments on Draft Safety Evaluation for Traveler TSTF-542, Revision 2, "Reactor Pressure Vessel Water Inventory Control," and Transmittal of Editorial Corrections to TSTF-542, Revision 2.

**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).

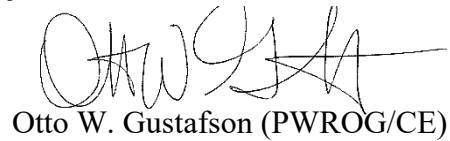
On March 14, 2016, the TSTF submitted traveler TSTF-542, Revision 2, "Reactor Pressure Vessel Water Inventory Control," to the Nuclear Regulatory Commission (NRC) for review (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16074A448). In the referenced letter, the NRC provided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

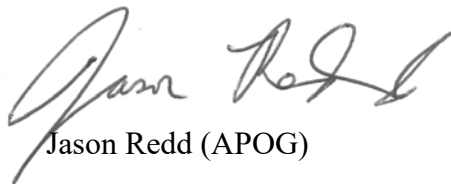
Should you have any questions, please do not hesitate to contact us.



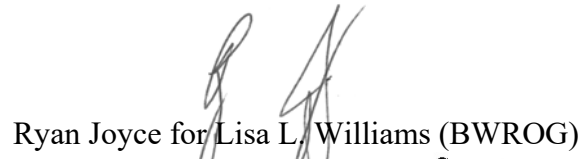
James R. Morris (PWROG/W)



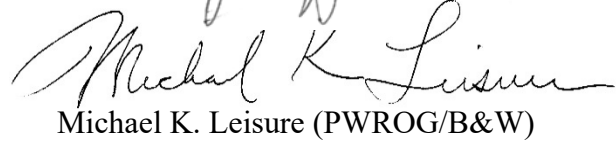
Otto W. Gustafson (PWROG/CE)



Jason Redd (APOG)



Ryan Joyce for Lisa L. Williams (BWROG)



Michael K. Leisure (PWROG/B&W)

- 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.

<b>Section and Location</b>	<b>Comment</b>
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, line 23	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 41 and page 5, line 1	Changed "valves" to "valve." There is only a single suction valve for CST and for Suppression Pool.

<b>Section and Location</b>	<b>Comment</b>
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](mailto: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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Kevin Hsueh, Chief  
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Office of Nuclear Reactor Regulation

Project No. 753  
Enclosures: As stated  
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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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Technical Specifications Task Force

Project No. 753

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1 **DRAFT SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION**

2 **TECHNICAL SPECIFICATIONS TASK FORCE TRAVELER**

3 **TSTF-542, REVISION 2**

4 **“REACTOR PRESSURE VESSEL WATER INVENTORY CONTROL”**

5  
6 **1.0 INTRODUCTION**

7  
8 By letter dated December 31, 2013 (Agencywide Document Access and Management System  
9 (ADAMS) Accession No. ML14002A112), the Technical Specifications (TS) Task Force (TSTF)  
10 submitted ~~Change~~-Traveler TSTF-542, “Reactor Pressure Vessel Water Inventory Control,”  
11 Revision 0, for U.S. Nuclear Regulatory Commission review and approval. By letter dated  
12 September 15, 2015, the TSTF submitted Revision 1 to ~~Change~~-Traveler TSTF-542 (ADAMS  
13 Accession No. ML15258A850), and by letter dated March 14, 2016, submitted Revision 2 to  
14 ~~Change~~-Traveler ~~TSTF-TSTF~~-542 (ADAMS Accession No. ML16074A448). Traveler TSTF-542  
15 proposes changes to the Standard Technical Specifications (STS) and Bases for boiling water  
16 reactor (BWR) designs BWR/4 and BWR/6.<sup>1</sup> The changes would be incorporated into future  
17 revisions of NUREG-1433, Volumes 1 and 2 and NUREG-1434, Volumes 1 and 2.

18 *NUREG-1433 is based on the BWR/4 plant design, but is also representative of the BWR/2, /3,*  
19 *and, in some cases, BWR/5 designs. NUREG-1434 is based on the BWR/6 plant design, and is*  
20 *representative, in many cases, of the BWR/5 design.*

21  
22 The proposed changes would replace the existing ~~BWR/4 and BWR/6~~ Specifications related to  
23 “operations with a potential for draining the reactor vessel” (OPDRVs) with revised  
24 ~~Specifications-specifications~~ for Reactor Pressure Vessel Water Inventory Control (RPV WIC).

25  
26 Throughout this safety evaluation (SE), items that are enclosed in square brackets signify  
27 plant-specific nomenclature or values. Individual licensees would furnish site-specific  
28 nomenclature or values for bracketed items when submitting a license amendment request  
29 (LAR) to adopt the changes described in this SE.  
30

---

<sup>1</sup> 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.

1 **2.0 REGULATORY EVALUATION**

2  
3 **2.1 TECHNICAL SPECIFICATIONS**

4  
5 Section IV, "The Commission Policy," of the Final Policy Statement on Technical Specifications  
6 Improvements for Nuclear Power Reactors (58 *Federal Register* 39132), dated July 22, 1993,  
7 states in part:

8  
9  
10 The purpose of Technical Specifications is to impose those  
11 conditions or limitations upon reactor operation necessary to  
12 obviate the possibility of an abnormal situation or event giving rise  
13 to an immediate threat to the public health and safety by  
14 identifying those features that are of controlling importance to  
15 safety and establishing on them certain conditions of operation  
16 which cannot be changed without prior Commission approval.

17 [T]he Commission will also entertain requests to adopt portions of  
18 the improved STS [(e.g., TSTF-542)], even if the licensee does  
19 not adopt all STS improvements...

20 The Commission encourages all licensees who submit Technical  
21 Specification related submittals based on this Policy Statement to  
22 emphasize human factors principles...

23 In accordance with this Policy Statement, improved STS have  
24 been developed and will be maintained for [the BWR/4 and  
25 BWR/6 designs]. The Commission encourages licensees to use  
26 the STS as the basis for plant-specific Technical Specifications...

27 [I]t is the Commission intent that the wording and Bases of the  
28 improved STS be used [] to the extent practicable.

29  
30  
31 **2.2 SYSTEM DESCRIPTION**

32  
33 The BWR reactor pressure vessels have a number of penetrations located below the top of  
34 active *fuel* (TAF). These penetrations provide entry for control ~~blades~~*rods*, recirculation flow,  
35 and shutdown cooling. Since these penetrations are below the TAF, this ~~creates a~~ *gives*  
36 potential to drain the reactor vessel water inventory and ~~thus~~ lose effective core cooling. The  
37 loss of water inventory and effective core cooling can potentially lead to fuel cladding failure and  
38 radioactive release.

39  
40 During operation in Modes 1 (Power Operation ~~with reactor mode switch position~~ *Reactor*  
41 *Mode Switch* in ~~run~~*Run*), 2 (Startup ~~with reactor mode switch position~~ *Reactor Mode Switch* in  
42 ~~refuel~~*Refuel (with all reactor vessel head closure bolts fully tensioned)* or ~~startup/hot~~  
43 ~~standby~~*Startup/Hot Standby*), and 3 (Hot ~~Standby with reactor mode switch position~~ *Shutdown -*  
44 ~~Reactor Mode Switch~~ in ~~shutdown~~), *Run and average reactor coolant temperature > [200] °F*),  
45 the TS for instrumentation and emergency core cooling systems (ECCS) require operability of

1 sufficient equipment to ensure large quantities of water ~~can~~*will* be injected into the vessel  
2 should level decrease below the preselected value. These requirements are designed to  
3 mitigate the effects of a loss-of-coolant accident (LOCA), but also provide protection for other  
4 accidents and transients that involve a water inventory loss.

5  
6 During BWR operation in Mode 4 (Cold Shutdown – *Reactor Mode Switch in Shutdown with all*  
7 *reactor vessel head closure bolts fully tensioned and with* average reactor coolant temperature  
8  $\leq [200]$  °F), and Mode 5 (Refueling - ~~with~~ One or more reactor vessel head closure bolts less  
9 than fully tensioned *and Reactor Mode Switch in Shutdown or Refuel*), the pressures and  
10 temperatures that could cause a LOCA are not present. During certain phases of refueling  
11 (Mode 5) a large volume of water is available above the RPV (i.e., the RPV head is removed,  
12 the water level is  $\geq [23]$  feet] over the top of the RPV flange, and the spent fuel storage pool  
13 gates are removed ~~for BWR/4 plants in NUREG-1433~~, or the upper containment pool is  
14 connected to the RPV ~~for BWR/6 plants in NUREG-1434~~.

15  
16 The large volume of water available in and above the RPV (during much of the time when in  
17 Mode 5) provides time for operator detection and manual operator action to stop and mitigate an  
18 RPV draining event. However, typically at other times during a refueling outage, during cold  
19 shutdown (Mode 4) or refueling (Mode 5), there may be a potential for significant drainage paths  
20 from certain outage activities, human error, and other events when it is more likely to have some  
21 normally available equipment, instrumentation, and systems inoperable due to maintenance and  
22 outage activities. There may not be as much time for operator action as compared to times  
23 when there are large volumes of water above the RPV.

24  
25 In comparison to Modes 1, 2, and 3, with typical high temperatures and pressures (especially in  
26 Modes 1 and 2), Modes 4 and 5 generally do not have the high pressure and temperature  
27 considered necessary for a LOCA envisioned from a high energy pipe failure. Thus, while the  
28 potential sudden loss of large volumes of water from a LOCA are not expected, operators  
29 monitor for BWR RPV water level decrease from potential significant or even unexpected  
30 drainage paths. These potential drainage paths in Modes 4 and 5 generally would require less  
31 water replacement capability to maintain water above TAF.

32  
33 To address the drain down potential during Modes 4 and 5, the current BWR STS contain  
34 specifications that are applicable during an OPDRV, or require suspension of OPDRVs if certain  
35 equipment is inoperable. The term OPDRV is not specifically defined in the TS and historically  
36 has been subject to inconsistent application by licensees. The changes discussed in this SE  
37 are intended to resolve any ambiguity by creating a new RPV water inventory control TS with  
38 attendant equipment operability requirements, required actions and surveillance requirements  
39 (SR) and deleting references to OPDRVs throughout the TS.

### 40 41 2.3 CHANGES TO THE STS

42  
43 The proposed changes would (1) provide a definition of a new term, DRAIN TIME; (2) revise  
44 and rename STS 3.5.2 as “Reactor Pressure Vessel Water Inventory Control;” (3) provide a new  
45 TS 3.3.5.2, “Reactor Pressure Vessel Water Inventory Control Instrumentation;” and (4) delete  
46 existing references to “operations with the potential to drain the reactor pressure vessel”  
47 throughout the STS. The descriptions of the proposed changes are provided in this section.  
48

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

3  
4 2.3.1 Insertion of New Definition of DRAIN TIME

5  
6 The following definition of "DRAIN TIME" would be added to Section 1.1, "Definitions" Section of  
7 the STS:

8  
9  
10 The DRAIN TIME is the time it would take for the water inventory  
11 in and above the Reactor Pressure Vessel (RPV) to drain to the  
12 top of the active fuel (TAF) seated in the RPV assuming:

- 13  
14 a) The water inventory above the TAF is divided by the limiting  
15 drain rate;
- 16  
17 b) The limiting drain rate is the larger of the drain rate through a  
18 single penetration flow path with the highest flow rate, or the  
19 sum of the drain rates through multiple penetration flow paths  
20 susceptible to a common mode failure (e.g., seismic event,  
21 loss of normal power, single human error), for all penetration  
22 flow paths below the TAF except:
- 23  
24 1. Penetration flow paths connected to an intact closed  
25 system, or isolated by manual or automatic valves *that* are  
26 locked, sealed, or otherwise secured in the closed position,  
27 blank flanges, or other devices that prevent flow ~~or~~ of  
28 reactor coolant through the penetration flow paths;
- 29  
30 2. Penetration flow paths capable of being isolated by valves  
31 that will close automatically without offsite power prior to  
32 the RPV water level being equal to the TAF when actuated  
33 by RPV water level isolation instrumentation; or
- 34  
35 3. Penetration flow paths with isolation devices that can be  
36 closed prior to the RPV water level being equal to the TAF  
37 by a dedicated operator trained in the task, who is in  
38 continuous communication with the control room, is  
39 stationed at the controls, and is capable of closing the  
40 penetration flow path isolation device without offsite power.
- 41  
42 c) The penetration flow paths required to be evaluated per  
43 paragraph b) are assumed to open instantaneously and are  
44 not subsequently isolated, and no water is assumed to be  
45 subsequently added to the RPV water inventory;
- 46  
47 d) No additional draining events occur; and  
48

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

2  
3 A bounding DRAIN TIME may be used in lieu of a calculated  
4 value.

5  
6  
7 2.3.2 Changes to STS Section 3.5:

8  
9 2.3.2.1 Title of TS 3.5

10  
11 The title of Section 3.5 is being revised from "Emergency Core Cooling System (ECCS) and  
12 Reactor Core Isolation Cooling System (RCIC)" to "Emergency Core Cooling Systems (ECCS),  
13 RPV Water Inventory Control, and Reactor Core Isolation Cooling (RCIC) System."

14  
15 2.3.2.2 Title of TS 3.5.2

16  
17 The title of TS 3.5.2 is being revised from "ECCS – Shutdown" to "Reactor Pressure Vessel  
18 (RPV) Water Inventory Control."

19  
20 2.3.2.3 LCO 3.5.2

21  
22 STS limiting condition for operation (LCO) 3.5.2 currently states "Two low pressure ECCS  
23 injection/spray subsystems shall be OPERABLE." The LCO note currently states: "One LPCI  
24 subsystem may be considered OPERABLE during alignment and operation for decay heat  
25 removal if capable of being manually realigned and not otherwise inoperable."  
26

27 STS LCO 3.5.2 for NUREG-1433 (~~BWR/4 STS~~) would be revised to state:

28  
29  
30 DRAIN TIME of RPV water inventory to the top of active fuel  
31 (TAF) shall be  $\geq$  36 hours.

32  
33 AND

34  
35 One low pressure ECCS injection/spray subsystem shall be  
36 OPERABLE.

37  
38  
39 The note for LCO 3.5.2 would be revised to state:

40  
41  
42 A Low Pressure Coolant Injection (LPCI) subsystem may be  
43 considered OPERABLE during alignment and operation for decay  
44 heat removal if capable of being manually realigned and not  
45 otherwise inoperable.  
46  
47

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

3  
 4 2.3.2.4 Applicability of TS LCO 3.5.2

5  
 6 For NUREG-1433 ~~(BWR/4)~~, LCO 3.5.2 is currently applicable in MODE 4 and in MODE 5,  
 7 except with the spent fuel storage pool gates removed and water level  $\geq$  [23 ft] over the top of  
 8 the reactor pressure vessel flange.

9  
 10 For NUREG-1434 ~~(BWR/6)~~, LCO 3.5.2 is currently applicable in Mode 4 and Mode 5 except  
 11 with the upper containment [cavity to dryer] pool [gate] removed and water level  $\geq$  [22 ft  
 12 8 inches] over the top of the reactor pressure vessel flange.

13  
 14 The applicability would be revised to be MODES 4 and 5, with no exceptions.

15  
 16 2.3.2.5 Actions Table of TS 3.5.2

17  
 18 The existing Actions Table of TS 3.5.2 for NUREG-1433 ~~(BWR/4)~~-states:

19

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	Immediately
	<u>AND</u> C.2 Restore one ECCS injection/spray subsystem to OPERABLE status	4 hours
D. Required Action C.2 and associated Completion Time not met	D.1 Initiate action to restore [secondary] containment to OPERABLE status.	Immediately
	<u>AND</u> D.2 [Initiate action to restore one standby gas treatment subsystem to OPERABLE status.	Immediately]
	<u>AND</u>	Immediately

	D.3 Initiate action to restore isolation capability in each required [secondary] containment penetration flow path not isolated.	
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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>	4 hours
	C.2 Verify each [secondary] containment penetration flow path is capable of being isolated in less than the DRAIN TIME.  <u>AND</u>	4 hours
	C.3 Verify one standby gas treatment subsystem is capable of being placed in operation in less than the DRAIN TIME.	4 hours
D. DRAIN TIME < 8 hours.	D.1 -----NOTE----- Required ECCS injection/spray subsystem or additional method of water injection shall be capable of operating without offsite electrical power. -----  Initiate action to establish an additional method of water injection with water sources capable of maintaining RPV water level > TAF for ≥ 36 hours.	Immediately



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

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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.	<p>C.1 Initiate action to suspend OPDRVs</p> <p><u>AND</u></p> <p>C.2 Restore one ECCS injection/spray subsystem to OPERABLE status</p>	<p>Immediately</p> <p>4 hours</p>

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

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2  
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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.	4 hours
	<u>AND</u>	
	C.2 Verify each [secondary containment] penetration flow path is capable of being isolated in less than the DRAIN TIME.	4 hours
	<u>AND</u>	
	C.3 [Verify one standby gas treatment subsystem is capable of being placed in operation in less than the DRAIN TIME.	4 hours]

<p>D. DRAIN TIME &lt; 8 hours.</p>	<p>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 &gt; TAF for ≥ 36 hours.</p> <p><u>AND</u></p> <p>D.2 Initiate action to establish [secondary containment] boundary</p> <p><u>AND</u></p> <p>D.3 Initiate action to isolate each [secondary containment] penetration flow path or verify it can be manually isolated from the control room.</p> <p><u>AND</u></p> <p>D.4 [Initiate action to verify one standby gas treatment subsystem is capable of being placed in operation.</p>	<p>Immediately</p> <p>Immediately</p> <p>Immediately</p> <p>Immediately]</p>
<p>E. Required Action and associated Completion Time of Condition C or D not met.</p> <p><u>OR</u></p> <p>DRAIN TIME &lt; 1 hour</p>	<p>E.1 Initiate action to restore DRAIN TIME to ≥ 36 hours.</p>	<p>Immediately</p>

1  
 2 2.3.2.6 TS 3.5.2 Surveillance Requirements

3  
 4 The NUREG-1433-(BWR/4) TS 3.5.2 currently contains the following SRs:

5

SURVEILLANCE	FREQUENCY
--------------	-----------

SR 3.5.2.1	Verify, for each required low pressure coolant injection (LPCI) subsystem, the suppression pool water level is $\geq$ [12 ft 2 inches].	[12 hours <u>OR</u> 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 $\geq$ [12 ft 2 inches] or  <i>b.</i> -----NOTE----- Only one required CS subsystem may take credit for this option during OPDRVS. -----  Condensate storage tank water level is $\geq$ [12 ft].	[12 hours <u>OR</u> 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 <u>OR</u> 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 <u>OR</u> In accordance with the Surveillance Frequency Control Program]

1  
2 The revised SRs for NUREG-1433-(BWR/4) would be:  
3

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

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

1 The corresponding NUREG-1434-(BWR/6) TS 3.5.2 currently contains the following SRs:  
 2

SURVEILLANCE		FREQUENCY												
SR 3.5.2.1	Verify, for each required low pressure ECCS injection/spray subsystem, the suppression pool water level is $\geq$ [12.67 ft].	[12 hours]  <u>OR</u>  In accordance with the Surveillance Frequency Control Program]												
SR 3.5.2.2	Verify, for the required High Pressure Core Spray (HPCS) subsystem, the: <ul style="list-style-type: none"> <li>a. Suppression pool water level is <math>\geq</math> [12.67 ft] or</li> <li>b. Condensate storage tank water level is <math>\geq</math> [18 ft]</li> </ul>	[12 hours]  <u>OR</u>  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]  <u>OR</u>  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]  <u>OR</u>  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]	[In accordance with the Inservice Testing Program]												
		<u>OR</u>												
		[92 days]												
		<u>OR</u>												
		In accordance with the Surveillance												
	<table border="0"> <thead> <tr> <th><u>System</u></th> <th><u>Flow Rate</u></th> <th><u>Pressure of</u> [System Head Corresponding to A Reactor Pressure of]</th> </tr> </thead> <tbody> <tr> <td>LPCS</td> <td><math>\geq</math>[7115]gpm</td> <td><math>\geq</math>[290]psig</td> </tr> <tr> <td>LPCI</td> <td><math>\geq</math>[7450]gpm</td> <td><math>\geq</math>[125]psig</td> </tr> <tr> <td>HPCS</td> <td><math>\geq</math>[7115]gpm</td> <td><math>\geq</math>[445]psig</td> </tr> </tbody> </table>	<u>System</u>	<u>Flow Rate</u>	<u>Pressure of</u> [System Head Corresponding to A Reactor Pressure of]	LPCS	$\geq$ [7115]gpm	$\geq$ [290]psig	LPCI	$\geq$ [7450]gpm	$\geq$ [125]psig	HPCS	$\geq$ [7115]gpm	$\geq$ [445]psig	
<u>System</u>	<u>Flow Rate</u>	<u>Pressure of</u> [System Head Corresponding to A Reactor Pressure of]												
LPCS	$\geq$ [7115]gpm	$\geq$ [290]psig												
LPCI	$\geq$ [7450]gpm	$\geq$ [125]psig												
HPCS	$\geq$ [7115]gpm	$\geq$ [445]psig												

	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  <u>OR</u>  In accordance with the Surveillance Frequency Control Program]

1  
2 The revised SRs for NUREG-1434 (BWR/6) would be:  
3

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

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

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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.



1  
2 2.3.3.1 Changes to STS LCOs 3.3.5.1A and 3.3.5.1B, Emergency Core Cooling System  
3 (ECCS) Instrumentation (Without and With Setpoint Control Program),  
4 respectively  
5

6 The STS LCOs 3.3.5.1A and 3.3.5.1B state that "the ECCS instrumentation for each Function in  
7 Table 3.3.5.1-1, [Emergency Core Cooling System Instrumentation,] shall be OPERABLE" with  
8 the applicability as stated in the table. Table 3.3.5.1-1 currently contains requirements for  
9 function operability during Modes 4 and 5 when associated ECCS subsystem(s) are required to  
10 be operable per LCO 3.5.2, "ECCS – Shutdown." Throughout this table, the applicability in  
11 Modes 4 and 5 is being deleted because the instrumentation requirements during shutdown are  
12 being consolidated into the new STS 3.3.5.2. Conforming changes are made to the ACTIONS  
13 Table of STS LCO 3.3.5.1A and 3.3.5.1B.  
14

15 2.3.3.2 Insertion of new STS 3.3.5.2A and 3.3.5.2B, Reactor Pressure Vessel (RPV)  
16 Water Inventory Control Instrumentation (Without and With Setpoint Control  
17 Program), respectively  
18

19 A new STS 3.3.5.2 is proposed to provide alternative instrumentation requirements to support  
20 manual initiation of the ECCS injection/spray subsystem required in new STS 3.5.2 and  
21 automatic isolation of penetration flow paths that may be credited in the determination of drain  
22 time. The current ~~STSTs~~ contain instrumentation requirements related to OPDRVs in four TS.  
23 These requirements are being consolidated into new STS 3.3.5.2.  
24

25 The existing STS 3.3.5.2, "Reactor Core Isolation Cooling (RCIC) System Instrumentation," is  
26 being renumbered to 3.3.5.3 in order to maintain the STS numbering conventions in the  
27 NUREGs.  
28

29 2.3.3.2.1 New TS 3.3.5.2A and B LCO and Applicability  
30

31 The proposed LCO 3.3.5.2 states:  
32  
33

34 The RPV Water Inventory Control instrumentation for each  
35 Function in Table 3.3.5.2-1 shall be OPERABLE.  
36  
37

38 The applicability states, "According to Table 3.3.5.2-1."  
39

40 The following sections describe the instrumentation functions contained in the new  
41 Table 3.3.5.2-1.  
42

1 2.3.3.2.2 ~~NUREG-1433 BWR/4~~ New Table 3.3.5.2-1, RPV Water Inventory Control  
2 Instrumentation

3  
4 2.3.3.2.2.1 Function 1.a, Core Spray System, Reactor Steam Dome Pressure - Low  
5 (Injection Permissive), and  
6 Function 2.a, Low Pressure Coolant Injection (LPCI) System, Reactor Steam  
7 Dome Pressure - Low (Injection Permissive)  
8

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

- 11
- 12 • The applicability is changed. The existing STS 3.3.5.1 applicability for these functions in  
13 Modes 4 and 5 is modified by a note that limits the applicability to when the associated  
14 ECCS subsystem(s) are required to be operable per LCO 3.5.2, "ECCS - Shutdown." The  
15 revised applicability is Modes 4 and 5 without exception, to be consistent with the  
16 applicability of new LCO 3.5.2, "RPV Water Inventory Control."  
17
- 18 • The number of required channels per function is unchanged.  
19
- 20 • In the new table, a Channel Check and Channel Functional Test are required at the existing  
21 frequency. Calibration of the trip units, Channel Calibration, Logic System Functional Test,  
22 and ECCS Response Time tests are no longer required in Modes 4 and 5.  
23
- 24 • In new LCO 3.3.5.2A, the Allowable Value is revised to eliminate the low pressure limit and  
25 to retain the high pressure limit. The RPV *pressure* is well below the lower limit in Modes 4  
26 and 5, so the low pressure limit is not needed.  
27

28 2.3.3.2.2.2 Function 1.b, Core Spray Pump Discharge Flow - Low (Bypass) and  
29 Function 2.b, Low Pressure Coolant Injection Pump Discharge Flow - Low  
30 (Bypass)  
31

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

- 34
- 35 • The applicability is changed. The current STS 3.3.5.1 applicability for these functions in  
36 Modes 4 and 5 is modified by a note that limits the applicability to when the associated  
37 ECCS subsystem(s) are required to be operable per current LCO 3.5.2, "ECCS -  
38 Shutdown." The revised applicability is Modes 4 and 5 without exception, to be consistent  
39 with the applicability of new LCO 3.5.2, "RPV Water Inventory Control."  
40
- 41 • For Function 1.b, the number of required channels per function is changed from [2] or [1 per  
42 pump], to [1 per pump]. For Function 2.b, the number of required channels per function is  
43 changed from [4] or [1 per pump], to [1 per pump]. Both are modified by a note stating  
44 "Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2, 'Reactor  
45 Pressure Vessel Water Inventory Control.'"  
46

- 1 • In the new table, a Channel Check and Channel Functional Test are required at the existing  
2 frequency. A Channel Calibration and Logic System Functional Test are no longer required  
3 in Modes 4 and 5.  
4  
5 • In new LCO 3.3.5.2A, the allowable value is unchanged.  
6

7 2.3.3.2.2.3 Function 1.c, Core Spray System, Manual Initiation, and  
8 Function 2.c, Low Pressure Coolant Injection (LPCI) System, Manual Initiation  
9

10 These functions were moved from current STS 3.3.5.1, Function 1.e and Function 2.h. The  
11 following changes are made:  
12

- 13 • The applicability is changed. The current STS 3.3.5.1 applicability for these functions in  
14 Modes 4 and 5 is modified by a note that limits the applicability to when the associated  
15 ECCS subsystem(s) are required to be operable per current LCO 3.5.2, "ECCS -  
16 Shutdown." The revised applicability is Modes 4 and 5 without exception, to be consistent  
17 with the applicability of new LCO 3.5.2, "RPV Water Inventory Control."  
18  
19 • The number of required channels per function is changed from [2] or [1 per subsystem], to  
20 [1 per subsystem] and is modified by a note stating "Associated with an ECCS subsystem  
21 required to be OPERABLE by LCO 3.5.2, 'Reactor Pressure Vessel Water Inventory  
22 Control.'" New LCO 3.5.2 only requires a single ECCS subsystem and the change in  
23 required channels reflects that requirement.  
24  
25 • Both the existing STS 3.3.5.1 and the revised STS 3.3.5.2 require a Logic System  
26 Functional Test on this function at the same frequency.  
27  
28 • There is no allowable value for this function.  
29

30 2.3.3.2.2.4 Function 3.a, RHR System Isolation, Reactor Vessel Water Level - Low, Level 3  
31

32 This function was moved from current STS 3.3.6.1, Function 6.b. The following changes are  
33 made:  
34

- 35 • The function name is changed from "Shutdown Cooling System Isolation Reactor Vessel  
36 Water Level - Low, Level 3" to "Residual Heat Removal [RHR] System Isolation Reactor  
37 Vessel Water Level - Low, Level 3." The current title is a misnomer in the STSs as the  
38 Level 3 instruments isolate more than shutdown cooling isolation valves.  
39  
40 • The applicability is changed. The existing STS 3.3.6.1 applicability for this function in  
41 Modes 4 and 5 is being deleted. The revised applicability is "when automatic isolation of the  
42 associated penetration flow path is credited in calculating Drain Time."  
43  
44 • The number of required channels is changed from [2], with a column header that states  
45 "Required Channels per Trip System," to [2 in one trip system]. This retains the requirement  
46 that the two channels must be associated with the same trip system.  
47

- 1 • In the new table, a Channel Check and Channel Functional Test are required at the existing  
2 frequency. A calibration of the trip unit, Channel Calibration, and Logic System Functional  
3 Test are no longer required in Modes 4 and 5.  
4
- 5 • The allowable value is unchanged.  
6

7 2.3.3.2.2.5 Function 4.a, Reactor Water Cleanup (RWCU) System Isolation, Reactor Vessel  
8 Water Level - Low Low, Level 2  
9

10 This function was relocated from current STS 3.3.6.1, Function 5.e. The following changes are  
11 made:  
12

- 13 • The applicability is changed. The current STS 3.3.6.1 applicability for this function is  
14 Modes 1, 2, and 3. The revised applicability is "when automatic isolation of the associated  
15 penetration flow path is credited in calculating Drain Time." In other words, if the drain time  
16 calculation assumes the RWCU system will be automatically isolated, this function must be  
17 operable to perform that function. This is consistent with the definition of drain time and the  
18 TS 3.5.2 requirements.  
19
- 20 • The number of required channels is changed from [2], with a column header that states  
21 "Required Channels per Trip System," to [2 in one trip system]. This retains the requirement  
22 that the two channels must be associated with the same trip system. Only one trip system is  
23 required to ensure that automatic isolation of one of the two isolation valves will occur on  
24 low reactor vessel water level.  
25
- 26 • A Channel Check and Channel Functional Test are required at the existing frequency. A  
27 calibration of the trip unit, Channel Calibration, Logic System Functional Test, and Isolation  
28 System Response Time tests are no longer required in Modes 4 and 5.  
29
- 30 • The allowable value is unchanged.  
31

32 2.2.3.2.3 ~~NUREG-1434 BWR/6~~ New Table 3.3.5.2-1, RPV Water Inventory Control  
33 Instrumentation  
34

35 2.3.3.2.3.1 Function 1.a, Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core  
36 Spray (LPCS) Subsystems, Reactor Steam Dome Pressure - Low (Injection  
37 Permissive) and  
38 Function 2.a, LPCI B and LPCI C Subsystems, Reactor Steam Dome Pressure -  
39 Low (Injection Permissive)  
40

41 These functions were moved from current STS 3.3.5.1, Function 1.d and Function 2.d. The  
42 following changes are made:  
43

- 44 • The applicability is changed. The current STS 3.3.5.1 applicability for these functions in  
45 Modes 4 and 5 is modified by a note that limits the applicability to when the associated  
46 ECCS subsystem(s) are required to be operable per current LCO 3.5.2, "ECCS -  
47 Shutdown." The revised applicability is Modes 4 and 5 without exception, to be consistent

1 with the applicability of new LCO 3.5.2, "RPV Water Inventory Control." Note that *NUREG-*  
2 *1434 the BWR/6 STS* does not include the Mode 4 and 5 applicability of this function. This  
3 apparently was an oversight in development of the NUREG.  
4

- 5 • In the new table, the number of required channels per function remains [3] and is modified  
6 by a note stating "Associated with an ECCS subsystem required to be OPERABLE by  
7 LCO 3.5.2, 'Reactor Pressure Vessel Water Inventory Control.'" New STS 3.5.2 only  
8 requires a single ECCS subsystem to be operable and the change reflects that requirement.  
9
- 10 • A Channel Check and Channel Functional Test are required at the existing frequency.  
11 Calibration of the trip units, Channel Calibration, Logic System Functional Test, and ECCS  
12 Response Time tests are no longer required in Modes 4 and 5.
- 13 • In new LCO 3.3.5.2A, the allowable value is revised to eliminate the low pressure limit and  
14 to retain the high pressure limit.

15  
16 2.3.3.2.3.2 Functions 1.b and 1.c, Low Pressure Coolant Injection-A (LPCI) and Low  
17 Pressure Core Spray (LPCS) Subsystems, LPCS Pump Discharge Flow - Low  
18 (Bypass) and LPCI Pump A Discharge Flow – Low (Bypass), and  
19 Function 2.b, LPCI B and LPCI C Subsystems, LPCI Pump B and LPCI Pump C  
20 Discharge Flow – Low (Bypass)  
21

22 These functions were moved from current STS 3.3.5.1, Function 1.e, 1.f, and 2.e. The following  
23 changes are made:  
24

- 25 • The applicability is changed. The current STS 3.3.5.1 applicability for these functions is  
26 Modes 4 and 5 when the associated ECCS subsystem(s) are required to be operable per  
27 LCO 3.5.2, "ECCS - Shutdown." The revised Applicability is Modes 4 and 5 without  
28 exception, to be consistent with the Applicability of new LCO 3.5.2, "RPV Water Inventory  
29 Control."  
30
- 31 • The number of required channels per function is changed from [1] to [1 per pump] and is  
32 modified by a note stating "Associated with an ECCS subsystem required to be OPERABLE  
33 by LCO 3.5.2, 'Reactor Pressure Vessel Water Inventory Control.'" New STS 3.5.2 only  
34 requires a single ECCS subsystem and the change in required channels reflects that  
35 requirement.  
36
- 37 • A Channel Check and Channel Functional Test are required at the existing frequency.  
38 Calibrating the trip unit, Channel Calibration and Logic System Functional Test are no longer  
39 required in Modes 4 and 5.
- 40
- 41 • In new LCO 3.3.5.2A, the allowable value is unchanged.

42  
43 2.3.3.2.3.3 Function 1.d, Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core  
44 Spray (LPCS) Subsystems, Manual Initiation, and  
45 Function 2.c, LPCI B and LPCI C Subsystems, Manual Initiation  
46

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

- 3
- 4 • The applicability is changed. The current STS 3.3.5.1 Applicability for these Functions in  
5 Modes 4 and 5 is modified by a note that limits the applicability to when the associated  
6 ECCS subsystem(s) are required to be operable per current LCO 3.5.2, "ECCS -  
7 Shutdown." The revised applicability is Modes 4 and 5 without exception, to be consistent  
8 with the applicability of new LCO 3.5.2, "RPV Water Inventory Control."  
9
- 10 • The number of required channels per function is changed from [1] to [1 per subsystem] and  
11 is modified by a note stating "Associated with an ECCS subsystem required to be  
12 OPERABLE by LCO 3.5.2, 'Reactor Pressure Vessel Water Inventory Control'." New  
13 STS 3.5.2 only requires a single ECCS subsystem and the change in required channels  
14 reflects that requirement.  
15
- 16 • Both the existing STS 3.3.5.1 and the revised STS 3.3.5.2 require a Logic System  
17 Functional Test on this function at the same frequency.  
18
- 19 • There is no allowable value for this function.  
20

21 2.3.3.2.3.4 Function 3.a, High Pressure Core Spray (HPCS) System, Reactor Vessel Water  
22 Level - High, Level 8  
23

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

- 26
- 27 • The applicability is changed. The current STS 3.3.5.1 applicability for this function is  
28 Modes 4 and 5 when the associated ECCS subsystem(s) are required to be operable per  
29 existing LCO 3.5.2, "ECCS - Shutdown." The revised applicability is Modes 4 and 5 without  
30 exception, to be consistent with the applicability of new LCO 3.5.2, "RPV Water Inventory  
31 Control."  
32
- 33 • The number of required channels per function is changed from [2] to [1] and is modified by a  
34 note stating "Associated with an ECCS subsystem required to be OPERABLE by LCO 3.5.2,  
35 'Reactor Pressure Vessel Water Inventory Control'." New STS 3.5.2 only requires a single  
36 ECCS subsystem and the change in required channels reflects that requirement.  
37
- 38 • A Channel Check and Channel Functional Test are required at the existing frequency.  
39 Calibration of the trip units, Channel Calibration, and Logic System Functional Test tests are  
40 no longer required in Modes 4 and 5.  
41
- 42 • The allowable value in new LCO 3.3.5.2A is unchanged.  
43

44 2.3.3.2.3.5 Function 3.b, High Pressure Core Spray (HPCS) System, Condensate Storage  
45 Tank Level – Low  
46

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

- 3
- 4 • The applicability is changed. The current STS 3.3.5.1 applicability for this function is  
5 Modes 4 and 5 when the associated ECCS subsystem(s) are required to be operable per  
6 current LCO 3.5.2, "ECCS - Shutdown." The revised applicability is Modes 4 and 5 when  
7 HPCS is operable for compliance with new LCO 3.5.2 and aligned to the Condensate  
8 Storage Tank. If HPCS is not being credited for meeting the new LCO 3.5.2 requirement for  
9 an operable ECCS subsystem, or if HPCS is being credited but is aligned to the suppression  
10 pool, this function is unneeded.
- 11
- 12 • The number of required channels per function is changed from [2] to [1]. New STS 3.5.2  
13 only requires a single ECCS subsystem to be operable, and the change in required  
14 channels reflects that requirement.
- 15
- 16 • A Channel Check and Channel Functional Test are required at the existing frequency.  
17 Calibration of the trip units, Channel Calibration, and Logic System Functional Test are no  
18 longer required in Modes 4 and 5.
- 19
- 20 • The allowable value in new LCO 3.3.5.2A is unchanged.

21  
22 2.3.3.2.3.6 Functions 3.c and 3.d, High Pressure Core Spray (HPCS) System, HPCS Pump  
23 Discharge Pressure - High (Bypass) and HPCS System Flow Rate - Low  
24 (Bypass)  
25

26 These functions were moved from current STS 3.3.5.1, Function 3.f and 3.g. The following  
27 changes are made:  
28

- 29 • The applicability is changed. The current STS 3.3.5.1 applicability for this function is  
30 Modes 4 and 5 when the associated ECCS subsystem(s) are required to be operable per  
31 current LCO 3.5.2, "ECCS - Shutdown." The revised applicability is Modes 4 and 5 without  
32 exception, to be consistent with the applicability of new LCO 3.5.2, "RPV Water Inventory  
33 Control."
- 34
- 35 • The number of required channels per function is changed from [1] to [1 per pump] and is  
36 modified by a note stating "Associated with an ECCS subsystem required to be OPERABLE  
37 by LCO 3.5.2, 'Reactor Pressure Vessel Water Inventory Control'." New STS 3.5.2 only  
38 requires a single ECCS subsystem and the change in required channels reflects that  
39 requirement.
- 40
- 41 • A Channel Check and Channel Functional Test are required at the existing frequency.  
42 Calibration of the trip units, Channel Calibration, and Logic System Functional Test are no  
43 longer required in Modes 4 and 5.
- 44
- 45 • The allowable value is unchanged.

46  
47 2.3.3.2.3.7 Function 3.e, High Pressure Core Spray (HPCS) System, Manual Initiation

1  
2 This function is moved from current STS 3.3.5.1, Function 3.h. The following changes are  
3 made:  
4

- 5 • The applicability is changed. The current STS 3.3.5.1 applicability for these functions in  
6 Modes 4 and 5 is modified by a note that limits the applicability to when the associated  
7 ECCS subsystem(s) are required to be operable per existing LCO 3.5.2, "ECCS -  
8 Shutdown." The revised applicability is Modes 4 and 5 without exception, to be consistent  
9 with the applicability of new LCO 3.5.2, "RPV Water Inventory Control."  
10
- 11 • The number of required channels per function is changed from [1] to [1 per subsystem] and  
12 is modified by a note stating "Associated with an ECCS subsystem required to be  
13 OPERABLE by LCO 3.5.2, 'Reactor Pressure Vessel Water Inventory Control'." New  
14 STS 3.5.2 only requires a single ECCS subsystem and the change in required channels  
15 reflects that requirement.
- 16 • Both the existing STS 3.3.5.1 and the revised STS 3.3.5.2 require a Logic System  
17 Functional Test on this function at the same frequency.  
18
- 19 • There is no allowable value for this function.

20  
21 2.3.3.2.3.8 Function 4.a, RHR System Isolation Reactor Vessel Water Level - Low, Level 3  
22

23 This function was moved from current STS 3.3.6.1, Function 5.c. The following changes are  
24 made:  
25

- 26 • The function name is changed from "Shutdown Cooling System Isolation Reactor Vessel  
27 Water Level - Low, Level 3" to "Residual Heat Removal System Isolation Reactor Vessel  
28 Water Level - Low, Level 3." This is a misnomer in the STSs as the Level 3 instruments  
29 isolate more than shutdown cooling isolation valves.  
30
- 31 • The applicability is changed. The current STS 3.3.6.1 applicability for this function is  
32 Modes 4 and 5. The revised applicability is "when automatic isolation of the associated  
33 penetration flow path is credited in calculating drain time.  
34
- 35 • The number of required channels is changed from [2], with a column header that states  
36 "Required Channels per Trip System," to [2 in one trip system]. This retains the requirement  
37 that the two channels must be associated with the same trip system. Only one trip system is  
38 required to ensure automatic isolation of one of the two isolation valves will occur on low  
39 reactor vessel water level.  
40
- 41 • A Channel Check and Channel Functional Test are required at the existing frequency. A  
42 calibration of the trip unit, Channel Calibration, Logic System Functional Test, and Isolation  
43 System Response Time tests are no longer required in Modes 4 and 5.  
44
- 45 • The existing allowable value is retained in new STS 3.3.5.2.  
46



1 2.3.3.2.3.9 Function 5.a, Reactor Water Cleanup (RWCU) System Isolation, Reactor Vessel  
2 Water Level - Low Low, Level 2  
3

4 This function was relocated from current STS 3.3.6.1, Function 4.k. The following changes are  
5 made:  
6

- 7 • The applicability is changed. The current STS 3.3.6.1 applicability is Modes 1, 2, and 3.  
8 The applicability is "when automatic isolation of the associated penetration flow path is  
9 credited in calculating Drain Time." In other words, if the drain time calculation assumes the  
10 RWCU system would be automatically isolated, this function must be operable to perform  
11 that function. This is consistent with the definition of drain time and the new STS 3.5.2  
12 requirements.  
13
- 14 • The number of required channels is changed from [2], with a column header that states  
15 "Required Channels per Trip System," to [2 in one trip system]. This retains the requirement  
16 that the two channels must be associated with the same trip system. Only one trip system is  
17 required to ensure that automatic isolation of one of the two isolation valves will occur on  
18 low reactor vessel water level.  
19
- 20 • A Channel Check and Channel Functional Test are required at the existing frequency. A  
21 calibration of the trip unit, Channel Calibration, Logic System Functional Test, and Isolation  
22 System Response Time tests are no longer required in Modes 4 and 5.  
23
- 24 • The existing allowable value is retained in LCO 3.3.5.2A.  
25

26 2.3.3.2.4 New TS 3.3.5.2A and B ACTIONS Table  
27

28 Condition A is applicable when one or more instrument channels are inoperable from  
29 Table 3.3.5.2-1. Required Action A.1 directs immediate entry into the condition referenced in  
30 Table 3.3.5.2-1 for that channel.  
31

32 Condition B is entered when the RHR system isolation and RWCU system isolation functions  
33 operability requirements are not met when automatic isolation of the associated penetration flow  
34 path is credited in calculating drain time. If the instrumentation is inoperable, Required  
35 Action B.1 directs an immediate declaration that the associated penetration flow path(s) are  
36 incapable of automatic isolation. Required Action B.2 requires an immediate calculation of drain  
37 time.  
38

39 Condition C is entered when the Low Reactor Steam Dome Pressure Injection Permissive  
40 Functions necessary for ECCS subsystem manual initiation operability requirements are not  
41 met. The channel must be placed in the trip condition within one hour.  
42

43 ~~For~~ *In NUREG-1433-BWR/4s*, Condition D is entered when the operability requirements for the  
44 Core Spray Pump Discharge Flow – Low Bypass, Low Pressure Coolant Injection Pump  
45 Discharge Flow – Low Bypass, or manual initiation of these functions operability requirements  
46 are not met. The Required Action is to restore the channel to operable status within 24 hours.  
47

1 ~~In For NUREG-1434BWR/6s~~, Condition D is entered when the Condensate Storage Tank Level  
2 –Low operability requirements are not met. Required Action D requires declaring the HPCS  
3 inoperable and aligning the HPCS pump suction to the suppression pool within one hour.  
4

5 ~~In For NUREG-1433BWR/4s~~, Condition E is entered if the ~~required-Required~~ Action and  
6 associated Completion Time of Condition C or D, are not met. Required Action E.1 requires the  
7 associated low pressure ECCS injection/spray subsystem to be declared inoperable  
8 immediately.  
9

10 ~~In For NUREG-1434BWR/6s~~, Condition E is entered if the Reactor Vessel Water Level – High  
11 Level 8 instrumentation operability requirements are not met. ~~Required~~ Action E.1 requires  
12 declaring the HCPS system inoperable in 1 hour and restoring the channel to Operable status  
13 within 24 hours.  
14

15 ~~In For NUREG-1434BWR/6s~~, Condition F is entered if the LPCS Pump Discharge Flow Low  
16 (Bypass), LPCI Pump A Discharge Flow Low (Bypass), LPCI Pump B and LPCI Pump C  
17 Discharge Flow – Low (Bypass), HPCS Pump Discharge Pressure – High (Bypass) HPCS  
18 System Flow Rate – Low – (Bypass) or Manual Initiation associated with these Functions  
19 operability requirements are not met. The required action is to restore the channel to  
20 OPERABLE status within 24 hours.  
21

22 ~~In For NUREG-1434BWR/6s~~, Condition G is entered if the ~~required-Required action-Actions~~ and  
23 associated ~~completion-Completion Time~~ of Condition C, D, E, or F is not met. Required  
24 Action G.1 requires the associated ECCS injection/spray subsystem to be declared inoperable  
25 immediately.  
26

27 2.3.3.2.5 New Surveillance Requirements SR 3.3.5.2.1, 3.3.5.2.2 and 3.3.5.3  
28

29 New Table 3.3.5.2-1 specifies which SRs apply for each ECCS function.  
30

31 SR 3.3.5.2.1 requires the performance of a Channel Check at a Frequency of [12 hours or in  
32 accordance with the Surveillance Frequency Control Program.]  
33

34 SR 3.3.5.2.2 requires the performance of a Channel Functional Test at a Frequency of [[92]  
35 days or in accordance with the Surveillance Frequency Control Program.]  
36

37 SR 3.3.5.2.3 requires the performance of a Logic System Functional Test at a Frequency of  
38 [[18] months or in accordance with the Surveillance Frequency Control Program.]  
39

40 2.3.3.3 Changes to Containment, Containment Isolation Valve and Standby Gas  
41 Treatment System Requirements  
42

43 The following TS are applicable during OPDRVs and/or contain Actions to suspend OPDRVS  
44 when the LCO is not met:  
45

46 NUREG-1433-(BWR/4 plants)

47 3.6.1.3, Primary Containment Isolation Valves (PCIVs)

48 3.6.4.1, [Secondary] Containment

1 3.6.4.2, Secondary Containment Isolation Valves (SCIVs)

2 3.6.4.3, Standby Gas Treatment System

3

4 NUREG-1434 (BWR/6 plants)

5 3.6.1.3, Primary Containment Isolation Valves (PCIVs)

6 3.6.4.1, [Secondary] Containment

7 3.6.4.2, Secondary Containment Isolation Valves (SCIVs)

8 3.6.4.3, Standby Gas Treatment System

9

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

12

13 2.3.3.4 Changes to Control Room Habitability and Temperature Control Requirements

14

15 NUREG-1433 (BWR/4 plants)

16 3.7.4, [Main Control Room Environmental Control (MCREC)] System

17 3.7.5, [Control Room Air Conditioning (AC)] System

18

19 NUREG-1434 (BWR/6 plants)

20 3.7.3, [Control Room Fresh Air (CRFA)] System

21 3.7.4, [Control Room AC] System

22

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

25

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

28

29 2.3.3.5 Changes to Electrical Sources Requirements

30

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

32 3.8.2, AC Sources - Shutdown

33 3.8.5, DC Sources - Shutdown

34 3.8.8, Inverters - Shutdown

35 3.8.10, Distribution Systems - Shutdown

36

37 These TS are applicable in Modes 4 and 5 and currently contain a required action to initiate  
38 action to suspend operations with a potential for draining the reactor vessel immediately if  
39 certain conditions are not met.

40

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

44

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

48

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

3  
4 TS 3.8.10 currently requires, in part, with one or more required AC, DC, [or AC vital bus]  
5 electrical power distribution subsystems inoperable, to initiate action to suspend operations with  
6 a potential for draining the reactor vessel immediately.

7  
8 These required actions are being deleted.

9  
10 2.4 APPLICABLE REGULATORY REQUIREMENTS

11  
12 The regulation at 10 CFR Section 50.36(a)(1) requires an applicant for an operating license to  
13 include in the application proposed technical specifications in accordance with the requirements  
14 of 10 CFR 50.36. The applicant must include in the application, a “summary statement of the  
15 bases or reasons for such specifications, other than those covering administrative controls.”  
16 However, per 10 CFR 50.36(a)(1), these technical specification bases “shall not become part of  
17 the technical specifications.” Per 10 CFR 50.90, whenever a holder of a license desires to  
18 amend the license, application for an amendment must be filed with the Commission, fully  
19 describing the changes desired, and following as far as applicable, the form prescribed for  
20 original applications.

21  
22 Additionally, 10 CFR 50.36(b) requires:

23  
24  
25 Each license authorizing operation of a ... utilization facility ... will  
26 include technical specifications. The technical specifications will  
27 be derived from the analyses and evaluation included in the safety  
28 analysis report, and amendments thereto, submitted pursuant to  
29 10 CFR 50.34 [“Contents of applications; technical information”].  
30 The Commission may include such additional technical  
31 specifications as the Commission finds appropriate.

32  
33  
34 Per 10 CFR 50.92(a), in determining whether an amendment to a license will be issued to the  
35 applicant, the Commission will be guided by the considerations which govern the issuance of  
36 initial licenses to the extent applicable and appropriate.

37  
38 The categories of items required to be in the TSs are provided in 10 CFR 50.36(c). As required  
39 by 10 CFR 50.36(c)(2)(i), the TSs will include LCOs, which are the lowest functional capability  
40 or performance levels of equipment required for safe operation of the facility. Per 10 CFR  
41 50.36(c)(2)(i), when an LCO of a nuclear reactor is not met, the licensee shall shut down the  
42 reactor or follow any remedial action permitted by the TSs until the condition can be met.

43  
44 The regulations at 10 CFR 50.36(c)(2)(ii) state that LCO’s must be established for each item  
45 meeting one of four criteria:

46  
47

1            *Criterion 1.* Installed instrumentation that is used to detect, and  
2            indicate in the control room, a significant abnormal degradation of  
3            the reactor coolant pressure boundary.

4  
5            *Criterion 2.* A process variable, design feature, or operating  
6            restriction that is an initial condition of a design basis accident or  
7            transient analysis that either assumes the failure of or presents a  
8            challenge to fission product barrier integrity.

9  
10           *Criterion 3.* A structure, system, or component that is part of the  
11           primary success path and which functions or actuates to mitigate a  
12           design basis accident or transient that either assumes the failure of  
13           or presents a challenge to the integrity of a fission product barrier.

14  
15           *Criterion 4.* A structure, system, or component which operating  
16           experience or probabilistic safety assessment has shown to be  
17           significant to public health and safety.

18  
19  
20           The regulation at 10 CFR 50.36(c)(3) requires TSs to include items in the category of SRs,  
21           which are requirements relating to test, calibration, or inspection to assure that the necessary  
22           quality of systems and components is maintained, that facility operation will be within safety  
23           limits, and that the LCOs will be met. Also, the regulation at 10 CFR 50.36(a)(1) states that a  
24           summary statement of the bases or reasons for such specifications, other than those covering  
25           administrative controls, shall also be included in the application, but shall not become part of the  
26           TSs.

27  
28           As described in the Commission's Final Policy Statement on Technical Specifications  
29           Improvements for Nuclear Power Reactors, recommendations were made by NRC and industry  
30           task groups for new STS that include greater emphasis on human factors principles in order to  
31           add clarity and understanding to the text of the STS, and provide improvements to the Bases  
32           Section of Technical Specifications, which provides the purpose for each requirement in the  
33           specification. Subsequently, improved vendor-specific STS were developed and issued by the  
34           NRC in September 1992. The improved STS were published as the following NRC Reports:

35  
36           - NUREG-1430, "Standard Technical Specifications, Babcock and Wilcox Plants"

37  
38           - NUREG-1431, "Standard Technical Specifications, Westinghouse Plants"

39  
40           - NUREG-1432, "Standard Technical Specifications, Combustion Engineering Plants"

41  
42           - NUREG-1433, "Standard Technical Specifications, General Electric Plants, BWR/4"

43  
44           - NUREG-1434, "Standard Technical Specifications, General Electric Plants, BWR/6"

45  
46           These improved STS were the result of extensive technical meetings and discussions among  
47           the NRC staff, industry owners' groups, vendors, and NUMARC. The Commission recognizes  
48           the advantages of improved technical specifications. Clarification of the scope and purpose of

1 technical specifications has provided useful guidance to both the NRC and industry and has  
2 served as an important incentive for industry participation in a voluntary program to improve  
3 technical specifications. It has resulted in improved STS that are intended to focus licensee and  
4 plant operator attention on those plant conditions most important to safety. This should also  
5 result in more efficient use of agency and industry resources.  
6

7 The NRC staff's guidance for review of TSs is in Chapter 16, *Technical Specifications*, of  
8 NUREG-0800, Revision 3, "Standard Review Plan for the Review of Safety Analysis Reports for  
9 Nuclear Power Plants" (SRP), dated March 2010, (ADAMS Accession No. ML100351425). As  
10 described therein, as part of the regulatory standardization effort, the NRC staff has prepared  
11 STS for each of the light-water reactor nuclear designs. NUREG-1433, Revision 4, contains the  
12 STS for BWR/4 plants, *and is also applicable to BWR/2, BWR/3, and in some cases, BWR/5*  
13 *plants*, and NUREG 1434, Revision 4, contains the STS for BWR/6 plants, *and is also*  
14 *applicable in some cases to BWR/5 plants*.  
15

### 16 **3.0 TECHNICAL EVALUATION**

#### 17 **3.1 DRAIN TIME DEFINITION**

18 The proposed drain time is the time it would take the RPV water inventory to drain from the  
19 current level to the TAF assuming the most limiting of the RPV penetrations flow paths with the  
20 largest flow rate, or a combination of penetration flow paths that could open due to a common  
21 mode failure, were to open *and the licensee took no mitigating action*.  
22  
23  
24

25 The NRC staff reviewed the proposed drain time definition from the traveler. For the purpose of  
26 NRC staff considerations, the term "break" describes a pathway for water to drain from the RPV  
27 that has not been prescribed in the "DRAIN TIME" definition proposed in TSTF-542. All RPV  
28 penetrations below the TAF are included in the determination of drain time as potential  
29 pathways. Attachment 2 to the RAI responses dated March 14, 2016 (ADAMS Accession  
30 No. ML16074A448), provided an example bounding drain time calculations for three examples:  
31 (1) water level at or below the reactor flange; (2) water level above RPV flange with fuel pool  
32 gates installed, and; (3) water level above reactor flange with fuel pool gates removed. The  
33 drain time is calculated by taking the water inventory above the break and dividing by the  
34 limiting drain rate until the TAF is reached. The limiting drain rate is a variable parameter  
35 depending on the break size and the reduction of elevation head above break location during  
36 the drain down event. The discharge point will depend on the lowest potential drain point for  
37 each RPV penetration flow path on a plant-specific basis. This calculation provides a  
38 conservative approach to determining the drain time of the RPV.  
39

40 Additionally, Attachment 2 to the RAI responses, provides a proposed example table to pair with  
41 the drain time calculation. This table correlates the drain time (hours) to the penetration flow  
42 path diameter (inches) and the reactor vessel water level (inches above the TAF). The  
43 proposed example table is color coded to visually show if LCO 3.5.2 is met, or which LCO  
44 condition the licensee would be in. This proposed example table provides operators with a  
45 correlation to relate the calculated drain time to the RPV water level and where in the LCO the  
46 operators should be. Based on these considerations, the NRC staff finds the proposed drain  
47 time definition with supporting calculation and table to be acceptable.  
48

1 3.2 WATER SOURCES

2  
3 The proposed LCO 3.5.2 *in NUREG-1433* states ~~that for BWR/4 TSs~~, one low pressure  
4 Emergency Core Cooling System (ECCS) injection/spray subsystem shall be OPERABLE. *The*  
5 *NUREG-1434 LCO 3.5.2 LCO states* ~~For BWR/6 TSs~~, one ECCS injection/spray subsystem  
6 shall be OPERABLE. It should be noted that the term “low pressure” does not appear in the  
7 ~~BWR/6~~ *NUREG-1434* LCO because the *BWR/5 and BWR/6* High Pressure Core Spray (HPCS)  
8 System may *also* be used to satisfy the LCO.  
9

10 The NRC staff reviewed the water sources that would be applicable to the proposed TS 3.5.2.  
11 The ECCS pumps are high-capacity pumps, with flow rates of thousands of gallons per minute  
12 (gpm). Most RPV penetration flow paths would have a drain rate on the order of tens or  
13 hundreds of gpm. The automatic initiation of an ECCS pump would provide the necessary  
14 water source to counter these expected drain rates. The LPCI subsystem is to be considered  
15 operable during alignment and operation for decay heat removal if capable of being manually  
16 realigned and not otherwise inoperable. Decay heat removal in MODEs 4 and 5 is not affected  
17 by the proposed change in TSTF-542 as these requirements on the number of RHR shutdown  
18 cooling subsystems that must be operable and in operation to ensure adequate decay heat  
19 removal from the core are unchanged. These requirements can be found in the ~~BWR/4~~  
20 ~~STS~~ *NUREG-1433* TS 3.4.9, “Residual Heat Removal (RHR) Shutdown Cooling System – Cold  
21 Shutdown,” TS 3.9.8, “Residual Heat Removal (RHR) – High Water Level, “ and TS 3.9.10,  
22 “Residual Heat Removal (RHR) – Low Water Level.” For ~~the BWR/6 STS~~ *NUREG-1434*, the  
23 applicable TS are TS 3.4.10, “Residual Heat Removal (RHR) Shutdown Cooling System – Cold  
24 Shutdown,” TS 3.9.8, “Residual Heat Removal (RHR) – High Water Level, and TS 3.9.10,  
25 “Residual Heat Removal (RHR) – Low Water Level.” Based on these considerations, the NRC  
26 staff finds the water sources provide assurances that the lowest functional capability required for  
27 safe operation is maintained and protecting the safety limit.  
28

29 3.3 TS 3.5.2 – REACTOR PRESSURE VESSEL (RPV) WATER INVENTORY CONTROL

30  
31 The proposed TS 3.5.2, “Reactor Pressure Vessel (RPV) Water Inventory Control,” LCO  
32 contains two parts. The first part states that DRAIN TIME of RPV water inventory to the top of  
33 active (TAF) shall be ≥ 36 hours, and the second part states *in NUREG-1433* ~~that for BWR/4~~,  
34 one low pressure ECCS injection/spray subsystem shall be OPERABLE, and *in NURG-1434* ~~for~~  
35 ~~BWR/6~~, one ECCS injection/spray subsystem shall be OPERABLE. The proposed applicability  
36 for TS 3.5.2 is MODEs 4 and 5.  
37

38 The NRC staff reviewed the proposed STS 3.5.2, focusing on ensuring the fuel remains covered  
39 with water and the changes made compared to the current STS. The proposed STS 3.5.2  
40 contains Conditions A through E based on either required ECCS injection/spray subsystem  
41 operability or drain time.  
42

43 The current STS LCO for ~~BWR/4~~ *in NUREG-1433 and NUREG-1434 4 and BWR/6 plants*  
44 ~~states~~ *state* that two ECCS injection/spray subsystems shall be operable, whereas the proposed  
45 LCO 3.5.2 states that only one ECCS injection/spray subsystem shall be operable. This change  
46 is reflected in Condition A. The change from two ECCS injection/spray subsystem to one ECCS  
47 injection/spray subsystem is because this redundancy is not required. With one ECCS  
48 injection/spray subsystem and non-safety related injection sources, defense-in-depth will be

1 maintained. The defense-in-depth measure is consistent with other events considered during  
2 shutdown with no additional single failure assumed. The drain time controls, in addition to the  
3 required ECCS injection/spray subsystem, provide reasonable assurance that an unexpected  
4 draining event can be prevented or mitigated before the RPV water level would be lowered to  
5 the TAF.  
6

7 The proposed Condition A states that if the required ECCS injection/spray subsystem is  
8 inoperable, it is to be restored to operable status within 4 hours. Proposed Condition B states  
9 that if Condition A is not met, a method of water injection capable of operating without offsite  
10 electrical power should be established immediately. The proposed Condition B for TS 3.5.2 is  
11 different from the STS, which states to initiate action to suspend OPDRVs. The proposed  
12 Condition B provides adequate assurance of an available water source should Condition A not  
13 be met within the 4-hour completion time.  
14

15 The proposed Condition C states that for a drain time  $< 36$  hours and  $\geq 8$  hours, to (1) verify  
16 [secondary containment] boundary is capable of being established in less than 4 hours, and  
17 (2) verify each [secondary containment] penetration flow path is capable of being isolated in less  
18 than 4 hours, and (3) verify one standby gas treatment subsystem is capable of being placed in  
19 operation in less than 4 hours. The current STS Condition C states if two ECCS injection/spray  
20 subsystem are inoperable then restore one to operable status within 4 hours. The proposed  
21 Condition C provides adequate protection should the DRAIN TIME be  $< 36$  hours and  $\geq 8$  hours  
22 because of the ability to establish secondary containment, isolate additional flow paths, and  
23 have the standby gas treatment subsystem operable.  
24

25 The proposed Condition D states that when drain time  $< 8$  hours to (1) immediately initiate  
26 action to establish an additional method of water injection with water sources capable of  
27 maintaining RPV water level  $> TAF$  for  $\geq 36$  hours, (2) immediately initiate action to establish  
28 [secondary] containment boundary, (3) immediately initiate action to isolate each [secondary]  
29 containment penetration flow path or verify it can be manually isolated from the control room,  
30 and (4) immediately initiate action to verify one standby gas treatment subsystem is capable of  
31 being placed in operation. Additionally, there is a note stating that required ECCS  
32 injection/spray subsystem or additional method of water injection shall be capable of operating  
33 without offsite electrical power, which is similar to proposed Condition B. The current STS for  
34 Condition D are similar to the proposed for when Required Action C.2 is not met. The proposed  
35 Condition D provides adequate protection should the DRAIN TIME be  $< 8$  hours because of the  
36 ability to establish secondary containment, isolate additional flow paths, and have the standby  
37 gas treatment subsystem operable.  
38

39 The proposed Condition E states that when the required action and associated completion time  
40 of Condition C or D is not met, or the drain time is  $< 1$  hour, then initiate action to restore drain  
41 time to  $\geq 36$  hours immediately. The proposed Condition E is new, as it is not present in the  
42 current ~~BWR/4 or BWR/6~~ STS. The proposed Condition E is acceptable as it provides the  
43 necessary step to restore the drain time to  $\geq 36$  hours should the other conditions not be met, or  
44 if the drain time is  $< 1$  hour.  
45

46 Based on the NRC staff's review, the proposed changes to TS 3.5.2 are acceptable based on  
47 the actions taken to mitigate the water level reaching the TAF with the water sources available  
48 and maintaining drain time  $\geq 36$  hours. The LCO correctly specifies the lowest functional



1 capability or performance levels of equipment required for safe operation of the facility. There is  
2 reasonable assurance that the required actions to be taken when the LCO is not met can be  
3 conducted without endangering the health and safety of the public.  
4

5 The existing TS 3.3.5.2, "RCIC System Instrumentation," is renumbered as TS 3.3.5.3. This  
6 increases consistency within the BWR TS as the Reactor Core Isolation Cooling (RCIC) System  
7 is discussed in the section on TS 3.5.3.  
8

9 3.4 STS 3.3.5.2, REACTOR PRESSURE VESSEL WATER INVENTORY CONTROL  
10 INSTRUMENTATION

11  
12 The proposed TS and associated LCO in TS Section 3.3, "Instrumentation," contains A and B  
13 versions of TS 3.3.5.2. The A version is for TS without a Setpoint Control Program and  
14 Table 3.3.5.2-1 has a column for listing Allowable Value. The B version is for TS with a Setpoint  
15 Control Program and Table 3.3.5.2-1 has no allowable value column, because the Setpoint  
16 Control Program dictates the setpoint value. In a like manner the associated LCO 3.3.5.2 has A  
17 and B versions. The actions and SRs for both versions A and B are the same *in NUREG-1433*  
18 *and NUREG-1434* ~~for BWR/4 and BWR/6~~.  
19

20 The purpose of the RPV Water Inventory Control Instrumentation is to support the requirements  
21 of new STS LCO 3.5.2, and the definition of drain time. There are instrumentation and controls  
22 and their signal functions that are required for manual initiation or required as a permissive or  
23 operational controls on the equipment of the systems that provide water injection capability,  
24 certain start commands, and isolation functions. These instruments are required to be operable  
25 if the systems that provide water injection and isolation functions are to be considered operable  
26 as described in the safety evaluation of new STS 3.5.2. In some cases the reactor operators  
27 have alternate, often more complex means, of starting and injecting water than the preferred  
28 simple push button start.  
29

30 Specifically, the *NUREG-1433 BWR/4* ~~the~~ RPV Water Inventory Control Instrumentation  
31 supports operation of the Core Spray and LPCI including manual initiation when needed as well  
32 as the system isolation of the RHR system and the RWCU system. The equipment involved  
33 with each of these systems is described in the safety evaluation of TS 3.5.2 and the Bases for  
34 LCO 3.5.2.  
35

36 Specifically, the *NUREG-1434 BWR/6* ~~the~~ RPV Water Inventory Control Instrumentation  
37 supports operation of the LPCI with subsystems LPCI A, LPCI B, and LPCI C, LPCS, and  
38 HPCS, including manual initiation when needed as well as the system isolation of the RHR  
39 system and the RWCU system. The equipment involved with each of these systems is  
40 described in the safety evaluation of TS 3.5.2 and the Bases for LCO 3.5.2.  
41

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

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

3  
4  
5 3.4.1 Proposed TS 3.3.5.2 LCO and Applicability

6  
7 The proposed LCO 3.3.5.2 states, "The RPV Water Inventory Control instrumentation for each  
8 Function in Table 3.3.5.2-1 shall be OPERABLE."

9  
10 The applicability states, "According to Table 3.3.5.2-1."

11  
12 Section 3.3.1 of TSTF-542, states:

13  
14  
15 Table 3.3.5.2-1 contains those instrumentation Functions needed  
16 to support manual initiation of the ECCS injection/spray  
17 subsystem required by LCO 3.5.2, and automatic isolation of  
18 penetration flow paths that may be credited in a calculation of  
19 Drain Time. The Functions in Table 3.3.5.2-1 are moved from  
20 existing TS 3.3.5.1, "ECCS Instrumentation," and TS 3.3.6.1,  
21 "Primary Containment Isolation Instrumentation" Functions that  
22 are required in Modes 4 or 5 or during OPDRVs. Creation of  
23 TS 3.3.5.2 places these Functions in a single location with  
24 requirements appropriate to support the safety function for  
25 TS 3.5.2.

26  
27 If plant-specific design and TS require different functions to  
28 support manual initiation of an ECCS subsystem, those functions  
29 should be included in TS 3.3.5.2.

30  
31  
32 3.4.2 Proposed TS 3.3.5.2 Actions ~~for BWR/4 and BWR/6~~

33  
34 TS 3.3.5.2 contains actions to be followed when the LCO is not met.

35  
36 Section 3.3.2, "Proposed TS 3.3.5.2 Actions," of TSTF-542, presents, discusses, and justifies  
37 the actions of TS 3.3.5.2 and LCO 3.3.5.2. The NRC staff finds these actions are sufficient and  
38 necessary, because when one or more instrument channels are inoperable the equipment and  
39 function controlled by these instruments cannot complete the required function in the normal  
40 manner and these actions direct the licensee to take appropriate actions as necessary and  
41 enter immediately into the Conditions referenced in Table 3.3.5.2-1. These actions satisfy the  
42 requirements of 10 CFR 50.36(c)(2)(i) by providing a remedial action permitted by the TS until  
43 the LCO can be met. The remedial actions provide reasonable assurance that an unexpected  
44 draining event can be prevented or mitigated before the RPV water level would be lowered to  
45 the TAF.

46  
47 3.4.3 Proposed TS 3.3.5.2 Actions for ~~BWR/4~~NUREG-1433

48

1 The following summarizes the proposed actions of Section 3.3.2 for ~~BWR/ANUREG-1433~~.

2  
3 Section 3.3.2, "Proposed TS 3.3.5.2 Actions," of TSTF-542, Revision 2, presents, discusses,  
4 and justifies the actions of TS 3.3.5.2 and LCO 3.3.5.2. The NRC staff finds these actions are  
5 sufficient and necessary, because when one or more instrument channels are inoperable the  
6 equipment and function controlled by these instruments cannot complete the required function  
7 in the normal way, and these actions direct the licensee to take appropriate actions as required.  
8 The actions provide reasonable assurance that an unexpected draining event can be prevented  
9 or mitigated before the RPV water level would be lowered to the TAF.

10  
11 Action A is applicable when one or more instrument channels are inoperable from  
12 Table 3.3.5.2-1 and directs the licensee to immediately enter the Condition referenced in  
13 Table 3.3.5.2-1 for that channel.

14  
15 Action B (concerning the RHR system Isolation and RWCU system Isolation functions) ~~are/is~~  
16 applicable when automatic isolation of the associated penetration flow path is credited ~~as not~~  
17 ~~having to be considered~~. as a path for potential drainage in calculating drain time. If the  
18 instrumentation is inoperable, Required Action B.1 directs an immediate declaration that the  
19 associated penetration flow path(s) are incapable of automatic isolation. Required Action B.2  
20 requires a re-calculation of drain time, but automatic isolation of the affected penetration flow  
21 paths cannot be credited.

22  
23 Action C (concerning low reactor steam dome pressure permissive Functions necessary for  
24 ECCS subsystem manual initiation) addresses an event in which the permissive is inoperable  
25 and manual initiation of ECCS using the control board pushbuttons is prevented. The function  
26 must be placed in the trip condition within one hour. With the permissive function instrument in  
27 the trip condition, manual initiation may now be performed using the preferred control board  
28 pushbuttons. This one-hour completion time is acceptable, because despite the preferred start  
29 method being prevented, the reactor operator can take manual control of the pump and the  
30 injection valve to inject water into the RPV and achieve the safety function. The time of one  
31 hour also provides reasonable time for evaluation and placing the channel in trip.

32  
33 Action D (concerning pump discharge flow bypass Functions and the manual initiation  
34 Functions) addresses actions when the bypass is inoperable and then there is a risk that the  
35 associated ECCS pump could overheat when the pump is operating and the associated  
36 injection valve is not fully open. In this condition, the operator can take manual control of the  
37 pump and the injection. Similar to justification in Action C, while this is not the preferred  
38 method, if a manual initiation function is inoperable, the ECCS subsystem pumps can be started  
39 manually and the valves can be opened manually. The 24-hour completion time is acceptable,  
40 because the functions can be performed manually and it allows time for the operator to evaluate  
41 and have necessary repairs completed. Unlike the failure of a pushbutton that may concern  
42 electronic component repairs, mechanical components may be involved in repairs, testing, and  
43 return to service of pumps and valves. This further justifies a 24-hour completion time as  
44 appropriate.

45  
46 Action E is needed and becomes necessary, if the ~~required-Required Action~~action and  
47 associated ~~Ccompletion Timescompletion time~~ of Condition C or D, are not met. If they are not  
48 met, then the associated low pressure ECCS injection/spray subsystem may be incapable of

1 performing the intended function, and the ECCS subsystem must be declared inoperable  
2 immediately.

3  
4 3.4.4 Proposed TS 3.3.5.2 Actions for ~~BWR/6~~NUREG-1434

5  
6 TS 3.3.5.2 contains proposed actions to be followed when the LCO is not met ~~for an~~  
7 ~~BWR/6~~NUREG-1434.

8  
9 Section 3.3.2, "Proposed TS 3.3.5.2 Actions," of TSTF-542, Revision 2, presents, discusses,  
10 and justifies the Actions of TS 3.3.5.2 and LCO 3.3.5.2. The NRC staff finds these actions are  
11 sufficient and necessary, because when one or more instrument channels are inoperable the  
12 equipment and function controlled by these instruments cannot complete the required function  
13 in the normal way and these actions direct the licensee to take appropriate actions as required.  
14 The actions provide reasonable assurance that an unexpected draining event can be prevented  
15 or mitigated before the RPV water level would be lowered to the TAF.

16  
17 Action A is applicable when one or more instrument channels are inoperable from Table 3.3.5.2-  
18 1 and directs the licensee to immediately enter the condition referenced in Table 3.3.5.2-1 for  
19 that channel.

20  
21 Action B (concerning the RHR system isolation and RWCU system isolation functions) ~~are~~  
22 applicable when automatic isolation of the associated penetration flow path is credited as ~~not~~  
23 ~~having to be considered as~~ a path for potential drainage in calculating drain time. If the  
24 instrumentation is inoperable, Required Action B.1 directs an immediate declaration that the  
25 associated penetration flow path(s) are incapable of automatic isolation. Required Action B.2  
26 requires a re-calculation of drain time, but automatic isolation of the affected penetration flow  
27 paths cannot be credited.

28  
29 Action C (concerning low reactor steam dome pressure permissive Functions necessary for  
30 ECCS subsystem manual initiation) addresses an event in which the permissive is inoperable  
31 and manual initiation of ECCS using the control board pushbuttons is prevented. The function  
32 must be placed in the trip condition within one hour. With the permissive function instrument in  
33 the trip condition, manual initiation may now be performed using the preferred control board  
34 pushbuttons. This one hour completion time is acceptable, because despite the preferred start  
35 method being prevented, the reactor operator can take manual control of the pump and the  
36 injection valve to inject water into the RPV and achieve the safety function. The time of one  
37 hour also provides reasonable time for evaluation and placing the channel in trip.

38  
39 Action D (concerning loss of adequate water supply for the HPCS System), addresses an event  
40 in which there is an inadequate water supply. The instrumentation functions have the ability to  
41 detect low-water setpoint in the Condensate Storage Tank and actuate valves to realign HPCS  
42 suction water source to the Suppression Pool. The Condensate Storage Tank Level - Low  
43 Function indicates multiple, inoperable channels within the same Function resulting in a loss of  
44 the automatic ability to swap suction to the Suppression Pool. The HPCS system must be  
45 declared inoperable within one hour or the HPCS pump suction must be realigned to the  
46 Suppression Pool, since, if realigned, the Function is already performed. This one hour is  
47 acceptable, because it provides sufficient time to take the action in order to minimize the risk of

1 HPCS being needed without an adequate water source by allowing time for restoration or  
2 alignment of the HPCS pump suction to the suppression pool.

3  
4 Action E (concerning HPCS high water level Function in the RPV) addresses actions when this  
5 instrument function is inoperable. HPCS Reactor Vessel Water Level - High, Level 8 function  
6 ensures that appropriate actions are taken if the HPCS Reactor Vessel Water Level - High,  
7 Level 8 Function is inoperable. If the inoperability results in the channel being tripped, the  
8 HPCS pump discharge valve will not open and HPCS injection is prevented. In that case the  
9 HPCS System must be declared inoperable within one hour, and the function must be restored  
10 to operable status within 24 hours. The one hour completion time is acceptable, because of the  
11 ability to manually start the HPCS pumps and open the discharge valve. The 24-hour  
12 completion time is acceptable, because it allows time for the operator to evaluate and arrange  
13 for repairs.

14  
15 Action F (concerning pump discharge flow bypass Functions and the manual initiation  
16 Functions) addresses an event in which the bypass is inoperable and there is a risk that the  
17 associated ECCS pump could overheat when the pump is operating and the associated  
18 injection valve is not fully open. In this condition, the operator can take manual control of the  
19 pump and the injection. Similar to justification in Action C, while this is not the preferred  
20 method, if a manual initiation function is inoperable, the ECCS subsystem pumps can be started  
21 manually and the valves can be opened manually. The 24-hour completion time is acceptable,  
22 because the functions can be performed manually and it allows time for the operator to evaluate  
23 and have necessary repairs completed. Unlike the failure of a pushbutton that may concern  
24 electronic component repairs, mechanical components may be involved in repairs, testing, and  
25 return to service of pumps and valves further justifying a 24-hour completion time as  
26 appropriate.

27  
28 Action G is needed and becomes necessary, if the ~~required-Required action-Actions~~ and  
29 associated ~~Ceompletion Timescompletion time~~ of Condition C, D, E, or F are not met. If they  
30 are not met, then the associated low pressure ECCS injection/spray subsystem may be  
31 incapable of performing the intended function, and the ECCS subsystem must be declared  
32 inoperable immediately.

33  
34 3.4.5 Proposed TS 3.3.5.2 Surveillances for ~~BWR/4NUREG-1433~~ and ~~BWR/6NUREG-~~  
35 ~~1434~~

36  
37 Section 3.3.3, "Proposed TS 3.3.5.2 Surveillances," of TSTF-542, presents, discusses, and  
38 justifies the SR of TS 3.3.5.2. The TS 3.3.5.2 SR include Channel Checks, Channel Functional  
39 Tests, and Logic System Functional Tests. There are three SRs numbered SR 3.3.5.2.1, SR  
40 3.3.5.2.2, and SR 3.3.5.2.3. The NRC staff finds these tests are sufficient and adequate,  
41 because they are essential to ensure the Functions of TS 3.3.5.2 are operable (i.e., capable of  
42 performing the specified safety function in support of TS 3.5.2, Drain Time, and the protection  
43 from a potential drain down of the RPV in Modes 4 and 5). The NRC staff finds the proposed  
44 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)  
45 by providing the specific SRs relating to test, calibration, or inspection to assure that the  
46 necessary quality of systems and components is maintained.

47

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

3  
4 SR 3.3.5.2.1 requires a Channel Check and is applied to all functions except manual initiation.  
5 Performance of the Channel Check ensures that a gross failure of instrumentation has not  
6 occurred. A Channel Check is normally a comparison of the parameter indicated on one  
7 channel to a similar parameter on other related channels. A Channel Check is significant in  
8 assuring that there is a low probability of an undetected complete channel failure and is a key  
9 safety practice to verifying the instrumentation continues to operate properly between each  
10 Channel Functional Test. The frequency of 12 hours, or in accordance with the Surveillance  
11 Frequency Control Program, is consistent with the existing requirements and supports operating  
12 shift situational awareness.

13  
14 SR 3.3.5.2.2 requires a Channel Functional Test and is applied to all functions except manual  
15 initiation. A Channel Functional Test is the injection of a simulated or actual signal into the  
16 channel as close to the sensor as practicable to verify operability of all devices in the channel  
17 required for channel operability. It is performed on each required channel to ensure that the  
18 entire channel will perform the intended function. The frequency is in accordance with the  
19 Surveillance Frequency Control Program or 92 days. The applicant states, "This is acceptable  
20 because it is consistent with the existing requirements for these Functions and is based upon  
21 operating experience that demonstrates channel failure is rare." Since periods in MODEs 4 and  
22 5 as refueling outages are often in the order of 30 days or less, licensees could include this SR,  
23 if desired, as part of a refueling activity.

24  
25 SR 3.3.5.2.3 requires a Logic System Functional Test and is only applied to the manual initiation  
26 functions. The Logic System Functional Test is a test of all logic components required for  
27 operability of a logic circuit, from as close to the sensor as practicable up to, but not including,  
28 the actuated device, and demonstrates the operability of the required manual initiation logic for  
29 a specific channel. The ECCS subsystem functional testing performed in proposed SR 3.5.2.7  
30 overlaps this surveillance to complete testing of the assumed safety function. The traveler  
31 states:

32  
33  
34 The Frequency of [18] months, or in accordance with the  
35 Surveillance Frequency Control Program, is consistent with the  
36 existing requirements, and is based upon operating experience  
37 that that has shown that these components usually pass the  
38 Surveillance when performed at this Frequency.

39  
40  
41 There are no SRs included to verify or adjust the instrument setpoint derived from the allowable  
42 value using a Channel Calibration or a surveillance to calibrate the trip unit. The traveler states,

43  
44  
45 A draining event in Mode 4 or 5 is not an analyzed accident and,  
46 therefore, there is no accident analysis on which to base the  
47 calculation of a setpoint. The purpose of the Functions is to allow  
48 ECCS manual initiation or to automatically isolate a penetration

1 flow path, but no specific RPV water level is assumed for those  
2 actions. Therefore, the Mode 3 Allowable Value was chosen for  
3 use in Modes 4 and 5 as it will perform the desired function.  
4 Calibrating the Functions in Modes 4 and 5 is not necessary, as  
5 TS 3.3.5.1 and TS 3.3.6.1 continue to require the Functions to be  
6 calibrated on an [18] month Frequency.  
7

8 And:

9  
10 A draining event in Mode 4 or 5 is not an analyzed accident and,  
11 therefore, there are no accident analysis assumptions on  
12 response time.  
13  
14

15 This is acceptable, because this is adequate to ensure the channel responds with the required  
16 pumping systems to inject water when needed and isolation equipment to perform when  
17 commanded.  
18

19 ECCS Response Time and Isolation System Response Time testing ensure that the individual  
20 channel response times are less than or equal to the maximum values assumed in the accident  
21 analysis. TS 3.3.5.2 does not include SRs to participate in any ECCS Response Time testing  
22 and Isolation System Response Time testing. This is acceptable because the purpose of these  
23 tests are to ensure that the individual channel response times are less than or equal to the  
24 maximum values assumed in the accident analysis, but a draining event in Mode 4 or 5 is not an  
25 analyzed accident and, therefore, there are no accident analysis assumptions on response time  
26 and there are alternate manual methods for achieving the safety function. A potential draining  
27 event in MODEs 4 and 5 is a slower event than a LOCA. More significant protective actions are  
28 required as the calculated drain time decreases.  
29

### 30 3.4.6 Conclusion of NRC Staff Review of TS 3.3.5.2

31  
32 The NRC staff finds that proposed TS 3.3.5.2 and LCO 3.3.5.2 satisfies Criterion 4 of  
33 10 CFR 50.36(c)(3), because specific instrumentation is provided that helps prevent or mitigate  
34 a potential RPV drain down event. Operating experience highlights that RPV draining events  
35 are potentially significant to public health and safety, as established in the following NRC  
36 documents:  
37

- 38 1. Information Notice 84-81 "Inadvertent Reduction in Primary Coolant Inventory in  
39 Boiling Water Reactors During Shutdown and Startup," November 1984.
- 40 2. Information Notice 86-74, "Reduction of Reactor Coolant Inventory Because of  
41 Misalignment of RHR Valves," August 1986.
- 42 3. Generic Letter 92-04, "Resolution of the Issues Related to Reactor Vessel Water  
43 Level Instrumentation in BWRs Pursuant to 10 CFR 50.54(f)," August 1992.
- 44 4. NRC Bulletin 93-03, "Resolution of Issues Related to Reactor Vessel Water Level  
45 draining event in Mode 4 Instrumentation in BWRs," May 1993.  
46

47 The NRC staff finds that proposed LCO 3.3.5.2 correctly specifies the lowest functional  
48 capability or performance levels of equipment required for safe operation of the facility. There is

1 reasonable assurance that the required actions to be taken when the LCO is not met can be  
2 conducted without endangering the health and safety of the public.

3  
4 3.5 TABLE 3.3.5.2-1, "RPV WATER INVENTORY CONTROL INSTRUMENTATION"

5  
6 In order to support the requirements of TS 3.5.2, and LCO 3.5.2, "Reactor Pressure Vessel  
7 (RPV) Water Inventory Control," and the definition of "DRAIN TIME"; the instrumentation  
8 requirements are designated in Table 3.3.5.2-1. These instruments are required to be operable  
9 if the systems that provide water injection and isolation functions are to be considered operable  
10 as described in the NRC staff's safety evaluation of TS 3.5.2.

11  
12 Table 3.3.5.2-1 specifies the instrumentation that shall be operable for each function in the table  
13 for Modes 4 and 5 (or other specified conditions), the required number of channels per function,  
14 conditions referenced from ~~required-Required action-Action~~ A.1, SR for the functions, the  
15 allowable value (if version A), and footnotes concerning items of the table.

16  
17 Table 3.3.5.2-1 ~~for in BWR/4NUREG-1433~~ and ~~BWR/6NUREG-1434~~ differ only in that version A  
18 has a column for the allowable value and B does not. Version A has a potential or generic  
19 allowable value in brackets. The brackets indicate that a plant-specific value should be used in  
20 the LAR to adopt TSTF-542.

21  
22 Section 3.3.4, "Proposed Table TS 3.3.5.2-1, 'RPV Water Inventory Control Instrumentation'" of  
23 TSTF-542, presents details on the functions required to support the equipment and functions of  
24 TS 3.5.2 ~~for in BWR/4NUREG-1433~~ and ~~BWR/6NUREG-1434~~. The NRC staff finds the  
25 presentation in this table acceptable, because this section sufficiently discusses the purpose of  
26 the functions, the applicability, the number of required channels, the references to the Condition  
27 to be entered by letter (e.g., A, B, C) if the function is inoperable, the applicable SRs, the  
28 selection of the allowable value, if applicable, and justification of differences between the  
29 existing and proposed TS functions. This RPV Water Inventory Control Instrumentation set is  
30 acceptable, because it is adequate to ensure the instruments of the channels responds with the  
31 required accuracy permitting pumps systems to operate to inject water when needed and  
32 isolation of equipment when commanded to support the prevention of or mitigate a potential  
33 RPV draining event.

34  
35 Each of the ECCS subsystems in ~~the BWR/4NUREG-1433~~ and ~~BWR/6NUREG-1434~~ in MODEs  
36 4 and 5 are initiated by manual pushbutton. The traveler states, "... automatic initiation of an  
37 ECCS injection/spray subsystem, with injection rates of thousands of gpm, may be undesirable  
38 as it can lead to overflowing the RPV cavity." Thus, there is adequate time to take manual  
39 actions (e.g., hours versus minutes). Considering the action statements as the drain time  
40 decreases (the proposed TS 3.5.2, Action E, prohibits plant conditions that could result in drain  
41 times less than one hour), therefore, there is sufficient time for the reactor operators to take  
42 manual action to stop the draining event, and to manually start an ECCS injection/spray  
43 subsystem or the additional method of water injection as needed. Consequently, there is no  
44 need for automatic initiation of ECCS to respond to an unexpected draining event. This is  
45 acceptable, because a draining event is a slow evolution when compared to a design basis  
46 LOCA assumed to occur at a significant power level.

47  
48 3.5.1 Proposed Table 3.3.5.2-1 Functions for ~~BWR/4NUREG-1433~~



1  
2 The following summarizes notable characteristics of the RPV Water Inventory Control  
3 Instrumentation as discussed in Section 3.3.4 of TSTF-542, Revision 2.  
4

5 For the *NUREG-1433* Table 3.3.5.2-1 Functions 1.a and 2.a, ~~BWR/4~~ CS and LPCI Systems,  
6 Reactor Steam Dome Pressure - Low (Injection Permissive), these signals are used as  
7 permissives and protection for these low pressure ECCS injection/spray subsystem manual  
8 initiation functions. This function ensures that the reactor pressure has fallen to a value below  
9 these subsystems' maximum design pressure before permitting the operator to open the  
10 injection valves of the low pressure ECCS subsystems. Even though during MODEs 4 and 5  
11 the reactor steam dome pressure is expected to virtually always be below the ECCS maximum  
12 design pumping pressure, the Reactor Steam Dome Pressure - Low signals are required to be  
13 operable and capable of permitting initiation of the ECCS.  
14

15 For the *NUREG-1433* Table 3.3.5.2-1 Functions 1.b and 2.b, ~~BWR/4~~ CS and LPCI Systems,  
16 Pump Discharge Flow - Low (Bypass), these minimum flow instruments are provided to protect  
17 the associated low pressure ECCS pumps from overheating when the pump is operating and  
18 the associated injection valve is not fully open. The minimum flow line valve is opened when  
19 low flow is sensed, and the valve is automatically closed when the flow rate is adequate to  
20 protect the pump. Where applicable, allowable values (version A) specified are high enough to  
21 ensure that the pump flow rate is sufficient to protect the pump, yet low enough to ensure that  
22 the closure of the minimum flow valve is initiated to allow full flow into the core. Brackets  
23 around allowable value indicate the actual value is to be plant-specific and dependent on actual  
24 equipment. The LPCI minimum flow valves are time delayed such that the valves will not open  
25 for 10 seconds after the switches detect low flow. This time delay is acceptable, because it is  
26 provided to limit reactor vessel inventory loss during the startup of the RHR shutdown cooling  
27 mode.  
28

29 For the *NUREG-1433* Table 3.3.5.2-1 Functions 1.c and 2.c, ~~BWR/4~~ CS System Manual  
30 Initiation and LPCI, System Manual Initiation, the manual initiation pushbutton channels  
31 introduce signals into the appropriate ECCS logic to provide manual initiation capability. There  
32 is one push button for each of the CS and LPCI subsystems (i.e., two for CS and two for LPCI).  
33 There is no allowable value for this Function since the channels are mechanically actuated  
34 based solely on the position of the push buttons. An instrument channel of the Manual Initiation  
35 Function (one channel per subsystem) is required to be Operable in MODEs 4 and 5 when the  
36 associated ECCS subsystems are required to be Operable per LCO 3.5.2.  
37

38 For the *NUREG-1433* Table 3.3.5.2-1 Function 3.a, ~~BWR/4~~ RHR System Isolation, Reactor  
39 Vessel Water Level - Low, Level 3, the function is only required to be operable when automatic  
40 isolation of the associated penetration flow path is credited in the drain time calculation. The  
41 number of required instrument channels is [2 in one trip system], which retains the requirement  
42 that the two instrument channels must be associated with the same trip system. Each trip  
43 system isolates one of two redundant isolation valves, and only one trip system is required to be  
44 operable to ensure that automatic isolation of one of the two isolation valves will occur on low  
45 reactor vessel water level indication. The allowable value (version A) was chosen to be the  
46 same as the Primary Containment Isolation Instrumentation Reactor Vessel Water Level - Low,  
47 Level 3 Allowable Value from LCO 3.3.6.1.  
48

1 For the *NUREG-1433* Table 3.3.5.2-1 Function 4.a, ~~BWR/4~~ RWCU, System Isolation, Reactor  
2 Vessel Water Level - Low Low, Level 2, the function is only required to be operable when  
3 automatic isolation of the associated penetration flow path is credited in the drain time  
4 calculation. The number of required channels is [2 in one trip system], which retains the  
5 requirement that the two instrument channels must be associated with the same trip system.  
6 Only one trip system is required to be operable to ensure that automatic isolation of one of the  
7 two isolation valves will occur on low reactor vessel water level. Allowable value (version A)  
8 was chosen to be the same as the ECCS Reactor Vessel Water Level - Low Low, Level 2  
9 Allowable Value from LCO 3.3.5.1.

10  
11 3.5.2 Proposed Table 3.3.5.2.-1 Functions for ~~BWR/6~~NUREG-1434

12  
13 The following summarizes notable characteristics of the RPV Water Inventory Control  
14 Instrumentation as discussed in Section 3.3.4 of TSTF-542, Revision 2.

15  
16 For the *NUREG-1434* Table 3.3.5.2-1 Functions 1.a and 2.a, ~~BWR/6~~ LPCS and LPCI Systems,  
17 Reactor Steam Dome Pressure - Low (Injection Permissive), these signals are used as  
18 permissives and protection for these low pressure ECCS injection/spray subsystem manual  
19 initiation functions. This function ensures that the reactor pressure has fallen to a value below  
20 these subsystems' maximum design pressure before permitting the operator from opening the  
21 injection valves of the low pressure ECCS subsystems. Even though during MODEs 4 and 5  
22 the reactor steam dome pressure is expected to virtually always be below the ECCS maximum  
23 design pumping pressure, the Reactor Steam Dome Pressure - Low signals are required to be  
24 operable and capable of permitting initiation of the ECCS.

25  
26 For the *NUREG-1434* Table 3.3.5.2-1 Functions 1.b, 1.c, and 2.b, ~~BWR/6~~ LPCS and LPCI  
27 Systems Low Pressure Coolant Injection and Low Pressure Core Spray Pump Discharge Flow -  
28 Low (Bypass), these instruments are provided to protect the associated low pressure ECCS  
29 pump from overheating when the pump is operating and the associated injection valve is not  
30 fully open. The minimum flow line valve is opened when low flow is sensed, and the valve is  
31 automatically closed when the flow rate is adequate to protect the pump. Where applicable  
32 allowable values (version A) specified are high enough to ensure that the pump flow rate is  
33 sufficient to protect the pump, yet low enough to ensure that the closure of the minimum flow  
34 valve is initiated to allow full flow into the core. Brackets around allowable value indicate the  
35 actual value is to be plant-specific and dependent on actual equipment.

36  
37 For the *NUREG-1434* Table 3.3.5.2-1 Functions 1.d and 2.c, ~~BWR/6~~ LPCS and LPCI Systems,  
38 Manual Initiation, the manual initiation pushbutton channels introduce signals into the  
39 appropriate ECCS logic to provide manual initiation capability. There is one pushbutton for  
40 each subsystem in the two divisions of low pressure ECCS (i.e., Division 1 ECCS, LPCS and  
41 LPCI A; Division 2 ECCS, LPCI B and LPCI C). There are four subsystems, thus four  
42 pushbuttons for the low pressure ECCS. The only manual initiation function required to be  
43 operable is that associated with the ECCS subsystem that is required to be operable by LCO  
44 3.5.2. Since the channels are mechanically actuated based solely on the position of the  
45 pushbuttons, there is no allowable value (version A) for this function. When this instrument  
46 function is inoperable, manual initiation with the control board push buttons is inoperable.  
47 However, the ECCS pumps can be started manually and valves can be opened manually by the  
48 reactor operator. This is not the preferred condition.

1  
2 For the *NUREG-1434* Table 3.3.5.2-1 Functions 3.a, **BWR/6** HPCS System Reactor Vessel  
3 Water Level - High, Level 8, the High RPV water level, Level 8 signal, is used to close the  
4 HPCS injection valve to prevent overflow into the main steam lines (MSLs). One instrument  
5 channel associated with the HPCS system is required to be operable to support LCO 3.5.2. The  
6 LCO 3.3.5.2 allowable value (version A) is chosen to isolate flow from the HPCS system prior to  
7 water overflowing into the MSLs.

8  
9 For the *NUREG-1434* Table 3.3.5.2-1 Functions 3.b, **BWR/6** HPCS System, Condensate  
10 Storage Tank Level – Low, the low level signal in the Condensate Storage Tank (CST) indicates  
11 the lack of an adequate supply of makeup water from this primary source for HPCS. Normally,  
12 the water source for the suction for HPCS is the CST. If the water level in the CST falls below a  
13 preselected level, instrumentation logic controls valves so suction is then pulled from the  
14 Suppression Pool. First the Suppression Pool suction valve is automatically opened and then  
15 the CST suction valve is automatically closed in a manner to ensure that an adequate supply of  
16 makeup water is available to the HPCS pump. The Condensate Storage Tank Level - Low  
17 signals are initiated from two level transmitters. The Condensate Storage Tank Level - Low  
18 Function Allowable Value is high enough to ensure adequate pump suction head while water is  
19 being taken from the CST.

20  
21 For the *NUREG-1434* Table 3.3.5.2-1 Functions 3.c and 3.d, **BWR/6** HPCS System, HPCS  
22 Pump Discharge Pressure - High (Bypass) and HPCS System Flow Rate - Low (Bypass), the  
23 minimum flow instruments are provided to protect the HPCS pump from overheating when the  
24 pump is operating and the associated injection valve is not fully open. The minimum flow line  
25 valve is opened when low flow and high pump discharge pressure are sensed, and the valve is  
26 automatically closed when the flow rate is adequate to protect the pump or the discharge  
27 pressure is low (indicating the HPCS pump is not operating).

28  
29 For the *NUREG-1434* Table 3.3.5.2-1 Function 3.e, **BWR/6** HPCS System, Manual Initiation,  
30 the Manual Initiation push button channel introduces a signal into the HPCS logic to provide  
31 manual initiation capability. There is one pushbutton for the HPCS system.

32  
33 For the *NUREG-1434* Table 3.3.5.2-1 Function 4.a, **BWR/6** RHR System Isolation, Reactor  
34 Vessel Water Level - Low, Level 3, the Function is only required to be operable when automatic  
35 isolation of the associated RHR system penetration flow path is credited in calculating drain  
36 time. The definition of drain time allows crediting the closing of penetration flow paths that are  
37 capable of being automatically isolated by RPV water level isolation instrumentation prior to the  
38 RPV water level dropping below the TAF, but if the instrument function is inoperable, a closed  
39 path cannot be credited and a drain time calculation must be re-performed.

40  
41 For the *NUREG-1434* Table 3.3.5.2-1 Function 5.a, **BWR/6** RWCU System Isolation, Reactor  
42 Vessel Water Level - Low Low, Level 2, the Function is only required to be Operable when  
43 automatic isolation of the associated RWCU system penetration flow path is credited in  
44 calculating drain time. The definition of drain time allows crediting the closing of penetration  
45 flow paths that are capable of being automatically isolated by RPV water level isolation  
46 instrumentation prior to the RPV water level dropping below the TAF, but if the instrument  
47 function is inoperable, a closed path cannot be credited and a drain time calculation must be re-  
48 performed. This function is not applicable in MODEs 4 or 5 in TS 3.3.6.1, but is being added to

1 TS 3.3.5.2 to support crediting the automatic isolation of the RWCU system in calculating drain  
2 time.

3  
4 3.6 OTHER DIFFERENCES BETWEEN THE CURRENT AND PROPOSED TS

5  
6 Section 3.4., "Evaluation of other Differences between the Current and Proposed TS," of TSTF-  
7 542, presents and discusses other differences between the current TS requirements related to  
8 OPDRVs and the proposed TS requirements for RPV WIC. The current STS contain  
9 requirements related to instrumentation that are applicable during OPDRVs and are applicable  
10 when the existing LCO 3.5.2 is applicable. They do not specifically impact the focus on TS  
11 3.3.5.2 and the associated LCO 3.5.2 and Table 3.3.5.2-1.

12  
13 3.7 STS 3.5.2 – REACTOR PRESSURE VESSEL (RPV) WATER INVENTORY CONTROL

14  
15 The categories of items required to be in the TSs are provided in 10 CFR 50.36(c). As required  
16 by 10 CFR 50.36(c)(2)(i), the TSs will include LCOs, which are the lowest functional capability  
17 or performance levels of equipment required for safe operation of the facility. Per 10 CFR  
18 50.36(c)(2)(i), when an LCO of a nuclear reactor is not met, the licensee shall shut down the  
19 reactor or follow any remedial action permitted by the TSs until the condition can be met.

20  
21 The regulations at 10 CFR 50.36(c)(2)(ii) state that LCOs must be established for each item  
22 meeting one of four criteria:

23  
24  
25 *Criterion 1.* Installed instrumentation that is used to detect, and  
26 indicate in the control room, a significant abnormal degradation of  
27 the reactor coolant pressure boundary.

28  
29 *Criterion 2.* A process variable, design feature, or operating  
30 restriction that is an initial condition of a design basis accident or  
31 transient analysis that either assumes the failure of or presents a  
32 challenge to fission product barrier integrity.

33  
34 *Criterion 3.* A structure, system, or component that is part of the  
35 primary success path and which functions or actuates to mitigate  
36 a design basis accident or transient that either assumes the failure  
37 of or presents a challenge to the integrity of a fission product  
38 barrier.

39  
40 *Criterion 4.* A structure, system, or component which operating  
41 experience or probabilistic safety assessment has shown to be  
42 significant to public health and safety.

43  
44  
45 Technical Specification Safety Limit 2.1.1.3 requires that reactor vessel water level shall be  
46 greater than the top of active irradiated fuel. Maintaining water level above the TAF ensures  
47 that the fuel cladding fission product barrier is protected during shutdown conditions. The  
48 changes to the STS described in traveler TSTF-542 establish specifications for equipment and

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

3  
4 NUREG-0800, Revision 3, *Standard Review Plan* (March 2010) (ADAMS Accession  
5 No. ML100351425), describes LOCAs as postulated accidents that would result from the loss of  
6 reactor coolant, at a rate in excess of the capability of the normal reactor coolant makeup  
7 system, from piping breaks in the reactor coolant pressure boundary. During operation in  
8 MODEs 4 and 5, the reactor coolant system is at a low operating temperature (<[200] °  
9 Fahrenheit) and is depressurized. An event involving a loss of inventory while in the shutdown  
10 condition is judged to not exceed the capacity of one ECCS subsystem. The accidents that are  
11 postulated to occur during shutdown conditions, the Fuel Handling Accident and the Waste Gas  
12 Decay Tank Rupture, do not involve a loss of inventory. The equipment and instrumentation  
13 associated with the Reactor Vessel Water Inventory Control TS do not provide detection or  
14 mitigation related to these design basis accidents.

15  
16 The revised STS LCO 3.5.2 contains requirements for operability of one ECCS subsystem  
17 along with requirements to maintain a sufficiently long drain time that plant operators would  
18 have time to diagnose and mitigate an unplanned draining event. The NRC staff has  
19 determined that the LCO 3.5.2 and 3.3.5.2 provide alternatives for the lowest functional  
20 capability or performance levels of equipment required for safe operation of the facility. On this  
21 basis, the NRC staff concludes that the requirements of 10 CFR 50.36(c)(2)(i) are met.

22  
23 Additionally, the revised STS LCOs 3.5.2 and 3.3.5.2 provide remedial actions to be taken in the  
24 event the LCO is not satisfied, therefore meeting the requirements of 10 CFR 50.36(c)(2)(i).  
25 The NRC staff has found that the remedial actions provide reasonable assurance that an  
26 unexpected draining event can be prevented or mitigated before the RPV water level would be  
27 lowered to the TAF.

28  
29 The regulation at 10 CFR 50.36(c)(3) requires TSs to include items in the category of SRs,  
30 which are requirements relating to test, calibration, or inspection to assure that the necessary  
31 quality of systems and components is maintained, that facility operation will be within safety  
32 limits, and that the LCOs will be met. The NRC staff reviewed the SRs associated with the  
33 revised LCOs 3.5.2 and 3.3.5.2. The NRC staff reviewed the new SRs and determined that  
34 they are appropriate for ensuring the operability of the equipment and instrumentation specified  
35 in LCOs 3.5.2. Therefore, the NRC staff concludes that 10 CFR 50.36(c)(3) is met.

36  
37 The regulation at 10 CFR 50.36(a)(1) states that a summary statement of the bases or reasons  
38 for such specifications, other than those covering administrative controls, shall also be included  
39 in the application, but shall not become part of the TSs. Traveler TSTF-542 contains TS Bases  
40 changes that describe the basis for the affected TS. A summary of the NRC staff's evaluation of  
41 the TS Bases changes is provided in an attachment to this SE.

42  
43 The NRC staff's guidance for review of TSs is in Chapter 16, *Technical Specifications*, of  
44 NUREG-0800, Revision 3, *Standard Review Plan* (March 2010) (ADAMS Accession  
45 No. ML100351425). As described therein, as part of the regulatory standardization effort, the  
46 NRC staff has prepared STS for each of the light-water reactor nuclear designs. NUREG-1433,  
47 Revision 4, contains the STS for BWR/4 plants, *and is applicable to BWR/2, BWR/3, and, in*  
48 *some cases, BWR/5 plants*, and NUREG 1434, Revision 4, contains the STS for BWR/6 plants

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

5  
6 **4.0 CONCLUSION**

7  
8 The NRC staff reviewed traveler TSTF-542, Revision 2, "Reactor Pressure Vessel Water  
9 Inventory Control," which proposed changes to NUREG-1433, Volumes 1 (STS for BWR/4) and  
10 2 (Bases) and NUREG-1434 Volumes 1 (STS for BWR/6) and 2 (Bases). The NRC staff  
11 determined that the proposed changes to the STS ~~for BWR/4 and the STS for BWR/6~~ met the  
12 standards for TS in 10 CFR 50.36(b). The proposed LCOs appropriately specify the lowest  
13 functional capability or performance levels of equipment required for safe operation of the  
14 facility, as required by 10 CFR 50.36(c)(2)(i). The remedial actions to be taken when an LCO is  
15 not met action statements provide adequate protection to the health and safety of the public,  
16 thereby satisfy the Act and 10 CFR 50.36(c)(2)(i). The proposed surveillance requirements  
17 assure that the necessary quality of systems and components is maintained, that facility  
18 operation will be within safety limits, and that the LCOs will be met, and satisfy 10 CFR  
19 50.36(c)(3).

20  
21 The proposed bases, which will be added to future revisions to NUREG-1433, Volume 2, and  
22 NUREG-1434, Volume 2, satisfy the Commission's Policy Statement by addressing the  
23 questions specified in the policy statement, and cite references to appropriate licensing  
24 documentation to support the Bases.

25  
26 Technical contacts: Matt Hardgrove, NRR/DSS/SRXB  
27 Eugene Eagle, NRR/DE/EICB

28  
29 Attachment: Basis for Accepting the Proposed Changes to the Standard Technical  
30 Specification Bases, Volume 2 of NUREGs 1433 and 1434

31  
32 Date:



- 1 1. What is the justification for the Technical Specification, i.e., which  
2 Policy Statement criterion requires it to be in the Technical  
3 Specifications?  
4
- 5 2. What are the Bases for each LCO, i.e., why was it determined to  
6 be the lowest functional capability or performance level for the  
7 system or component in question necessary for safe operation of  
8 the facility and, what are the reasons for the Applicability of the  
9 LCO?  
10
- 11 3. What are the Bases for each Action, i.e., why should this remedial  
12 action be taken if the associated LCO cannot be met; how does  
13 this Action relate to other Actions associated with the LCO; and  
14 what justifies continued operation of the system or component at  
15 the reduced state from the state specified in the LCO for the  
16 allowed time period?  
17
- 18 4. What are the Bases for each Safety Limit?  
19
- 20 5. What are the Bases for each Surveillance Requirement and  
21 Surveillance Frequency; i.e., what specific functional requirement  
22 is the surveillance designed to verify? Why is this surveillance  
23 necessary at the specified frequency to assure that the system or  
24 component function is maintained, that facility operation will be  
25 within the Safety Limits, and that the LCO will be met?  
26

27 Note: In answering these questions the Bases for each number  
28 (e.g., Allowable Value, Response Time, Completion Time,  
29 Surveillance Frequency), state, condition, and definition (e.g.,  
30 operability) should be clearly specified. As an example, a number  
31 might be based on engineering judgment, past experience, or  
32 PSA insights; but this should be clearly stated.  
33

34 The NRC staff used the guidance contained in the Final Policy Statement during its review of  
35 the proposed changes to the Bases.  
36

## 37 2.2 Description of Changes 38

39 Volume 2 NUREGs-1433 and -1434 contain the Bases for each Safety Limit and each LCO  
40 contained in Volume 1. The Bases for each LCO is organized into sections:  
41

42 Background



1           Applicable Safety Analyses, LCO, and Applicability  
2           Actions  
3           Surveillance Requirements  
4           References  
5

6 The Bases for LCOs 3.3.5.2 (A and B) and 3.5.2 were rewritten in their entirety to reflect the  
7 changes in the associated LCOs. The Bases for the remainder of the affected LCOs were  
8 modified to reflect the deletion of OPDRVs.  
9

10 In the following sections, the discussion is applicable to both NUREG 1433 (~~for BWR/4 plants~~)  
11 and NUREG 1434 (~~for BWR/6 plants~~) unless otherwise noted. The discussion provides a  
12 summary of the revised Bases, followed by the NRC staff's evaluation of the revised Bases.  
13

### 14 **3.0    TECHNICAL EVALUATION**

#### 15 16 3.1    Evaluation of B 3.3.5.2 (A) and B 3.3.5.2 (B)

17  
18 B 3.3.5.2(A) is applicable in the absence of a Setpoint Control Program, and B 3.3.5.2(B) is  
19 applicable if a Setpoint Control Program is used. For simplicity in presentation, the description  
20 provided below applies to both the (A) and (B) versions, unless otherwise stated.  
21

22 The Background section provides

- 23
- 24       • a description of the reactor pressure vessel (RPV) design, which includes penetrations
- 25       below the top of active fuel
- 26       • a description of Safety Limit 2.1.1.3, which requires the RPV water level to be above the
- 27       top of active fuel
- 28       • an explanation of the purpose of the RPV water Inventory Control Instrumentation, which
- 29       is to support the requirements of LCO 3.5.2, Reactor Pressure Vessel Water Inventory
- 30       Control by ensuring that the functions required for manual initiation of required
- 31       Emergency Core Cooling System (ECCS) injection/spray subsystem are available and
- 32       that other functions supporting isolation of flowpath(s) on low RPV level are available.  
33

34 The Applicable Safety Analyses, LCO and Applicability section provides:

- 35
- 36       • a statement that indicates that water inventory control is required in Modes 4 and 5 to
- 37       protect Safety Limit 2.1.1.3 and a discussion that due to the reduced Reactor Coolant
- 38       System (RCS) pressure in the shutdown condition, a very large break in the RCS is not
- 39       postulated in the shutdown condition.
- 40       • an explanation that this LCO is applicable in Modes 4 and 5 to support operability of
- 41       subsystems required to be operable in Modes 4 and 5 as specified in LCO 3.5.2.

- 1 • a description of why the LCO meets Criterion 4 specified in 10 CFR 50.36(c)(2)(ii) as a  
2 structure, system or component which operating experience has shown to be significant  
3 to public health and safety.
- 4 • a detailed discussion regarding each function contained in LCO 3.3.5.2  
5
  - 6 ○ Core Spray and Low Pressure Coolant Injection Systems:
  - 7 ○ Function 1.a, 2.a Reactor Steam Dome Pressure – Low (Injection Permissive) is  
8 required to be Operable to ensure the capability of initiating ECCS when  
9 pressure is below the injection subsystems design pressure. The actuation logic  
10 is one out of two taken twice, four channels are required to be operable.
  - 11 ○ For ~~BWR/6~~NUREG-1433~~s6's~~:
    - 12 ▪ Function 1.b, 2.b Core Spray and Low Pressure Coolant Injection Pump  
13 Discharge Flow – Low (Bypass) is required to be operable to ensure  
14 minimum flow line is available to protect the associated low pressure  
15 ECCS pump from overheating on low discharge and to ensure closure of  
16 the minimum flow valve is initiated at the proper ~~point to ensure full~~  
17 ~~injection point when the flow when required rate is adequate to protect the~~  
18 ~~pump~~. One channel per required pump is required to be operable.
  - 19 ○ For ~~BWR/6~~NUREG-1434~~s6's~~:
    - 20 ▪ Function 1.b, 1.c, 2.b Low Pressure Coolant Injection and Low Pressure  
21 Core Spray ~~pump~~Pump Discharge Flow - Low (Bypass) is required to be  
22 operable to ensure minimum flow line is available to protect the  
23 associated low pressure ECCS pump from overheating on low discharge  
24 and to ensure closure of the minimum flow valve is initiated at the proper  
25 ~~point to ensure full injection flow when required. when the flow rate is~~  
26 ~~adequate to protect the pump~~. One channel per required pump is  
27 required to be operable.
  - 28 ○ Function 1.c (for ~~BWR/4~~NUREG-1433), 1.d (for ~~BWR/6~~NUREG-1434) 2.c,  
29 Manual Initiation, is required to be operable to provide manual initiation  
30 capability. One channel (pushbutton) per required subsystem is required to be  
31 operable per ECCS subsystem required to be operable.
  - 32 ○ For ~~BWR/6~~NUREG-1434, High Pressure Core Spray System
    - 33 ▪ Function 3.a, Reactor Vessel Water Level – High, Level 8 is used to close  
34 the HPCS injection valve to prevent overflow into the main steam lines.  
35 One channel associated with the HPCS system required by LCO 3.5.2 is  
36 required to be operable. The allowable value is chosen to ensure no  
37 overflow into the main steam lines.
    - 38 ▪ Function 3.b, Condensate Storage Tank (CST) Level, Low indicates low  
39 supply of makeup water from this source. HPCS is normally aligned to  
40 take suction on the CST. On low CST level, the HPCS pump suction  
41 ~~valves~~valve from the suppression pool open and then the suction

- 1 ~~valves~~ valve from the CST close. One channel is required to be operable  
2 when HPCS is required per LCO 3.5.2 and the HPCS is aligned to the  
3 CST. The allowable value is selected to ensure adequate pump suction  
4 head.
- 5     ▪ Function 3.c., 3.d HPCS Pump Discharge Pressure – High (Bypass) and  
6     HPCS System Flow Rate – Low (Bypass) is required to be operable to  
7     ensure minimum flow line is available to protect the associated HPCS  
8     pump from overheating on low discharge. The allowable value is set to  
9     ensure the flow is sufficient to protect the pump, but closes when a  
10    minimum flow is ~~reached to ensure full injection flow into the core.~~  
11    adequate to protect the pump or the discharge pressure is low (indicating  
12    the HPCS pump is not operating). One channel is required when HPCS  
13    is required to be operable per LOC 3.5.2.
  - 14    ▪ Function 3.e, Manual Initiation, is required to be operable to ensure  
15    manual initiation capability. One channel is required when the associated  
16    ECCS subsystem is required by LCO 3.5.2.
- 17    ○ RHR System Isolation:
    - 18    ○ Function 3.a (for ~~BWR/4NUREG-1433~~) and 4.a (for ~~BWR/6NUREG-1434~~),  
19    Reactor Vessel Water Level – Low Level 3 may be credited for automatic  
20    isolation of penetration flow paths associated with the RHR system. The function  
21    is required to be operable when automatic isolation of the associated penetration  
22    flow path is assumed in the calculated Drain Time. Two channels in the same  
23    trip system are required to be operable.
    - 24    ○ Reactor Water Cleanup (RWCU) System Isolation
    - 25    ○ Function 4.a (for ~~NUREG-1433BWR/4~~) and 5.a (for ~~BWR/6NUREG-1434~~),  
26    Reactor Vessel Water level – Low Low, Level 2 may be credited for automatic  
27    isolation of penetration flow paths associated with the RWCU System. This  
28    function is required to be operable when automatic isolation of the associated  
29    penetration flow path is assumed in the calculated Drain Time. Two channels in  
30    the same trip system are required to be operable.
    - 31    ○ The Allowable Value selected is the same as the Allowable Value during Power  
32    Operation.
- 33    ○ an explanation of each Required Action and Completion Time contained in the Actions  
34    Table
- 35    ○ For ~~NUREG-1433BWR/4s~~:
    - 36    ▪ Condition A is entered when a channel is declared inoperable and  
37    Required Action A.1 directs entry into the Appropriate Condition.
    - 38    ▪ Condition B is entered when Functions ~~4.3.a, 2 and 4.a, 1.b or 2.b~~ are  
39    inoperable. The Required Action is to declare the associated penetration  
40    inoperable. The Required Action is to declare the associated penetration  
41    inoperable. The Required Action is to declare the associated penetration  
42    inoperable.

- 1 flow path incapable of automatic isolation and to recalculate the Drain  
2 Time without taking credit for the automatic isolation of the affect  
3 pathway.
- 4 ▪ Condition C is entered when the steam dome pressure signal permissive  
5 is inoperable. Inoperability of the permissive means that the injection  
6 function cannot be manually initiated. The Required Action is to place the  
7 permissive in the tripped condition within one hour. This enables manual  
8 initiation of the injection function. The one hour allowance provides  
9 sufficient time for the operator to place the channel in trip.
  - 10 ▪ Condition D is entered when the Core Spray or Low Pressure Coolant  
11 Injection Pump Discharge Flow – Low bypass functions are unavailable.  
12 In this condition, the Required Action is to restore the channel to operable  
13 status within 24 hours. The 24 hour is judged to be appropriate because  
14 manual operation of the pumps and the *minimum flow valves injection*  
15 *valves* is still available, but this is not the preferred condition.
  - 16 ▪ Condition E is entered when the Required Action and associated  
17 Completion Time for Condition C or D is not met. In this case, the  
18 associated ECCS subsystem may not be capable of performing its  
19 intended function, and is declared inoperable immediately.
- 20
- 21 ○ For ~~BWR/6NUREG-1434s6s~~:
    - 22 ▪ Condition A is entered when a channel is declared inoperable and  
23 Required Action A.1 directs entry into the Appropriate Condition.
    - 24 ▪ Condition B is entered when the RHR System Isolation or RWCU System  
25 Isolation functions are inoperable. The Required Action is to declare the  
26 associated penetration flow path incapable of automatic isolation and to  
27 recalculate the Drain Time without taking credit for the automatic isolation  
28 of the affect pathway.
    - 29 ▪ Condition C is entered when the Steam Dome Low Pressure Signal  
30 (Injection Permissive) is inoperable. Inoperability of the permissive  
31 means that the injection function cannot be manually initiated. The  
32 Required Action is to place the permissive in the tripped condition within  
33 one hour. This enables manual initiation of the injection function. The  
34 one hour allowance provides sufficient time for the operator to place the  
35 channel in trip.
    - 36 ▪ Condition D is entered when the CST Level – Low function is inoperable.  
37 The Required Action is to declare HPCS system inoperable and to align  
38 the HPCS pump suction to the suppression pool within 1 hour.
    - 39 ▪ Condition E is entered when the Reactor Vessel Water Level – High –  
40 Level 8 function is inoperable. The Required Action is to declare HPCS  
41 system inoperable within 1 hour and to restore the channel to operable  
42 status within 24 hours.

- 1           ▪ Condition F is entered when the LPCS Pump Discharge Flow – Low  
2           (Bypass), LPCI Pump A Discharge Flow – Low (Bypass), LPCI Pump B  
3           and LPCI pump C Discharge Flow – Low (Bypass), HPCS Pump  
4           Discharge Pressure – High (Bypass), HPCS System Flow rate – Low  
5           (Bypass) or any of the required Manual functions are inoperable. The  
6           Required Action is to restore the channel to operable status within 24  
7           hours. The 24 hour is judged to be appropriate because manual  
8           operation of the pumps and the ~~minimum flow injection~~ valves is still  
9           available, but this is not the preferred condition.
- 10          ▪ Condition G is entered when the Required Action and associated  
11          Completion Time for Condition C, D, E or F is not met. In this case, the  
12          associated ECCS subsystem may not be capable of performing its  
13          intended function, and is declared inoperable immediately.

14  
15 The Surveillance Requirements section provides:

- 16           • a description of the purpose of each Surveillance Requirement and the basis for the  
17           surveillance frequency selected. For each function,  
18
  - 19           ○ A channel check is performed to verify that a gross failure of an instrument  
20           channel has not occurred. Agreement criteria is established based on channel  
21           instrument uncertainties and readability. The surveillance is performed once per  
22           12 hours or in accordance with the Surveillance Frequency Control Program.  
23           The frequency was selected based on operating experience that indicates  
24           channel failure is rare.
  - 25           ○ A channel functional test is performed to verify the channel is capable of  
26           performing its intended function. The surveillance is performed once per 92 days  
27           or in accordance with the Surveillance Frequency Control Program. The  
28           frequency was selected based on operating experience that indicates channel  
29           failure is rare.
  - 30           ○ A logic system functional test is performed to verify proper functioning of the  
31           required initiation logic for a channel. The surveillance is performed once per 18  
32           months or in accordance with the Surveillance Frequency Control Program. The  
33           frequency was selected because of the preference to perform the surveillance  
34           under shutdown conditions.

35  
36 The References section provides lists Regulatory Guide 1.105, "Setpoints for Safety-Related  
37 Instrumentation," and NEDE-770-06-2, "Addendum to Bases for Changes to Surveillance Test  
38 Intervals and Allowed Out-of-Service Times for Selected ~~instrumentation~~ Instrumentation  
39 Technical Specifications."

40  
41 The staff reviewed the revised bases to ensure the applicable criteria from 10 CFR 50.36 is  
42 identified and justified. The revised bases state that the proposed LCO meets the Criterion 4

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

### 11 3.2 EVALUATION OF B 3.5.2

12 The Background section provides

- 13
- 14
- 15
- 16 • a description of the reactor pressure vessel (RPV) design, which includes penetrations
- 17 below the top of active fuel
- 18 • a description of Safety Limit 2.1.1.3, which requires the RPV water level to be above the
- 19 top of active fuel
- 20

21 The Applicable Safety Analyses, LCO and Applicability section provides:

- 22
- 23 • a statement that indicates that water inventory control is required in Modes 4 and 5 to
- 24 protect Safety Limit 2.1.1.3 and a discussion that due to the reduced RCS pressure in
- 25 the shutdown condition, a very large break in the RCS is not postulated in the shutdown
- 26 condition.
- 27 • an explanation that one low pressure ECCS injection/spray subsystem can maintain
- 28 adequate RPV level (explanation retained from previous Bases for LCO 3.5.2)
- 29 • a description of why the LCO meets Criterion 4 specified in 10 CFR 50.36(c)(2)(ii) as a
- 30 structure, system or component which operating experience has shown to be significant
- 31 to public health and safety.
- 32 • an explanation that a Drain Time of 36 hours was selected for the LCO because this
- 33 time period is reasonable for the operator to identify and initiate remedial measures.
- 34 • an explanation that the LCO also requires one low pressure ECCS injection/spray
- 35 subsystem to be operable and capable of being manually started so that it is available
- 36 should an unexpected drain event occur. The ECCS injection/spray subsystem may be
- 37 considered operable during alignment for decay heat removal because the restriction on
- 38 drain time ensures sufficient time is available to initiate LPCI operation to maintain
- 39 inventory if required.
- 40 • an explanation of each Required Action and Completion Time contained in the Actions
- 41 Table

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

37

38 The Surveillance Requirements section provides:

39

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

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

33  
34 The References section cites the applicable operating generic correspondence describing  
35 operating experience related to inventory control during shutdown conditions. It lists Information  
36 Notice 84-81 "Inadvertent Reduction in Primary Coolant Inventory in Boiling Water Reactors  
37 During Shutdown and Startup," November 1984; Information Notice 86-74, "Reduction of  
38 Reactor Coolant Inventory Because of Misalignment of RHR Valves," August 1986; Generic  
39 Letter 92-04, "Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation  
40 in BWRs Pursuant to 10 CFR 50.54(Ff)," August 1992; NRC Bulletin 93-03, "Resolution of  
41 Issues Related to Reactor Vessel Water Level Instrumentation in BWRs," May 1993;  
42 Information Notice 94-52, "Inadvertent Containment Spray and Reactor Vessel Draindown at



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

3  
4 The revised Bases (Volume 2 of NUREG 1434) for TS 3.5.2 ~~for the BWR/6~~ differ from the  
5 revised Bases for ~~NUREG-1433 the BWR/4 TS~~. The major difference is that the LCO requires  
6 one ECCS injection/spray subsystem to be operable. The ECCS injection/spray subsystem is  
7 either one of the three Low Pressure Coolant Injection subsystems, one Low Pressure Core  
8 Spray System, or one High Pressure Core Spray System. This difference is reflected  
9 throughout the Bases for TS 3.5.2 in NUREG 1434, Volume 2.

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

### 19 20 3.3 EVALUATION OF ADDITIONAL BASES CHANGES

#### 21 22 3.3.1 B 3.3.5.1, ECCS Instrumentation

23  
24 The Bases for several instrument functions related to automatic ECCS initiation were revised to  
25 reflect a revised Applicability. The functions would no longer be required during Modes 4 and 5  
26 because of the relatively slow transient of unexpected drain events. It is judged that sufficient  
27 time is permitted for operators to mitigate such a transient. The instrumentation affected *in*  
28 ~~NUREG-1433 is for BWR/4s are~~ Reactor Vessel Water Level – Low Low Low, Level 1; Low  
29 Pressure Coolant Injection (LPCI) System Reactor Vessel Water Level – Low Low Low, Level 1;  
30 and Low Pressure Coolant Injection Pump Start – Time Delay Relay. For ~~BWR/6 NUREG-~~  
31 ~~1434's 6's~~, the affected functions are LPCI A and LPCS: Reactor Vessel Water Level – Low Low  
32 Low, Level 1; LPCI Pump A Start – Time Delay Relay; LPCI B and C: Reactor Vessel Water  
33 Level – Low Low Low, Level 1; LPCI Pump B Start – Time Delay Relay; and HPCS Reactor  
34 Vessel Water Level Lo Low, Level 2.

35  
36 The remainder of the changes to the Bases for this LCO reflect the relocation of instrumentation  
37 function requirements to the LCO 3.3.5.2.

#### 38 39 3.3.2 B 3.3.6.1, Primary Containment Isolation Instrumentation

40  
41 The Bases for the Shutdown Cooling Isolation, Reactor Vessel Water Level – Low, Level 3 was  
42 revised to reflect the relocation of this requirement to LCO 3.3.5.2.

1  
2 For ~~BWR/6NUREG-1434's6's~~, the function for Primary Containment Isolation, Containment and  
3 Drywell Ventilation Exhaust Radiation – High is revised to reflect the deletion of this  
4 requirement.

5  
6 3.3.2 B 3.5.3, RCIC System

7  
8 The Applicability was revised to state that in Modes 4 and 5, RPV water inventory control is  
9 provided by LCO 3.5.2.

10  
11 3.3.3 B 3.6.1.3, PCIVs [Primary Containment Isolation Valves]

12  
13 The Applicability was changed to replace the statement that certain valves are required to be  
14 operable to prevent inadvertent drain down to state that certain valves are required to be  
15 operable when the associated instrumentation is required to be operable.

16  
17 The description of the Applicability and Actions is revised to delete the discussion of OPDRVs.

18  
19 3.3.4 Other Affected Bases

20  
21 The description of the Applicability, Actions and Applicable Safety Analyses Sections are  
22 revised to delete the discussion of OPDRVs ~~or~~, inadvertent drain down of the vessel, *or other*  
23 *related administrative changes* for the following LCOs:

- 24  
25 • 3.3.6.1 ~~Primary~~ *Secondary* Containment Isolation Instrumentation  
26 • *3.3.7.1 MCREC System Instrumentation*  
27 • 3.5.1 ECCS - Operating  
28 • 3.6.2.2 Suppression Pool Water Level  
29 • 3.6.4.1 [Secondary] Containment  
30 • 3.6.4.2 SCIVs [Secondary Containment Isolation Valves]  
31 • 3.6.4.3 SGT System [Standby Gas Treatment]  
32 • 3.7.4 MCREC [Main Control Room Environmental Control] System  
33 • 3.7.5 Control Room AC [Air Conditioning] System  
34 • 3.8.2 AC Sources – Shutdown  
35 • 3.8.5 DC Sources – Shutdown  
36 • 3.8.8 Inverters – Shutdown  
37 • 3.8.10 Distribution Systems – Shutdown  
38 • 3.10.1 Inservice Leak and Hydrostatic Testing Operation  
39

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

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

4

5 **4.0 CONCLUSION**

6

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

12

**Attachment 2**

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

**Summary Table of TSTF Comments**

<b>Section and Location</b>	<b>Comment</b>
	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.

<b>Section and Location</b>	<b>Comment</b>
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 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**

1 *General Directions: This model SE provides the format and content to be used when preparing*  
2 *the plant-specific SE of an LAR to adopt TSTF-542. The **bolded** bracketed information shows*  
3 *text that should be filled in for the specific amendment; individual licensees would furnish*  
4 *site-specific nomenclature or values for these bracketed items. The italicized wording provides*  
5 *guidance on what should be included in each section and should not be included in the SE.*  
6

7 **DRAFT MODEL SAFETY EVALUATION**

8 **BY THE OFFICE OF NUCLEAR REACTOR REGULATION**

9 **TECHNICAL SPECIFICATIONS TASK FORCE TRAVELER**

10 **TSTF-542, REVISION 2**

11 **“REACTOR PRESSURE VESSEL WATER INVENTORY CONTROL”**

12  
13 **1.0 INTRODUCTION**

14  
15 By application dated **[enter date]** (Agencywide Documents Access and Management System  
16 (ADAMS) Accession No. **[MLXXXXXXXXXX]**), **[name of licensee]** (the licensee) requested to  
17 adopt Technical Specifications Task Force (TSTF) Traveler TSTF-542, “Reactor Pressure  
18 Vessel Water Inventory Control,” Revision 2, which changes to the technical specifications (TS)  
19 for **[PLANT]**. Traveler TSTF-542, Revision 2, was approved by the NRC on **[enter date]**  
20 (ADAMS Accession No. **[MLXXXXXXXXXX]**).

21  
22 The proposed changes would replace the existing requirements in the TS related to “operations  
23 ~~with a which have the~~ potential for draining the reactor vessel” (OPDRVs) with revised TS  
24 providing an alternative for Reactor Pressure Vessel Water Inventory Control (RPV WIC).  
25 These alternative requirements would protect Safety Limit 2.1.1.3, which requires reactor  
26 pressure vessel (RPV) water level to be greater than the top of the active fuel (TAF).  
27

28 *Choose applicable paragraphs based on information provided in the LAR:*

29 **[The licensee is not proposing any variations from the TS changes described in the**  
30 **TSTF-542 or the applicable parts of the NRC staff’s safety evaluation of TSTF-542.]**  
31

32 **[The licensee is proposing the following variations from the TS changes described in the**  
33 **TSTF-542 or the applicable parts of TSTF-542 or the NRC staff’s safety evaluation.]**  
34

35 **[The [PLANT] TS utilize different [numbering][and][titles] than the Standard Technical**  
36 **Specifications on which TSTF-542 was based. Specifically, [describe differences between**  
37 **the plant-specific TS numbering and/or titles and the TSTF-542 numbering and titles.]**  
38 **These differences are administrative and do not affect the applicability of TSTF-542 to the**  
39 **[PLANT] TS.]**  
40

41 **[The [PLANT] TS limiting condition for operation (LCO) 3.5.2 does ~~de~~ not contain a Note**  
42 **regarding realignment to the Low Pressure Coolant Injection mode. This has no effect on the**  
43 **adoption of the TSTF-542 and is an acceptable variation.]**  
44



1 **2.0 REGULATORY EVALUATION**

2  
3 **2.1 TECHNICAL SPECIFICATIONS**

4  
5 Section IV, "The Commission Policy," of the Final Policy Statement on Technical Specifications  
6 Improvements for Nuclear Power Reactors (58 *Federal Register* 39132), dated July 22, 1993,  
7 states in part:

8  
9 The purpose of Technical Specifications is to impose those  
10 conditions or limitations upon reactor operation necessary to  
11 obviate the possibility of an abnormal situation or event giving rise  
12 to an immediate threat to the public health and safety by  
13 identifying those features that are of controlling importance to  
14 safety and establishing on them certain conditions of operation  
15 which cannot be changed without prior Commission approval.

16 [T]he Commission will also entertain requests to adopt portions of  
17 the improved STS [(e.g., TSTF-542)], even if the licensee does  
18 not adopt all STS improvements...

19 The Commission encourages all licensees who submit Technical  
20 Specification related submittals based on this Policy Statement to  
21 emphasize human factors principles...

22 In accordance with this Policy Statement, improved STS have  
23 been developed and will be maintained for [the BWR/4 and  
24 BWR/6 designs]. The Commission encourages licensees to use  
25 the STS as the basis for plant-specific Technical Specifications...

26 [I]t is the Commission intent that the wording and Bases of the  
27 improved STS be used [] to the extent practicable.

28  
29 **2.2 SYSTEM DESCRIPTION**

30  
31 The boiling water reactor (BWR) RPV hasve a number of penetrations located below the TAF.  
32 These penetrations provide entry for control blades, recirculation flow, and shutdown cooling.  
33 Since these penetrations are below the TAF, this gives-creates a potential to drain the reactor  
34 vessel water inventory and thus-lose effective core cooling. The loss of water inventory and  
35 effective core cooling can potentially lead to fuel cladding failure and radioactive release.

36  
37 During operation in Modes 1 (Power Operation - ~~Reactor Mode Switch in Run~~ with reactor  
38 mode switch position in run), 2 (Startup - with Rreactor Mmode Sswitch position in Rrefuel (with  
39 all reactor vessel head closure bolts fully tensioned) or Sstartup/Hhot Sstandby), and 3 (Hot  
40 Standby - with Rreactor mode-Mode Sswitch position in Run and average reactor coolant  
41 temperature > [200] °F), shutdown), the TS for instrumentation and emergency core cooling  
42 systems (ECCS) require operability of sufficient equipment to ensure large quantities of water  
43 can be injected into the vessel should level decrease below the preselected value. These  
44 requirements are designed to mitigate the effects of a loss-of-coolant accident (LOCA), but also  
45 provide protection for other accidents and transients that involve a water inventory loss.  
46

1 During BWR operation in Mode 4 (Cold Shutdown ~~with-~~ *Reactor Mode Switch in Shutdown with*  
2 *all reactor vessel head closure bolts fully tensioned and* average reactor coolant temperature  
3  $\leq$  [200] °F), and Mode 5 (Refueling ~~with-~~ *One or more reactor vessel head closure bolts less*  
4 *than fully tensioned and Reactor Mode Switch in Shutdown or Refuel*~~one or more reactor vessel~~  
5 ~~head closure bolts less than fully tensioned~~), the pressures and temperatures that could cause a  
6 LOCA are not present. During certain phases of refueling (Mode 5) a large volume of water is  
7 available above the RPV (i.e., the RPV head is removed, the water level is  $\geq$  [23 feet] over the  
8 top of the RPV flange, and [for BWR/2, /3, /4, and /5 plants enter “the spent fuel storage pool  
9 gates are removed” or for BWR/6 plants enter “the upper containment pool is connected to  
10 the RPV” or upper containment cavity to dryer pool gate removed].

11  
12 The large volume of water available in and above the RPV (during much of the time when in  
13 Mode 5) provides time for operator detection and manual operator action to stop and mitigate an  
14 RPV draining event. However, typically at other times during a refueling outage, during cold  
15 shutdown (Mode 4) or refueling (Mode 5), there may be a potential for significant drainage paths  
16 from certain outage activities, human error, and other events when it is more likely to have some  
17 normally available equipment, instrumentation, and systems inoperable due to maintenance and  
18 outage activities. There may not be as much time for operator action as compared to times  
19 when there are large volumes of water above the RPV.

20  
21 In comparison to Modes 1, 2, and 3, with typical high temperatures and pressures (especially in  
22 Modes 1 and 2), Modes 4 and 5 generally do not have the high pressure and temperature  
23 considered necessary for a LOCA envisioned from a high energy pipe failure. Thus, while the  
24 potential sudden loss of large volumes of water from a LOCA are not expected, operators  
25 monitor for BWR RPV water level decrease from potential significant or even unexpected  
26 drainage paths. These potential drainage paths in Modes 4 and 5 generally would require less  
27 water replacement capability to maintain water above TAF.

28  
29 To address the drain down potential during Modes 4 and 5, the current TS contain specifications  
30 that are applicable during an OPDRV, or require suspension of OPDRVs if certain equipment is  
31 inoperable. The term OPDRV is not specifically defined in the TS and historically has been  
32 subject to inconsistent application by licensees. The changes discussed in this safety  
33 evaluation (SE) are intended to resolve any ambiguity by creating a new RPV WIC TS with  
34 attendant equipment operability requirements, required actions and surveillance requirements,  
35 and deleting references to OPDRVs throughout the TS.

## 36 37 2.3 CHANGES TO THE TS

38  
39 The proposed changes would (1) provide a definition of a new term, DRAIN TIME; (2) revise  
40 and rename TS 3.5.2 as “Reactor Pressure Vessel Water Inventory Control;” (3) provide a new  
41 TS 3.3.5.2, “Reactor Pressure Vessel Water Inventory Control Instrumentation;” and (4) delete  
42 existing references to “operations with the potential to drain the reactor pressure vessel”  
43 throughout the TS. The descriptions of the proposed changes are provided in this section.

44  
45 A summary statement of the bases or reasons for such specifications, other than those covering  
46 administrative controls, were also included in the application, but these bases shall not become  
47 part of the technical specifications.

### 48 49 2.3.1 Insertion of New Definition of DRAIN TIME

1  
2 The following definition of "DRAIN TIME" would be added to the TS Section 1.1, "Definitions":  
3  
4

5 The DRAIN TIME is the time it would take for the water inventory  
6 in and above the Reactor Pressure Vessel (RPV) to drain to the  
7 top of the active fuel (TAF) seated in the RPV assuming:  
8

- 9 a) The water inventory above the TAF is divided by the limiting  
10 drain rate;  
11  
12 b) The limiting drain rate is the larger of the drain rate through a  
13 single penetration flow path with the highest flow rate, or the  
14 sum of the drain rates through multiple penetration flow paths  
15 susceptible to a common mode failure (e.g., seismic event,  
16 loss of normal power, single human error), for all penetration  
17 flow paths below the TAF except:  
18  
19 1. Penetration flow paths connected to an intact closed  
20 system, or isolated by manual or automatic valves *that* are  
21 locked, sealed, or otherwise secured in the closed position,  
22 blank flanges, or other devices that prevent flow ~~or~~ of  
23 reactor coolant through the penetration flow paths;  
24  
25 2. Penetration flow paths capable of being isolated by valves  
26 that will close automatically without offsite power prior to  
27 the RPV water level being equal to the TAF when actuated  
28 by RPV water level isolation instrumentation; or  
29  
30 3. Penetration flow paths with isolation devices that can be  
31 closed prior to the RPV water level being equal to the TAF  
32 by a dedicated operator trained in the task, who is in  
33 continuous communication with the control room, is  
34 stationed at the controls, and is capable of closing the  
35 penetration flow path isolation device without offsite power.  
36  
37 c) The penetration flow paths required to be evaluated per  
38 paragraph b) are assumed to open instantaneously and are  
39 not subsequently isolated, and no water is assumed to be  
40 subsequently added to the RPV water inventory;  
41  
42 d) No additional draining events occur; and  
43  
44 e) Realistic cross-sectional areas and drain rates are used.

45  
46 A bounding DRAIN TIME may be used in lieu of a calculated  
47 value.  
48  
49

1 2.3.2 Changes to TS Section 3.5:

2  
3 2.3.2.1 Title of TS 3.5  
4

5 The title of Section 3.5 is being revised from “Emergency Core Cooling System (ECCS) and  
6 Reactor Core Isolation Cooling System (RCIC)” to “Emergency Core Cooling Systems (ECCS),  
7 RPV Water Inventory Control, and Reactor Core Isolation Cooling (RCIC) System.”  
8

9 2.3.2.2 Title of TS 3.5.2

10  
11 The title of TS 3.5.2 is being revised from “ECCS – Shutdown” to “Reactor Pressure Vessel  
12 (RPV) Water Inventory Control.”  
13

14 2.3.2.3 LCO 3.5.2

15  
16 TS limiting condition for operation (LCO) 3.5.2 currently states “Two low pressure ECCS  
17 injection/spray subsystems shall be OPERABLE.” [The LCO note currently states: “One LPCI  
18 subsystem may be considered OPERABLE during alignment and operation for decay heat  
19 removal if capable of being manually realigned and not otherwise inoperable.”]  
20

21 *For BWR/2, /3, /4 plants choose:*  
22 **[LCO 3.5.2 would be revised to state:**

23  
24  
25 **DRAIN TIME of RPV water inventory to the top of active fuel**  
26 **(TAF) shall be ≥ 36 hours.**

27  
28 **AND**

29  
30 **One low pressure ECCS injection/spray subsystem shall be**  
31 **OPERABLE.**

32  
33  
34 **[The note for LCO 3.5.2 would be revised to state:**

35  
36  
37 **A Low Pressure Coolant Injection (LPCI) subsystem may be**  
38 **considered OPERABLE during alignment and operation for**  
39 **decay heat removal if capable of being manually realigned**  
40 **and not otherwise inoperable.]**

41  
42  
43 *For BWR/5 and /6 plants choose:*  
44 **[The phrase “low pressure” in LCO 3.5.2 is omitted because the high pressure core spray**  
45 **system *may be is*-used to satisfy this requirement.]**  
46

1 2.3.2.4 Applicability of TS LCO 3.5.2

2  
3 *For BWR/2, /3, /4 and /5 plants choose: [LCO 3.5.2 is currently applicable in MODE 4 and in*  
4 *MODE 5, except with the spent fuel storage pool gates removed and water level  $\geq$  [23 ft] over*  
5 *the top of the reactor pressure vessel flange.]*

6  
7 *For BWR/6 plants choose: [LCO 3.5.2 is currently applicable in Mode 4 and Mode 5 except with*  
8 *the upper containment [cavity to dryer] pool [gate] removed and water level  $\geq$  [22 ft 8 inches]*  
9 *over the top of the reactor pressure vessel flange.]*

10  
11 The applicability would be revised to be Modes 4 and 5, with no exceptions.

12  
13 2.3.2.5 Actions Table of TS 3.5.2

14  
15 The existing Actions Table of TS 3.5.2 contains requirements to restore at least one train of  
16 ECCS injection/spray systems to operable status if the LCO is not met.

17  
18 The revised TS 3.5.2 Actions Table would provide increasingly stringent requirements on  
19 [secondary] containment], [secondary] containment] isolation valves, [the standby gas treatment  
20 system] and methods for water injection as the Drain Time decreases. If the Drain Time is one  
21 hour or less, immediate action must be taken to increase the Drain Time.

22  
23 2.3.2.6 TS 3.5.2 Surveillance Requirements

24  
25 TS 3.5.2 currently contains Surveillance Requirements (SRs) to verify the availability of a  
26 suction source, the availability of an appropriate flow path, and proper functioning of the ECCS  
27 injection/spray system pump(s).

28  
29 The revised SRs would verify the Drain Time is greater than or equal to 36 hours and verify the  
30 availability of a suction source, appropriate flow path and proper functioning of the required  
31 ECCS injection/spray system pump.

32  
33 The existing and proposed TS 3.5.2 Surveillances *Frequencies [are described below]]~~provide~~*  
34 *the option to perform the Surveillances at a fixed interval or are* in accordance with the  
35 Surveillance Frequency Control Program (SFCP), ~~for those plants that have adopted an SFCP].~~

36  
37 2.3.3 Changes to TS Section 3.3:

38  
39 ~~*NOTE: The STS contain two versions of certain specifications in Section 3.3, Instrumentation.*~~  
40 ~~*One is applicable for licensees that have not adopted a Setpoint Control Program (the "A"*~~  
41 ~~*version) and the other is applicable for licensees that have adopted a Setpoint Control Program*~~  
42 ~~*(the "B" version). In the "A" version of the STS, the Allowable Value column is retained in the*~~  
43 ~~*Instrumentation Table, and the Instrumentation Table contains footnotes that provide details*~~  
44 ~~*regarding SRs. In the "B" version of the STS, the Allowable Value has been relocated to the*~~  
45 ~~*Setpoint Control Program, and this column does not appear in the Instrumentation Table.*~~  
46 ~~*Additionally, in the "B" version, the footnotes that provide details regarding SRs are not*~~  
47 ~~*necessary. Choose the A or B version below to correspond with the plant-specific TS.*~~  
48

1 *[Reviewer's Note: Some BWRs do not have the capability to perform Channel Checks. If the*  
2 *existing TS do not include Channel Checks, TS 3.3.5.1 will not add Channel Checks.]*  
3

4 2.3.3.1 Changes to TS LCOs ~~[3.3.5.1A or 3.3.5.1B]~~, Emergency Core Cooling System  
5 (ECCS) Instrumentation-~~(Without or With Setpoint Control Program)~~  
6

7 The TS LCO ~~[3.3.5.1A or 3.3.5.1B]~~ states that "the ECCS instrumentation for each Function in  
8 Table 3.3.5.1-1, shall be OPERABLE" with the applicability as stated in the table.

9 Table 3.3.5.1-1 currently contains requirements for function operability during Modes 4 and 5  
10 when associated ECCS subsystem(s) are required to be operable per LCO 3.5.2, "ECCS –  
11 Shutdown." Throughout this table, the applicability in Modes 4 and 5 is being deleted because  
12 the instrumentation requirements during shutdown are being consolidated into the new TS  
13 3.3.5.2. Conforming changes are made to the Actions Table of TS LCO ~~[3.3.5.1A or 3.3.5.1B]~~.  
14

15 2.3.3.2 Insertion of new TS ~~[3.3.5.2A or 3.3.5.2B]~~, Reactor Pressure Vessel (RPV)  
16 Water Inventory Control Instrumentation-~~(Without or With Setpoint Control~~  
17 ~~Program)]~~  
18

19 A new TS 3.3.5.2 is proposed to provide alternative instrumentation requirements to support  
20 manual initiation of the ECCS injection/spray subsystem required in new TS 3.5.2 and automatic  
21 isolation of penetration flow paths that may be credited in the determination of drain time. The  
22 current TS contain instrumentation requirements related to OPDRVs in ~~four~~ *two* TS. These  
23 requirements are being consolidated into new TS 3.3.5.2.  
24

25 *[Reviewer's Note: An acceptable variation in the model application is to not renumber 3.3.5.2*  
26 *and to number the new TS 3.3.5.3.]* [The existing TS 3.3.5.2, "Reactor Core Isolation Cooling  
27 (RCIC) System Instrumentation," is being renumbered to 3.3.5.3 in order to maintain the TS  
28 numbering conventions.]  
29

30 2.3.3.2.1 New TS 3.3.5.2~~[A or B]~~ LCO and Applicability  
31

32 The proposed LCO 3.3.5.2 states:  
33

34 The RPV Water Inventory Control instrumentation for each  
35 Function in Table 3.3.5.2-1 shall be OPERABLE.  
36

37 The applicability states, "According to Table 3.3.5.2-1."  
38

39 The following sections describe the instrumentation functions contained in the new  
40 Table 3.3.5.2-1.  
41

42 2.3.3.2.2 New Table 3.3.5.2-1, RPV Water Inventory Control Instrumentation  
43

44 *For BWR/2, /3, or /4 choose 2.3.3.2.2.1 through 2.3.3.2.2.5:*

1  
2 2.3.3.2.2.1 Function 1.a, Core Spray System, Reactor Steam Dome Pressure - Low  
3 (Injection Permissive)  
4 Function 2.a, Low Pressure Coolant Injection (LPCI) System, Reactor Steam  
5 Dome Pressure - Low (Injection Permissive)  
6

7 These functions were moved from current TS 3.3.5.1, Function **[1.c]** and Function **[2.c]**. The  
8 following changes are made:  
9

- 10 • The applicability is changed. The existing TS 3.3.5.1 applicability for these functions in  
11 Modes 4 and 5 is modified by a note that limits the applicability to when the associated  
12 ECCS subsystem(s) are required to be operable per LCO 3.5.2, "ECCS - Shutdown." The  
13 revised applicability is Modes 4 and 5 without exception, to be consistent with the  
14 applicability of new LCO 3.5.2, "RPV Water Inventory Control."  
15
- 16 • The number of required channels per function is unchanged.  
17
- 18 • In the new table, a Channel Check and Channel Functional Test are required at the existing  
19 frequency. Calibration of the trip units, Channel Calibration, Logic System Functional Test,  
20 and ECCS Response Time tests are no longer required in Modes 4 and 5.  
21
- 22 • In new LCO 3.3.5.2A, the Allowable Value is revised to eliminate the low pressure limit and  
23 to retain the high pressure limit. The RPV pressure is well below the lower limit in Modes 4  
24 and 5, so the low pressure limit is not needed.  
25

26 2.3.3.2.2.2 Functions 1.b and 2.b, Core Spray and Low Pressure Coolant Injection (LPCI)  
27 Systems, Core Spray and Low Pressure Coolant Injection Pumps Discharge  
28 Flow - Low (Bypass)  
29

30 These functions were moved from current TS 3.3.5.1, Function **[1.d]** and Function **[2.g]**. The  
31 following changes are made:  
32

- 33 • The applicability is changed. The current TS 3.3.5.1 applicability for these functions in  
34 Modes 4 and 5 is modified by a note that limits the applicability to when the associated  
35 ECCS subsystem(s) are required to be operable per current LCO 3.5.2, "ECCS -  
36 Shutdown." The revised applicability is Modes 4 and 5 without exception, to be consistent  
37 with the applicability of new LCO 3.5.2, "RPV Water Inventory Control."  
38
- 39 • The number of required channels per function is changed from **[2]** or **[4]** or **[1 per pump]**, to  
40 **[1 per pump]** and is modified by a note stating "Associated with an ECCS subsystem  
41 required to be OPERABLE by LCO 3.5.2, 'Reactor Pressure Vessel Water Inventory  
42 Control.'"  
43
- 44 • In the new table, a Channel Check and Channel Functional Test are required at the existing  
45 frequency. A Channel Calibration and Logic System Functional Test are no longer required  
46 in Modes 4 and 5.  
47
- 48 • In new LCO 3.3.5.2A, the allowable value is unchanged.

1  
2 2.3.3.2.2.3 Function 1.c, Core Spray System, Manual Initiation, and  
3 Function 2.c, Low Pressure Coolant Injection (LPCI) System, Manual Initiation  
4

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

- 7
- 8 • The applicability is changed. The current TS 3.3.5.1 applicability for these functions in  
9 Modes 4 and 5 is modified by a note that limits the applicability to when the associated  
10 ECCS subsystem(s) are required to be operable per current LCO 3.5.2, "ECCS -  
11 Shutdown." The revised applicability is Modes 4 and 5 without exception, to be consistent  
12 with the applicability of new LCO 3.5.2, "RPV Water Inventory Control."  
13
  - 14 • The number of required channels per function is changed from [2, or 1 per subsystem,] to  
15 [1 per subsystem] and is modified by a note stating "Associated with an ECCS subsystem  
16 required to be OPERABLE by LCO 3.5.2, 'Reactor Pressure Vessel Water Inventory  
17 Control.'" New LCO 3.5.2 only requires a single ECCS subsystem and the change in  
18 required channels reflects that requirement.  
19
  - 20 • Both the existing TS 3.3.5.1 and the revised TS 3.3.5.2 require a Logic System Functional  
21 Test on this function at the same frequency.  
22
  - 23 • There is no allowable value for this function.  
24

25 2.3.3.2.2.4 Function 3.a, RHR System Isolation, Reactor Vessel Water Level - Low, Level 3  
26

27 This function was moved from current TS 3.3.6.1, Function [6.b]. The following changes are  
28 made:

- 29
- 30 • The function name is changed from "Shutdown Cooling System Isolation Reactor Vessel  
31 Water Level - Low, Level 3" to "Residual Heat Removal [RHR] System Isolation Reactor  
32 Vessel Water Level - Low, Level 3." The current title is a misnomer in the TSs as the  
33 Level 3 instruments isolate more than shutdown cooling isolation valves.  
34
  - 35 • The applicability is changed. The existing TS 3.3.6.1 applicability for this function in  
36 Modes 4 and 5 is being deleted. The revised applicability is "when automatic isolation of the  
37 associated penetration flow path is credited in calculating Drain Time."  
38
  - 39 • The number of required channels is changed from [2], with a column header that states  
40 "Required Channels per Trip System," to [2 in one trip system]. This retains the  
41 requirement that the two channels must be associated with the same trip system.  
42
  - 43 • In the new table, a Channel Check and Channel Functional Test are required at the existing  
44 frequency. A calibration of the trip unit, Channel Calibration, and Logic System Functional  
45 Test are no longer required in Modes 4 and 5.  
46
  - 47 • The allowable value is unchanged.  
48



1 2.3.3.2.2.5 Function 4.a, Reactor Water Cleanup (RWCU) System Isolation, Reactor Vessel  
2 Water Level - Low Low, Level 2  
3

4 This function exists in the current TS 3.3.6.1, Function **[5.e]**. The function is inserted into new  
5 STS 3.3.5.2 as follows:  
6

- 7 • The current TS 3.3.6.1 applicability for this function is Modes 1, 2, and 3. The applicability in  
8 STS 3.3.5.2 is "when automatic isolation of the associated penetration flow path is credited  
9 in calculating Drain Time." In other words, if the drain time calculation assumes the RWCU  
10 system will be automatically isolated, this function must be operable to perform that function.  
11 This is consistent with the definition of drain time and the TS 3.5.2 requirements.  
12
- 13 • The number of required channels is changed from **[2]**, with a column header that states  
14 "Required Channels per Trip System," to **[2 in one trip system]**. This retains the  
15 requirement that the two channels must be associated with the same trip system. Only one  
16 trip system is required to ensure that automatic isolation of one of the two isolation valves  
17 will occur on low reactor vessel water level.  
18
- 19 • A Channel Check and Channel Functional Test are required at the existing frequency. A  
20 calibration of the trip unit, Channel Calibration, Logic System Functional Test, and Isolation  
21 System Response Time tests are no longer required in Modes 4 and 5.  
22
- 23 • The allowable value is unchanged.  
24

25 *For BWR/5 and /6 choose 2.3.3.2.2.1 through 2.3.3.2.2.9:*  
26

27 2.3.3.2.2.1 Function 1.a, Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core  
28 Spray (LPCS) Subsystems, Reactor Steam Dome Pressure - Low (Injection  
29 Permissive), and  
30 Function 2.a, LPCI B and LPCI C Subsystems, Reactor Steam Dome Pressure -  
31 Low (Injection Permissive)  
32

33 These functions were moved from current TS 3.3.5.1, Function **[1.d]** and Function **[2.d]**. The  
34 following changes are made:  
35

- 36 • The applicability is changed. The current TS 3.3.5.1 applicability for these functions in  
37 Modes 4 and 5 is modified by a note that limits the applicability to when the associated  
38 ECCS subsystem(s) are required to be operable per current LCO 3.5.2, "ECCS -  
39 Shutdown." The revised applicability is Modes 4 and 5 without exception, to be consistent  
40 with the applicability of new LCO 3.5.2, "RPV Water Inventory Control."  
41
- 42 • In the new table, the number of required channels per function remains **[3]** and is modified  
43 by a note stating "Associated with an ECCS subsystem required to be OPERABLE by  
44 LCO 3.5.2, 'Reactor Pressure Vessel Water Inventory Control.'" New TS 3.5.2 only requires  
45 a single ECCS subsystem to be operable and the change reflects that requirement.  
46

- 1 • A Channel Check and Channel Functional Test are required at the existing frequency.  
2 Calibration of the trip units, Channel Calibration, Logic System Functional Test, and ECCS  
3 Response Time tests are no longer required in Modes 4 and 5.  
4

- 5 • In new LCO 3.3.5.2A, the allowable value is revised to eliminate the low pressure limit and  
6 to retain the high pressure limit.  
7

8 2.3.3.2.2.2 Functions 1.b and 1.c, Low Pressure Coolant Injection-A (LPCI) and Low  
9 Pressure Core Spray (LPCS) Subsystems, LPCS Pump Discharge Flow - Low  
10 (Bypass) and LPCI Pump A Discharge Flow – Low (Bypass), and  
11 Function 2.b, LPCI B and LPCI C Subsystems, LPCI Pump B and LPCI Pump C  
12 Discharge Flow – Low (Bypass)  
13

14 These functions were moved from current TS 3.3.5.1, Function [1.e], [1.f], and [2.e]. The  
15 following changes are made:  
16

- 17 • The applicability is changed. The current TS 3.3.5.1 applicability for these functions is  
18 Modes 4 and 5 when the associated ECCS subsystem(s) are required to be operable per  
19 LCO 3.5.2, "ECCS - Shutdown." The revised Applicability is Modes 4 and 5 without  
20 exception, to be consistent with the Applicability of new LCO 3.5.2, "RPV Water Inventory  
21 Control."  
22
- 23 • The number of required channels per function is changed from [1] to [1 per pump] and is  
24 modified by a note stating "Associated with an ECCS subsystem required to be OPERABLE  
25 by LCO 3.5.2, 'Reactor Pressure Vessel Water Inventory Control'." New TS 3.5.2 only  
26 requires a single ECCS subsystem and the change in required channels reflects that  
27 requirement.  
28
- 29 • A Channel Check and Channel Functional Test are required at the existing frequency.  
30 Calibrating the trip unit, Channel Calibration and Logic System Functional Test are no longer  
31 required in Modes 4 and 5.  
32
- 33 • In new LCO 3.3.5.2A, the allowable value is unchanged.  
34

35 2.3.3.2.2.3 Function 1.d, Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core  
36 Spray (LPCS) Subsystems, Manual Initiation, and  
37 Function 2.c, LPCI B and LPCI C Subsystems, Manual Initiation  
38

39 These functions were moved from current TS 3.3.5.1, Function [1.g] and Function [2.f]. The  
40 following changes are made:  
41

- 42 • The applicability is changed. The current TS 3.3.5.1 Applicability for these Functions in  
43 Modes 4 and 5 is modified by a note that limits the applicability to when the associated  
44 ECCS subsystem(s) are required to be operable per current LCO 3.5.2, "ECCS -  
45 Shutdown." The revised applicability is Modes 4 and 5 without exception, to be consistent  
46 with the applicability of new LCO 3.5.2, "RPV Water Inventory Control."  
47

- 1 • The number of required channels per function is changed from **[1]** to **[1 per subsystem]**  
2 and is modified by a note stating "Associated with an ECCS subsystem required to be  
3 OPERABLE by LCO 3.5.2, 'Reactor Pressure Vessel Water Inventory Control'." New  
4 TS 3.5.2 only requires a single ECCS subsystem and the change in required channels  
5 reflects that requirement.  
6
- 7 • Both the existing TS 3.3.5.1 and the revised TS 3.3.5.2 require a Logic System Functional  
8 Test on this function at the same frequency.  
9
- 10 • There is no allowable value for this function.

11  
12 2.3.3.2.2.4 Function 3.a, High Pressure Core Spray (HPCS) System, Reactor Vessel Water  
13 Level - High, Level 8  
14

15 This function was moved from current TS 3.3.5.1, Function **[3.c]**. The following changes are  
16 made:  
17

- 18 • The applicability is changed. The current TS 3.3.5.1 applicability for this function is Modes 4  
19 and 5 when the associated ECCS subsystem(s) are required to be operable per existing  
20 LCO 3.5.2, "ECCS - Shutdown." The revised applicability is Modes 4 and 5 without  
21 exception, to be consistent with the applicability of new LCO 3.5.2, "RPV Water Inventory  
22 Control."  
23
- 24 • The number of required channels per function is changed from **[2]** to **[1]** and is modified by  
25 a note stating "Associated with an ECCS subsystem required to be OPERABLE by LCO  
26 3.5.2, 'Reactor Pressure Vessel Water Inventory Control'." New TS 3.5.2 only requires a  
27 single ECCS subsystem and the change in required channels reflects that requirement.  
28
- 29 • A Channel Check and Channel Functional Test are required at the existing frequency.  
30 Calibration of the trip units, Channel Calibration, and Logic System Functional Test tests are  
31 no longer required in Modes 4 and 5.  
32
- 33 • The allowable value in new LCO 3.3.5.2A is unchanged.

34  
35 2.3.3.2.2.5 Function 3.b, High Pressure Core Spray (HPCS) System, Condensate Storage  
36 Tank Level – Low  
37

38 This function was moved from current TS 3.3.5.1, Function **[3.d]**. The following changes are  
39 made:  
40

- 41 • The applicability is changed. The current TS 3.3.5.1 applicability for this function is Modes 4  
42 and 5 when the associated ECCS subsystem(s) are required to be operable per current  
43 LCO 3.5.2, "ECCS - Shutdown." The revised applicability is Modes 4 and 5 when HPCS is  
44 operable for compliance with new LCO 3.5.2 and aligned to the Condensate Storage Tank.  
45 If HPCS is not being credited for meeting the new LCO 3.5.2 requirement for an operable  
46 ECCS subsystem, or if HPCS is being credited but is aligned to the suppression pool, this  
47 function is unneeded.  
48

- 1 • The number of required channels per function is changed from **[2]** to **[1]**. New TS 3.5.2 only  
2 requires a single ECCS subsystem to be operable, and the change in required channels  
3 reflects that requirement.  
4
- 5 • A Channel Check and Channel Functional Test are required at the existing frequency.  
6 Calibration of the trip units, Channel Calibration, and Logic System Functional Test are no  
7 longer required in Modes 4 and 5.  
8
- 9 • The allowable value in new LCO 3.3.5.2A is unchanged.

10  
11 2.3.3.2.2.6 Functions 3.c and 3.d, High Pressure Core Spray (HPCS) System, HPCS Pump  
12 Discharge Pressure - High (Bypass) and HPCS System Flow Rate - Low  
13 (Bypass)  
14

15 These functions were moved from current TS 3.3.5.1, Function **[3.f]** and **[3.g]**. The following  
16 changes are made:  
17

- 18 • The applicability is changed. The current TS 3.3.5.1 applicability for this function is Modes 4  
19 and 5 when the associated ECCS subsystem(s) are required to be operable per current  
20 LCO 3.5.2, "ECCS - Shutdown." The revised applicability is Modes 4 and 5 without  
21 exception, to be consistent with the applicability of new LCO 3.5.2, "RPV Water Inventory  
22 Control."  
23
- 24 • The number of required channels per function is changed from **[1]** to **[1 per pump]** and is  
25 modified by a note stating "Associated with an ECCS subsystem required to be OPERABLE  
26 by LCO 3.5.2, 'Reactor Pressure Vessel Water Inventory Control'." New TS 3.5.2 only  
27 requires a single ECCS subsystem and the change in required channels reflects that  
28 requirement.  
29
- 30 • A Channel Check and Channel Functional Test are required at the existing frequency.  
31 Calibration of the trip units, Channel Calibration, and Logic System Functional Test are no  
32 longer required in Modes 4 and 5.  
33
- 34 • The allowable value is unchanged.

35  
36 2.3.3.2.2.7 Function 3.e, High Pressure Core Spray (HPCS) System, Manual Initiation  
37

38 This function is moved from current TS 3.3.5.1, Function **[3.h]**. The following changes are  
39 made:  
40

- 41 • The applicability is changed. The current TS 3.3.5.1 applicability for these functions in  
42 Modes 4 and 5 is modified by a note that limits the applicability to when the associated  
43 ECCS subsystem(s) are required to be operable per existing LCO 3.5.2, "ECCS -  
44 Shutdown." The revised applicability is Modes 4 and 5 without exception, to be consistent  
45 with the applicability of new LCO 3.5.2, "RPV Water Inventory Control."  
46
- 47 • The number of required channels per function is changed from **[1]** to **[1 per subsystem]**  
48 and is modified by a note stating "Associated with an ECCS subsystem required to be

1 OPERABLE by LCO 3.5.2, 'Reactor Pressure Vessel Water Inventory Control.'" New  
2 TS 3.5.2 only requires a single ECCS subsystem and the change in required channels  
3 reflects that requirement.  
4

- 5 • Both the existing TS 3.3.5.1 and the revised TS 3.3.5.2 require a Logic System Functional  
6 Test on this function at the same frequency.  
7
- 8 • There is no allowable value for this function.  
9

10 2.3.3.2.2.8 Function 4.a, RHR System Isolation Reactor Vessel Water Level - Low, Level 3

11  
12 This function was moved from current TS 3.3.6.1, Function **[5.c]**. The following changes are  
13 made:  
14

- 15 • The function name is changed from "Shutdown Cooling System Isolation Reactor Vessel  
16 Water Level - Low, Level 3" to "Residual Heat Removal System Isolation Reactor Vessel  
17 Water Level - Low, Level 3."  
18
- 19 • The applicability is changed. The current TS 3.3.6.1 applicability for this function is Modes 4  
20 and 5. The revised applicability is "when automatic isolation of the associated penetration  
21 flow path is credited in calculating drain time.  
22
- 23 • The number of required channels is changed from **[2]**, with a column header that states  
24 "Required Channels per Trip System," to **[2 in one trip system]**. This retains the  
25 requirement that the two channels must be associated with the same trip system. Only one  
26 trip system is required to ensure automatic isolation of one of the two isolation valves will  
27 occur on low reactor vessel water level.  
28
- 29 • A Channel Check and Channel Functional Test are required at the existing frequency. A  
30 calibration of the trip unit, Channel Calibration, Logic System Functional Test, and Isolation  
31 System Response Time tests are no longer required in Modes 4 and 5.  
32
- 33 • The existing allowable value is retained in new TS 3.3.5.2.  
34

35 ~~2.32~~.3.2.2.9 Function 5.a, Reactor Water Cleanup (RWCU) System Isolation, Reactor Vessel  
36 Water Level - Low Low, Level 2  
37

38 This function exists in the current STS 3.3.6.1 as Function **[4.k]**. The function is inserted into  
39 new STS 3.3.5.2 as follows:  
40

- 41 • The current STS 3.3.6.1 applicability for this function is Modes 1, 2, and 3. The applicability  
42 in STS 3.3.5.2 is "when automatic isolation of the associated penetration flow path is  
43 credited in calculating Drain Time." In other words, if the drain time calculation assumes the  
44 RWCU system would be automatically isolated, this function must be operable to perform  
45 that function. This is consistent with the definition of drain time and the new TS 3.5.2  
46 requirements.  
47

- 1 • The number of required channels is changed from [2], with a column header that states  
2 "Required Channels per Trip System," to [2 in one trip system]. This retains the  
3 requirement that the two channels must be associated with the same trip system. Only one  
4 trip system is required to ensure that automatic isolation of one of the two isolation valves  
5 will occur on low reactor vessel water level.  
6
- 7 • A Channel Check and Channel Functional Test are required at the existing frequency. A  
8 calibration of the trip unit, Channel Calibration, Logic System Functional Test, and Isolation  
9 System Response Time tests are no longer required in Modes 4 and 5.  
10
- 11 • The existing allowable value is retained in LCO 3.3.5.2A.]

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

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

22 *Changes to these instrumentation functions is justified by the discussion in Sections 3.3 and*  
23 *3.4.1 of the TSTF-542 justification and are described in the licensee's application.*

#### 24 2.3.3.2.3 New TS 3.3.5.2[A or B] Actions Table

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

28 Condition B is entered when the RHR system isolation and RWCU system isolation functions  
29 operability requirements are not met when automatic isolation of the associated penetration flow  
30 path is credited in calculating drain time. If the instrumentation is inoperable, Required  
31 Action B.1 directs an immediate declaration that the associated penetration flow path(s) are  
32 incapable of automatic isolation. Required Action B.2 requires an immediate calculation of drain  
33 time.

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

37 *For BWR/2, /3, or /4 plants choose:*

38 [Condition D is entered when the operability requirements for the Core Spray Pump Discharge  
39 Flow – Low Bypass, Low Pressure Coolant Injection Pump Discharge Flow – Low Bypass, or  
40 manual initiation of these functions operability requirements are not met. The Required Action  
41 is to restore the channel to operable status within 24 hours.

1  
2 Condition E is entered if the required Action and associated Completion Time of Condition C or  
3 D, are not met. Required Action E.1 requires the associated low pressure ECCS injection/spray  
4 subsystem to be declared inoperable immediately.]  
5

6 *For BWR/5 or /6 plants choose:*

7 [Condition D is entered when the Condensate Storage Tank Level –Low operability  
8 requirements are not met. Required Action D requires declaring the HPCS inoperable and  
9 aligning the HPCS pump suction to the suppression pool within one hour.

10  
11 Condition E is entered if the Reactor Vessel Water Level – High Level 8 instrumentation  
12 operability requirements are not met. Action E.1 requires declaring the HCPS system  
13 inoperable in 1 hour and restoring the channel to Operable status within 24 hours.  
14

15 Condition F is entered if the LPCS Pump Discharge Flow Low (Bypass), LPCI Pump A  
16 Discharge Flow Low (Bypass), LPCI Pump B and LPCI Pump C Discharge Flow – Low  
17 (Bypass), HPCS Pump Discharge Pressure – High (Bypass) HPCS System Flow Rate – Low –  
18 (Bypass) or Manual Initiation associated with these Functions operability requirements are not  
19 met. The required action is to restore the channel to OPERABLE status within 24 hours.  
20

21 Condition G is entered if the required action and associated completion time of Condition C, D,  
22 E, or F is not met. Required Action G.1 requires the associated ECCS injection/spray  
23 subsystem to be declared inoperable immediately.]  
24

25 2.3.3.2.4 New Surveillance Requirements 3.3.5.2.1, 3.3.5.2.2 and 3.3.5.3  
26

27 New Table 3.3.5.2-1 specifies which SRs apply for each ECCS function.  
28

29 SR 3.3.5.2.1 requires the performance of a Channel Check at a Frequency of **[12 hours or in**  
30 **accordance with the Surveillance Frequency Control Program.]**  
31

32 SR 3.3.5.2.2 requires the performance of a Channel Functional Test at a Frequency of **[[92]**  
33 **days or in accordance with the Surveillance Frequency Control Program.]**  
34

35 SR 3.3.5.2.3 requires the performance of a Logic System Functional Test at a Frequency of  
36 **[[18] months or in accordance with the Surveillance Frequency Control Program.]**  
37

38 2.3.3.3 Changes to Containment, Containment Isolation Valve and Standby Gas  
39 Treatment System Requirements  
40

41 The following TS are applicable during OPDRVs and/or contain Actions to suspend OPDRVs  
42 when the LCO is not met:  
43

44 *For BWR/2, /3, /4 or /54 plants choose:*

45 [3.6.1.3, Primary Containment Isolation Valves (PCIVs)

46 3.6.4.1, **[Secondary]** Containment

47 3.6.4.2, Secondary Containment Isolation Valves (SCIVs)

48 3.6.4.3, Standby Gas Treatment System]  
49

1 *For BWR/6 plants choose:*

2 [3.6.1.3, Primary Containment Isolation Valves (PCIVs)

3 3.6.4.1, **[Secondary Containment]**

4 3.6.4.2, **[Secondary Containment]** Isolation Valves (SCIVs)

5 **[3.6.4.3, Standby Gas Treatment System]**

6

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

9

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

14

15 2.3.3.4 Changes to Control Room Habitability and Temperature Control Requirements

16

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

19

20 *For BWR/4 plants choose:*

21 [3.7.4, **[Main Control Room Environmental Control (MCREC)]** System

22 3.7.5, **[Control Room Air Conditioning (AC)]** System]

23

24 *For BWR/6 plants choose:*

25 [3.7.3, **[Control Room Fresh Air (CRFA)]** System

26 3.7.4, **[Control Room AC]** System]

27

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

30

31 2.3.3.5 Changes to Electrical Sources Requirements

32

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

36

37 3.8.2, AC Sources - Shutdown

38 3.8.5, DC Sources - Shutdown

39 3.8.8, Inverters - Shutdown

40 3.8.10, Distribution Systems - Shutdown

41

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

45

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

49



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

3  
4 TS 3.8.10 currently requires, in part, with one or more required AC, DC, **[or AC vital bus]**  
5 electrical power distribution subsystems inoperable, to initiate action to suspend operations with  
6 a potential for draining the reactor vessel immediately.

7  
8 These required actions are being deleted.

9  
10 *An acceptable deviation is the inclusion of plant-specific systems that provide the electrical*  
11 *power functions in the TS. Changes to the TS controls on these systems is justified by the*  
12 *discussion in Section 3.4.4 of the TSTF-542 justification.*

13  
14 *Note: Insert description of any licensee specific TS changes. An acceptable variation from*  
15 *TSTF-542 is the elimination of any plant-specific TS requirements related to OPDRVs, the*  
16 *related concepts such as "RHR integrity maintained," and Required Actions to "suspend*  
17 *OPDRVs" that do not appear in the NUREG-1433 and NUREG 1434. Changes to these TS*  
18 *controls are justified by the discussion in the TSTF-542 justification.*

#### 19 20 2.4 APPLICABLE REGULATORY REQUIREMENTS

21  
22 Pursuant to 10 CFR 50.90, whenever a holder of an operating license desires to amend the  
23 license, application for an amendment must be filed with the Commission fully describing the  
24 changes desired, and following as far as applicable, the form prescribed for original  
25 applications. The technical information to be included in an application for an operating license  
26 is governed in particular by 10 CFR 50.34(b).

27  
28 10 CFR 50.36(a)(1) requires each applicant for a license authorizing operation of a utilization  
29 facility to include in the application proposed technical specifications in accordance with the  
30 requirements of 10 CFR 50.36. The regulation at 10 CFR Section 50.36(a)(1) requires an  
31 applicant to submit, as part of the application, a "summary statement of the bases or reasons for  
32 such specifications, other than those covering administrative controls." However, per 10 CFR  
33 50.36(a)(1), these technical specification bases "shall not become part of the technical  
34 specifications."

35  
36 As described in 10 CFR 50.92(a), in determining whether an amendment to a license will be  
37 issued to the applicant, the Commission will be guided by the considerations which govern the  
38 issuance of initial licenses applicable and appropriate. The general considerations that guide  
39 the Commission include, as stated in 10 CFR 50.40(a), how the technical specifications provide  
40 reasonable assurance the health and safety of the public will not be endangered. Also, to issue  
41 an operating license, of which technical specifications are a part, the Commission must make  
42 the findings of 10 CFR 50.57, including finding the 10 CFR 50.57(a)(3)(i) finding that there is  
43 reasonable assurance that the activities authorized by the operating license can be conducted  
44 without endangering the health and safety of the public.

45  
46 As required by 10 CFR 50.36(b), the TS "will be derived from the analyses and evaluation  
47 included in the safety analysis report, and amendments thereto, submitted pursuant to 10 CFR  
48 50.34 ["Contents of applications; technical information"]. The Commission may include such  
49 additional technical specifications as the Commission finds appropriate."

1  
2 The categories of items required to be in the TSs are provided in 10 CFR 50.36(c). As required  
3 by 10 CFR 50.36(c)(2)(i), the TSs will include LCOs, which are the lowest functional capability  
4 or performance levels of equipment required for safe operation of the facility. Per 10 CFR  
5 50.36(c)(2)(i), when an LCO of a nuclear reactor is not met, the licensee shall shut down the  
6 reactor or follow any remedial action permitted by the TSs until the condition can be met.  
7

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

10  
11 *Criterion 1.* Installed instrumentation that is used to detect, and  
12 indicate in the control room, a significant abnormal degradation of  
13 the reactor coolant pressure boundary.  
14

15 *Criterion 2.* A process variable, design feature, or operating  
16 restriction that is an initial condition of a design basis accident or  
17 transient analysis that either assumes the failure of or presents a  
18 challenge to fission product barrier integrity.  
19

20 *Criterion 3.* A structure, system, or component that is part of the  
21 primary success path and which functions or actuates to mitigate a  
22 design basis accident or transient that either assumes the failure of  
23 or presents a challenge to the integrity of a fission product barrier.  
24

25 *Criterion 4.* A structure, system, or component which operating  
26 experience or probabilistic safety assessment has shown to be  
27 significant to public health and safety.  
28

29 The regulation at 10 CFR 50.36(c)(3) requires TSs to include items in the category of SRs,  
30 which are requirements relating to test, calibration, or inspection to assure that the necessary  
31 quality of systems and components is maintained, that facility operation will be within safety  
32 limits, and that the LCOs will be met. Also, the regulation at 10 CFR 50.36(a)(1) states that a  
33 summary statement of the bases or reasons for such specifications, other than those covering  
34 administrative controls, shall also be included in the application, but shall not become part of the  
35 TSs.  
36

37 The NRC staff's guidance for review of TSs is in Chapter 16, *Technical Specifications*, of  
38 NUREG-0800, Revision 3, "Standard Review Plan for the Review of Safety Analysis Reports for  
39 Nuclear Power Plants" (SRP), dated March 2010, (ADAMS Accession No. ML100351425). As  
40 described therein, as part of the regulatory standardization effort, the NRC staff has prepared  
41 STS for each of the light-water reactor nuclear designs. *Choose applicable NUREG: [NUREG-*  
42 **1433, Revision 4, contains the STS for BWR/4 plants, and is also applicable to BWR/2,**  
43 **BWR/3, and in some cases, BWR/5 plants] or [NUREG 1434, Revision 4, contains the STS**  
44 **for BWR/6 plants, and is also applicable in some cases to BWR/5 plants]].  
45**

### 46 **3.0 TECHNICAL EVALUATION**

#### 47 48 **3.1 DRAIN TIME DEFINITION**

49

1 The proposed drain time is the time it would take the RPV water inventory to drain from the  
2 current level to the TAF assuming the most limiting of the RPV penetrations flow paths with the  
3 largest flow rate, or a combination of penetration flow paths that could open due to a common  
4 mode failure, were to open.

5  
6 The NRC staff reviewed the proposed drain time definition. For the purpose of NRC staff  
7 considerations, the term “break” describes a pathway for water to drain from the RPV that has  
8 not been prescribed in the proposed “DRAIN TIME” definition. All RPV penetrations below the  
9 TAF are included in the determination of drain time as potential pathways. The drain time is  
10 calculated by taking the water inventory above the break and dividing by the limiting drain rate  
11 until the TAF is reached. The limiting drain rate is a variable parameter depending on the break  
12 size and the reduction of elevation head above break location during the drain down event. The  
13 discharge point will depend on the lowest potential drain point for each RPV penetration flow  
14 path on a plant-specific basis. This calculation provides a conservative approach to determining  
15 the drain time of the RPV.

### 16 17 3.2 WATER SOURCES

18  
19 *For BWR/2, /3 /4, or /5 plants choose:*

20 [The proposed LCO 3.5.2 states that, one low pressure Emergency Core Cooling System  
21 (ECCS) injection/spray subsystem shall be OPERABLE.]

22  
23 *For BWR/6 plants choose:*

24 [The proposed LCO 3.5.2 states that, one ECCS injection/spray subsystem shall be  
25 OPERABLE.]

26  
27 The NRC staff reviewed the water sources that would be applicable to the proposed TS 3.5.2.  
28 The ECCS pumps are high-capacity pumps, with flow rates of thousands of gallons per minute  
29 (gpm). Most RPV penetration flow paths would have a drain rate on the order of tens or  
30 hundreds of gpm. The automatic initiation of an ECCS pump would provide the necessary  
31 water source to counter these expected drain rates. The LPCI subsystem is to be considered  
32 operable during alignment and operation for decay heat removal if capable of being manually  
33 realigned and not otherwise inoperable. Decay heat removal in MODEs 4 and 5 is not affected  
34 by the proposed change as these requirements on the number of RHR shutdown cooling  
35 subsystems that must be operable and in operation to ensure adequate decay heat removal  
36 from the core are unchanged. ~~For BWR/4 plants choose: [These requirements can be found in~~  
37 ~~TS [3.4.9], “Residual Heat Removal (RHR) Shutdown Cooling System – Cold Shutdown,”~~  
38 ~~TS [3.9.8], “Residual Heat Removal (RHR) – High Water Level, “ and TS [3.9.10], “Residual~~  
39 ~~Heat Removal (RHR) – Low Water Level.”]~~ ~~For the BWR/6 plants choose: [These~~  
40 ~~requirements can be found in TS 3.4.10, “Residual Heat Removal (RHR) Shutdown Cooling~~  
41 ~~System—Cold Shutdown,” TS 3.9.8, “Residual Heat Removal (RHR)—High Water Level, and~~  
42 ~~TS 3.9.10, “Residual Heat Removal (RHR)—Low Water Level.”]~~ Based on these  
43 considerations, the NRC staff finds the water sources provide assurances that the lowest  
44 functional capability required for safe operation is maintained and supports the safety limit.  
45

1 3.3 TS 3.5.2 – REACTOR PRESSURE VESSEL (RPV) WATER INVENTORY CONTROL

2  
3 The proposed TS 3.5.2, "Reactor Pressure Vessel (RPV) Water Inventory Control," LCO  
4 contains two parts. The first part states that drain time of RPV water inventory to the TAF shall  
5 be  $\geq 36$  hours. *For BWR/2, /3, of /4 choose:* **[The second part states, one low pressure**  
6 **ECCS injection/spray subsystem shall be OPERABLE.]** *For BWR/5 or /6 plants choose:*  
7 **[The second part states, one ECCS injection/spray subsystem shall be OPERABLE.]** The  
8 proposed applicability for TS 3.5.2 is MODEs 4 and 5.  
9

10 The NRC staff reviewed the proposed TS 3.5.2, focusing on ensuring the fuel remains covered  
11 with water and the changes made compared to the current TS. The proposed TS 3.5.2 contains  
12 Conditions A through E based on either required ECCS injection/spray subsystem operability or  
13 drain time.  
14

15 The current TS LCO states that two ECCS injection/spray subsystems shall be operable,  
16 whereas the proposed LCO 3.5.2 states that only one ECCS injection/spray subsystem shall be  
17 operable. This change is reflected in Condition A. The change from two ECCS injection/spray  
18 subsystem to one ECCS injection/spray subsystem is because this redundancy is not required.  
19 With one ECCS injection/spray subsystem and non-safety related injection sources, defense-in-  
20 depth will be maintained. The defense-in-depth measure is consistent with other events  
21 considered during shutdown with no additional single failure assumed. The drain time controls,  
22 in addition to the required ECCS injection/spray subsystem, provide reasonable assurance that  
23 an unexpected draining event can be prevented or mitigated before the RPV water level would  
24 be lowered to the TAF.  
25

26 *The proposed Mode 4 and 5 applicability of TS 3.5.2 is appropriate given the unaffected TS*  
27 *requirements on ECCS and RPV water level in Modes 1, 2, and 3.*  
28

29 The proposed Condition A states that if the required ECCS injection/spray subsystem is  
30 inoperable, it is to be restored to operable status within 4 hours. Proposed Condition B states  
31 that if Condition A is not met, a method of water injection capable of operating without offsite  
32 electrical power should be established immediately. The proposed Condition B provides  
33 adequate assurance of an available water source should Condition A not be met within the  
34 4-hour completion time.  
35

36 The proposed Condition C states that for a drain time  $< 36$  hours and  $\geq 8$  hours, to (1) verify  
37 **[secondary containment]** boundary is capable of being established in less than 4 hours, and  
38 (2) verify each **[secondary containment]** penetration flow path is capable of being isolated in  
39 less than 4 hours, and *[(3) verify one standby gas treatment subsystem is capable of being*  
40 *placed in operation in less than 4 hours].* The proposed Condition C provides adequate  
41 protection should the DRAIN TIME be  $< 36$  hours and  $\geq 8$  hours because of the ability to  
42 establish *[secondary containment]*, isolate additional flow paths, *[and have the standby gas*  
43 *treatment subsystem operable].*  
44

45 The proposed Condition D states that when drain time  $< 8$  hours to (1) immediately initiate  
46 action to establish an additional method of water injection with water sources capable of  
47 maintaining RPV water level  $> TAF$  for  $\geq 36$  hours, (2) immediately initiate action to establish  
48 **[secondary] containment** boundary, (3) immediately initiate action to isolate each  
49 **[secondary] containment** penetration flow path or verify it can be manually isolated from the

1 control room, and (4) [immediately initiate action to verify one standby gas treatment subsystem  
2 is capable of being placed in operation]. Additionally, there is a note stating that required ECCS  
3 injection/spray subsystem or additional method of water injection shall be capable of operating  
4 without offsite electrical power, which is similar to proposed Condition B. The current TS for  
5 Condition D are similar to the proposed for when Required Action C.2 is not met. The proposed  
6 Condition D provides adequate protection should the DRAIN TIME be < 8 hours because of the  
7 ability to establish [secondary containment], isolate additional flow paths, and [have the standby  
8 gas treatment subsystem operable.]  
9

10 The proposed Condition E states that when the required action and associated completion time  
11 of Condition C or D is not met, or the drain time is < 1 hour, then initiate action to restore drain  
12 time to ≥ 36 hours immediately. The proposed Condition E is new, as it is not present in the  
13 current TS. The proposed Condition E is acceptable as it provides the necessary step to  
14 restore the drain time to ≥ 36 hours should the other conditions not be met, or if the drain time is  
15 < 1 hour.  
16

17 Based on the NRC staff's review, the proposed changes to TS 3.5.2 are acceptable based on  
18 the actions taken to mitigate the water level reaching the TAF with the water sources available  
19 and maintaining drain time ≥ 36 hours. The LCO correctly specifies the lowest functional  
20 capability or performance levels of equipment required for safe operation of the facility. There is  
21 reasonable assurance that the required actions to be taken when the LCO is not met can be  
22 conducted without endangering the health and safety of the public  
23

24 ~~The existing TS 3.3.5.2, "RCIC System Instrumentation," is renumbered as TS 3.3.5.3. This~~  
25 ~~increases consistency within the TS as the Reactor Core Isolation Cooling (RCIC) System is~~  
26 ~~discussed in the section on TS 3.5.3. NOTE: Some licensees may choose to assign a different~~  
27 ~~number to this new TS. This is an acceptable alternative.~~  
28

#### 29 3.4 TS 3.3.5.2, REACTOR PRESSURE VESSEL WATER INVENTORY CONTROL 30 INSTRUMENTATION 31

32 ~~The existing TS 3.3.5.2, "RCIC System Instrumentation," is renumbered as TS 3.3.5.3. This~~  
33 ~~increases consistency within the TS as the Reactor Core Isolation Cooling (RCIC) System is~~  
34 ~~discussed in the section on TS 3.5.3. NOTE: Some licensees may choose to assign a different~~  
35 ~~number to this new TS. This is an acceptable alternative.~~  
36

37 The purpose of the RPV Water Inventory Control Instrumentation is to support the requirements  
38 of new TS LCO 3.5.2, and the definition of drain time. There are instrumentation and controls  
39 that are required for manual initiation or required as a permissive or operational controls on the  
40 equipment of the systems that provide water injection capability, certain start commands, and  
41 isolation functions. These instruments are required to be operable if the systems that provide  
42 water injection and isolation functions are to be considered operable as described in the safety  
43 evaluation of new TS 3.5.2. In some cases the reactor operators have alternate, often more  
44 complex means, of starting and injecting water than the preferred simple push button start.  
45

46 *For BWR/2, /3, or /4 plants choose:*

47 **[Specifically, the RPV Water Inventory Control Instrumentation supports operation of the**  
48 **Core Spray and LPCI including manual initiation when needed as well as the system**

1 isolation of the RHR system and the RWCU system. The equipment involved with each  
2 of these systems is described in the evaluation of TS 3.5.2 and the Bases for LCO 3.5.2.]

3  
4 *For BWR/5 or /6 plants choose:*

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

10  
11 3.4.1 Proposed TS 3.3.5.2 LCO and Applicability

12  
13 The proposed LCO 3.3.5.2 states, "The RPV Water Inventory Control instrumentation for each  
14 Function in Table 3.3.5.2-1 shall be OPERABLE."

15  
16 The applicability states, "According to Table 3.3.5.2-1."

17  
18 Section 3.3.1 of TSTF-542, states:

19  
20  
21 Table 3.3.5.2-1 contains those instrumentation Functions needed  
22 to support manual initiation of the ECCS injection/spray  
23 subsystem required by LCO 3.5.2, and automatic isolation of  
24 penetration flow paths that may be credited in a calculation of  
25 Drain Time. The Functions in Table 3.3.5.2-1 are moved from  
26 existing TS 3.3.5.1, "ECCS Instrumentation," and TS 3.3.6.1,  
27 "Primary Containment Isolation Instrumentation" Functions that  
28 are required in Modes 4 or 5 or during OPDRVs. Creation of  
29 TS 3.3.5.2 places these Functions in a single location with  
30 requirements appropriate to support the safety function for  
31 TS 3.5.2.

32  
33 If plant-specific design and TS require different functions to  
34 support manual initiation of an ECCS subsystem, those functions  
35 should be included in TS 3.3.5.2.

36  
37  
38 3.4.2 Proposed TS 3.3.5.2 Actions

39  
40 TS 3.3.5.2 contains actions to be followed when the LCO is not met.

41  
42 TSTF-542, Section 3.3.2, "Proposed TS 3.3.5.2 Actions," discusses the actions of TS 3.3.5.2  
43 and LCO 3.3.5.2. The NRC staff finds these actions are sufficient and necessary, because  
44 when one or more instrument channels are inoperable the equipment and function controlled by  
45 these instruments cannot complete the required function in the normal manner and these  
46 actions direct the licensee to take appropriate actions as necessary and enter immediately into  
47 the Conditions referenced in Table 3.3.5.2-1. These actions satisfy the requirements of 10 CFR  
48 50.36(c)(32)(i) by providing a remedial action permitted by the TS until the LCO can be met.

1 The remedial actions provide reasonable assurance that an unexpected draining event can be  
2 prevented or mitigated before the RPV water level would be lowered to the TAF.

3  
4 *For BWR/2, /3, or /4 plants choose the following Section 3.4.3:*

5 3.4.3 Proposed TS 3.3.5.2 Actions

6  
7 TSTF-542, Section 3.3.2, "Proposed TS 3.3.5.2 Actions," discusses the actions of TS 3.3.5.2  
8 and LCO 3.3.5.2. The NRC staff finds these actions are sufficient and necessary, because  
9 when one or more instrument channels are inoperable the equipment and function controlled by  
10 these instruments cannot complete the required function in the normal way, and these actions  
11 direct the licensee to take appropriate actions as required. The actions provide reasonable  
12 assurance that an unexpected draining event can be prevented or mitigated before the RPV  
13 water level would be lowered to the TAF.

14  
15 Action A is applicable when one or more instrument channels are inoperable from  
16 Table 3.3.5.2-1 and directs the licensee to immediately enter the Condition referenced in  
17 Table 3.3.5.2-1 for that channel.

18  
19 Action B (concerning the RHR system Isolation and RWCU system Isolation functions) are  
20 applicable when automatic isolation of the associated penetration flow path is credited as not  
21 having to be considered as a path for potential drainage in calculating drain time. If the  
22 instrumentation is inoperable, Required Action B.1 directs an immediate declaration that the  
23 associated penetration flow path(s) are incapable of automatic isolation. Required Action B.2  
24 requires a re-calculation of drain time, but automatic isolation of the affected penetration flow  
25 paths cannot be credited.

26  
27 Action C (concerning low reactor steam dome pressure permissive Functions necessary for  
28 ECCS subsystem manual initiation) addresses an event in which the permissive is inoperable  
29 and manual initiation of ECCS using the control board pushbuttons is prevented. The function  
30 must be placed in the trip condition within one hour. With the permissive function instrument in  
31 the trip condition, manual initiation may now be performed using the preferred control board  
32 pushbuttons. This one-hour completion time is acceptable, because despite the preferred start  
33 method being prevented, the reactor operator can take manual control of the pump and the  
34 injection valve to inject water into the RPV and achieve the safety function. The time of one  
35 hour also provides reasonable time for evaluation and placing the channel in trip.

36  
37 Action D (concerning pump discharge flow bypass Functions and the manual initiation  
38 Functions) addresses actions when the bypass is inoperable and then there is a risk that the  
39 associated ECCS pump could overheat when the pump is operating and the associated  
40 injection valve is not fully open. In this condition, the operator can take manual control of the  
41 pump and the injection. Similar to justification in Action C, while this is not the preferred  
42 method, if a manual initiation function is inoperable, the ECCS subsystem pumps can be started  
43 manually and the valves can be opened manually. The 24-hour completion time is acceptable,  
44 because the functions can be performed manually and it allows time for the operator to evaluate  
45 and have necessary repairs completed. Unlike the failure of a pushbutton that may concern  
46 electronic component repairs, mechanical components may be involved in repairs, testing, and  
47 return to service of pumps and valves. This further justifies a 24-hour completion time as  
48 appropriate.

49

1 Action E is needed and becomes necessary; if the required action and associated completion  
2 time of Condition C or D; are not met. If they are not met, then the associated low pressure  
3 ECCS injection/spray subsystem may be incapable of performing the intended function, and the  
4 ECCS subsystem must be declared inoperable immediately.†

5  
6 *For BWR/5 or /6 plants choose the following Section 3.43:*

7 3.4.3 Proposed TS 3.3.5.2 Actions

8  
9 TSTF-542, Section 3.3.2, "Proposed TS 3.3.5.2 Actions," discusses the actions of TS 3.3.5.2  
10 and LCO 3.3.5.2. The NRC staff finds these actions are sufficient and necessary, because  
11 when one or more instrument channels are inoperable the equipment and function controlled by  
12 these instruments cannot complete the required function in the normal way and these actions  
13 direct the licensee to take appropriate actions as required. The remedial actions provide  
14 reasonable assurance that an unexpected draining event can be prevented or mitigated before  
15 the RPV water level would be lowered to the TAF.

16  
17 Action A is applicable when one or more instrument channels are inoperable from Table 3.3.5.2-  
18 1 and directs the licensee to immediately enter the condition referenced in Table 3.3.5.2-1 for  
19 that channel.

20  
21 Action B (concerning the RHR system isolation and RWCU system isolation functions) *is are*  
22 applicable when automatic isolation of the associated penetration flow path is credited ~~as not~~  
23 ~~having to be considered~~ as a path for potential drainage in calculating drain time. If the  
24 instrumentation is inoperable, Required Action B.1 directs an immediate declaration that the  
25 associated penetration flow path(s) are incapable of automatic isolation. Required Action B.2  
26 requires a re-calculation of drain time, but automatic isolation of the affected penetration flow  
27 paths cannot be credited.

28  
29 Action C (concerning low reactor steam dome pressure permissive Functions necessary for  
30 ECCS subsystem manual initiation) addresses an event in which the permissive is inoperable  
31 and manual initiation of ECCS using the control board pushbuttons is prevented. The function  
32 must be placed in the trip condition within one hour. With the permissive function instrument in  
33 the trip condition, manual initiation may now be performed using the preferred control board  
34 pushbuttons. This one hour completion time is acceptable, because despite the preferred start  
35 method being prevented, the reactor operator can take manual control of the pump and the  
36 injection valve to inject water into the RPV and achieve the safety function. The time of one  
37 hour also provides reasonable time for evaluation and placing the channel in trip.

38  
39 Action D (concerning loss of adequate water supply for the HPCS System), addresses an event  
40 in which there is an inadequate water supply. The instrumentation functions have the ability to  
41 detect low-water setpoint in the Condensate Storage Tank and actuate valves to realign HPCS  
42 suction water source to the Suppression Pool. The Condensate Storage Tank Level - Low  
43 Function indicates multiple, inoperable channels within the same Function resulting in a loss of  
44 the automatic ability to swap suction to the Suppression Pool. The HPCS system must be  
45 declared inoperable within one hour or the HPCS pump suction must be realigned to the  
46 Suppression Pool, since, if realigned, the Function is already performed. This one hour is  
47 acceptable, because it provides sufficient time to take the action in order to minimize the risk of  
48 HPCS being needed without an adequate water source by allowing time for restoration or  
49 alignment of the HPCS pump suction to the suppression pool.



1  
2 Action E (concerning HPCS high water level Function in the RPV) addresses actions when this  
3 instrument function is inoperable. HPCS Reactor Vessel Water Level - High, Level 8 function  
4 ensures that appropriate actions are taken if the HPCS Reactor Vessel Water Level - High,  
5 Level 8 Function is inoperable. If the inoperability results in the channel being tripped, the  
6 HPCS pump discharge valve will not open and HPCS injection is prevented. In that case the  
7 HPCS System must be declared inoperable within one hour, and the function must be restored  
8 to operable status within 24 hours. The one hour completion time is acceptable, because of the  
9 ability to manually start the HPCS pumps and open the discharge valve. The 24-hour  
10 completion time is acceptable, because it allows time for the operator to evaluate and arrange  
11 for repairs.

12  
13 Action F (concerning pump discharge flow bypass Functions and the manual initiation  
14 Functions) addresses an event in which the bypass is inoperable and there is a risk that the  
15 associated ECCS pump could overheat when the pump is operating and the associated  
16 injection valve is not fully open. In this condition, the operator can take manual control of the  
17 pump and the injection. Similar to justification in Action C, while this is not the preferred  
18 method, if a manual initiation function is inoperable, the ECCS subsystem pumps can be started  
19 manually and the valves can be opened manually. The 24-hour completion time is acceptable,  
20 because the functions can be performed manually and it allows time for the operator to evaluate  
21 and have necessary repairs completed. Unlike the failure of a pushbutton that may concern  
22 electronic component repairs, mechanical components may be involved in repairs, testing, and  
23 return to service of pumps and valves further justifying a 24-hour completion time as  
24 appropriate.

25  
26 Action G is needed and becomes necessary, if the required action and associated completion  
27 time of Condition C, D, E, or F are not met. If they are not met, then the associated low  
28 pressure ECCS injection/spray subsystem may be incapable of performing the intended  
29 function, and the ECCS subsystem must be declared inoperable immediately.

30  
31 3.4.4 Proposed TS 3.3.5.2 Surveillances

32  
33 The TS 3.3.5.2 SR include Channel Checks, Channel Functional Tests, and Logic System  
34 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.  
35 The NRC staff finds these tests are sufficient and adequate, because they are essential to  
36 ensure the Functions of TS 3.3.5.2 are operable (i.e., capable of performing the specified safety  
37 function in support of TS 3.5.2, Drain Time, and the protection from a potential drain down of the  
38 RPV in Modes 4 and 5). The NRC staff finds the proposed TS 3.3.5.2 surveillances of LCO  
39 3.5.2 as described in Section 3.3.3 satisfies 10 CFR 50.36(c)(3) by providing the specific SRs  
40 relating to test, calibration, or inspection to assure that the necessary quality of systems and  
41 components is maintained.

42  
43 SR 3.3.5.2.1 requires a Channel Check and is applied to all functions except manual initiation.  
44 Performance of the Channel Check ensures that a gross failure of instrumentation has not  
45 occurred. A Channel Check is normally a comparison of the parameter indicated on one  
46 channel to a similar parameter on other related channels. A Channel Check is significant in  
47 assuring that there is a low probability of an undetected complete channel failure and is a key  
48 safety practice to verifying the instrumentation continues to operate properly between each  
49 Channel Functional Test. The frequency of **12 hours, or in accordance with the**

1 **Surveillance Frequency Control Program**], is consistent with the existing requirements and  
2 supports operating shift situational awareness.

3  
4 SR 3.3.5.2.2 requires a Channel Functional Test and is applied to all functions except manual  
5 initiation. A Channel Functional Test is the injection of a simulated or actual signal into the  
6 channel as close to the sensor as practicable to verify operability of all devices in the channel  
7 required for channel operability. It is performed on each required channel to ensure that the  
8 entire channel will perform the intended function. The frequency is **[in accordance with the**  
9 **Surveillance Frequency Control Program or 92 days]**. The applicant states, "This is  
10 acceptable because it is consistent with the existing requirements for these Functions and is  
11 based upon operating experience that demonstrates channel failure is rare." Since periods in  
12 MODEs 4 and 5 as refueling outages are often in the order of 30 days or less, licensees could  
13 include this SR, if desired, as part of a refueling activity.

14  
15 SR 3.3.5.2.3 requires a Logic System Functional Test and is only applied to the manual initiation  
16 functions. The Logic System Functional Test is a test of all logic components required for  
17 operability of a logic circuit, from as close to the sensor as practicable up to, but not including,  
18 the actuated device, and demonstrates the operability of the required manual initiation logic for  
19 a specific channel. The ECCS subsystem functional testing performed in proposed SR 3.5.2.7  
20 overlaps this surveillance to complete testing of the assumed safety function. The TSTF-542,  
21 Section 3.2.4.6, states:

22  
23  
24 The Frequency of [18] months, or in accordance with the  
25 Surveillance Frequency Control Program, is consistent with the  
26 existing requirements, and is based upon operating experience  
27 that that has shown that these components usually pass the  
28 Surveillance when performed at this Frequency.

29  
30  
31 There are no SRs included to verify or adjust the instrument setpoint derived from the allowable  
32 value using a Channel Calibration or a surveillance to calibrate the trip unit. TSTF-542,  
33 Section 3.3.3, states,

34  
35  
36 A draining event in Mode 4 or 5 is not an analyzed accident and,  
37 therefore, there is no accident analysis on which to base the  
38 calculation of a setpoint. The purpose of the Functions is to allow  
39 ECCS manual initiation or to automatically isolate a penetration  
40 flow path, but no specific RPV water level is assumed for those  
41 actions. Therefore, the Mode 3 Allowable Value was chosen for  
42 use in Modes 4 and 5 as it will perform the desired function.  
43 Calibrating the Functions in Modes 4 and 5 is not necessary, as  
44 TS 3.3.5.1 and TS 3.3.6.1 continue to require the Functions to be  
45 calibrated on an [18] month Frequency.

46  
47 And:  
48

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

6 This is acceptable, because this is adequate to ensure the channel responds with the required  
7 pumping systems to inject water when needed and isolation equipment to perform when  
8 commanded.  
9

10 ECCS Response Time and Isolation System Response Time testing ensures that the individual  
11 channel response times are less than or equal to the maximum values assumed in the accident  
12 analysis. TS 3.3.5.2 does not include SRs to participate in any ECCS Response Time testing  
13 and Isolation System Response Time testing. This is acceptable because the purpose of these  
14 tests are to ensure that the individual channel response times are less than or equal to the  
15 maximum values assumed in the accident analysis, but a draining event in Mode 4 or 5 is not an  
16 analyzed accident and, therefore, there are no accident analysis assumptions on response time  
17 and there are alternate manual methods for achieving the safety function. A potential draining  
18 event in MODEs 4 and 5 is a slower event than a LOCA. More significant protective actions are  
19 required as the calculated drain time decreases.  
20

#### 21 3.4.5 Conclusion of NRC Staff Review of TS 3.3.5.2

22

23 The NRC staff finds that proposed TS 3.3.5.2 and LCO 3.3.5.2 satisfies Criterion 4 of  
24 10 CFR 50.36(c)(3), because specific instrumentation is provided that helps prevent or mitigate  
25 a potential RPV drain down event. Operating experience highlights that RPV draining events  
26 are potentially significant to public health and safety, as established in the following NRC  
27 documents:  
28

- 29 1. Information Notice 84-81 "Inadvertent Reduction in Primary Coolant Inventory in  
30 Boiling Water Reactors During Shutdown and Startup," November 1984.
- 31 2. Information Notice 86-74, "Reduction of Reactor Coolant Inventory Because of  
32 Misalignment of RHR Valves," August 1986.
- 33 3. Generic Letter 92-04, "Resolution of the Issues Related to Reactor Vessel Water  
34 Level Instrumentation in BWRs Pursuant to 10 CFR 50.54(f)," August 1992.
- 35 4. NRC Bulletin 93-03, "Resolution of Issues Related to Reactor Vessel Water Level  
36 draining event in Mode 4 Instrumentation in BWRs," May 1993.  
37

38 The NRC staff finds that proposed LCO 3.3.5.2 correctly specifies the lowest functional  
39 capability or performance levels of equipment required for safe operation of the facility. There is  
40 reasonable assurance that the required actions to be taken when the LCO is not met can be  
41 conducted without endangering the health and safety of the public.  
42

#### 43 3.5 TABLE 3.3.5.2-1, "RPV WATER INVENTORY CONTROL INSTRUMENTATION"

44

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

1  
2 Table 3.3.5.2-1 specifies the instrumentation that shall be operable for each function in the table  
3 for Modes 4 and 5 (or other specified conditions), the required number of channels per function,  
4 conditions referenced from required action A.1, SR for the functions, [the allowable value  
5 ~~(removed this if version B)~~], and footnotes concerning items of the table.  
6

7 ~~Note: Table 3.3.5.2-1 version A has a column for the allowable value. Version A has the~~  
8 ~~allowable value in brackets. The brackets indicate that a plant specific value should be used in~~  
9 ~~the LAR to adopt TSTF 542. Table 3.3.5.2-1 version B does not have a column for the~~  
10 ~~allowable value.~~  
11

12 Proposed Table TS 3.3.5.2-1, 'RPV Water Inventory Control Instrumentation,' presents details  
13 on the functions required to support the equipment and functions of TS 3.5.2. The NRC staff  
14 finds the presentation in this table acceptable, because this section sufficiently discusses the  
15 purpose of the functions, the applicability, the number of required channels, the references to  
16 the Condition to be entered by letter (e.g., A, B, C) if the function is inoperable, the applicable  
17 SRs, [the selection of the allowable value], and justification of differences between the existing  
18 and proposed TS functions. This RPV Water Inventory Control Instrumentation set is  
19 acceptable, because it is adequate to ensure the instruments of the channels responds with the  
20 required accuracy permitting pumps systems to operate to inject water when needed and  
21 isolation of equipment when commanded to support the prevention of or mitigate a potential  
22 RPV draining event.  
23

24 Each of the ECCS subsystems in MODEs 4 and 5 are initiated by manual pushbutton.  
25 Automatic initiation of an ECCS injection/spray subsystem may be undesirable because it could  
26 lead to overflowing the RPV cavity, due to injection rates of thousands of gallons per minute.  
27 Thus, there is adequate time to take manual actions (e.g., hours versus minutes). Considering  
28 the action statements as the drain time decreases (the proposed TS 3.5.2, Action E, prohibits  
29 plant conditions that could result in drain times less than one hour), therefore, there is sufficient  
30 time for the reactor operators to take manual action to stop the draining event, and to manually  
31 start an ECCS injection/spray subsystem or the additional method of water injection as needed.  
32 Consequently, there is no need for automatic initiation of ECCS to respond to an unexpected  
33 draining event. This is acceptable, because a draining event is a slow evolution when  
34 compared to a design basis LOCA assumed to occur at a significant power level.  
35

36 *For BWR/2, /3, or /4 plant, choose the following Section 3.5.1:*

37 3.5.1 Proposed Table 3.3.5.2-1, Functions  
38

39 For the Table 3.3.5.2-1 Functions 1.a and 2.a, BWR/4 CS and LPCI Systems, Reactor Steam  
40 Dome Pressure - Low (Injection Permissive), these signals are used as permissives and  
41 protection for these low pressure ECCS injection/spray subsystem manual initiation functions.  
42 This function ensures that the reactor pressure has fallen to a value below these subsystems'  
43 maximum design pressure before permitting the operator to open the injection valves of the low  
44 pressure ECCS subsystems. Even though during MODEs 4 and 5 the reactor steam dome  
45 pressure is expected to virtually always be below the ECCS maximum design pumping  
46 pressure, the Reactor Steam Dome Pressure - Low signals are required to be operable and  
47 capable of permitting initiation of the ECCS.  
48

1 For the Table 3.3.5.2-1 Functions 1.b and 2.b, CS and LPCI Systems, Pump Discharge Flow -  
2 Low (Bypass), these minimum flow instruments are provided to protect the associated low  
3 pressure ECCS pumps from overheating when the pump is operating and the associated  
4 injection valve is not fully open. The minimum flow line valve is opened when low flow is  
5 sensed, and the valve is automatically closed when the flow rate is adequate to protect the  
6 pump. ~~Use for Version "A" TS: [Where applicable, allowable values specified are high enough~~  
7 ~~to ensure that the pump flow rate is sufficient to protect the pump, yet low enough to ensure that~~  
8 ~~the closure of the minimum flow valve is initiated to allow full flow into the core.]~~ The LPCI  
9 minimum flow valves are time delayed such that the valves will not open for 10 seconds after  
10 the switches detect low flow. This time delay is acceptable, because it is provided to limit  
11 reactor vessel inventory loss during the startup of the RHR shutdown cooling mode.

12  
13 For the Table 3.3.5.2-1 Functions 1.c and 2.c, CS System Manual Initiation and LPCI, System  
14 Manual Initiation, the manual initiation pushbutton channels introduce signals into the  
15 appropriate ECCS logic to provide manual initiation capability. There is one push button for  
16 each of the CS and LPCI subsystems (i.e., two for CS and two for LPCI). There is no allowable  
17 value for this Function since the channels are mechanically actuated based solely on the  
18 position of the push buttons. An instrument channel of the Manual Initiation Function (one  
19 channel per subsystem) is required to be Operable in MODEs 4 and 5 when the associated  
20 ECCS subsystems are required to be Operable per LCO 3.5.2.

21  
22 For the Table 3.3.5.2-1 Function 3.a, RHR System Isolation, Reactor Vessel Water Level - Low,  
23 Level 3, the function is only required to be operable when automatic isolation of the associated  
24 penetration flow path is credited in the drain time calculation. The number of required  
25 instrument channels is **[2 in one trip system]**, which retains the requirement that the two  
26 instrument channels must be associated with the same trip system. Each trip system isolates  
27 one of two redundant isolation valves, and only one trip system is required to be operable to  
28 ensure that automatic isolation of one of the two isolation valves will occur on low reactor vessel  
29 water level indication. ~~Use for Version "A" TS: [The allowable value was chosen to be the~~  
30 ~~same as the Primary Containment Isolation Instrumentation Reactor Vessel Water Level - Low,~~  
31 ~~Level 3 Allowable Value from LCO 3.3.6.1.]~~

32  
33 For the Table 3.3.5.2-1 Function 4.a, RWCU, System Isolation, Reactor Vessel Water Level -  
34 Low Low, Level 2, the function is only required to be operable when automatic isolation of the  
35 associated penetration flow path is credited in the drain time calculation. The number of  
36 required channels is **[2 in one trip system]**, which retains the requirement that the two  
37 instrument channels must be associated with the same trip system. Only one trip system is  
38 required to be operable to ensure that automatic isolation of one of the two isolation valves will  
39 occur on low reactor vessel water level. ~~Use for Version "A" TS: [Allowable value was chosen~~  
40 ~~to be the same as the ECCS Reactor Vessel Water Level - Low Low, Level 2 Allowable Value~~  
41 ~~from LCO 3.3.5.1.]~~

42  
43 *For BWR/5 or /6 plant, choose the following Section 3.5.2:*

44 3.5.2 Proposed Table 3.3.5.2.-1, Functions

45  
46 For the Table 3.3.5.2-1 Functions 1.a and 2.a, LPCS and LPCI Systems, Reactor Steam Dome  
47 Pressure - Low (Injection Permissive), these signals are used as permissives and protection for  
48 these low pressure ECCS injection/spray subsystem manual initiation functions. This function  
49 ensures that the reactor pressure has fallen to a value below these subsystems' maximum

1 design pressure before permitting the operator from opening the injection valves of the low  
2 pressure ECCS subsystems. Even though during MODEs 4 and 5 the reactor steam dome  
3 pressure is expected to virtually always be below the ECCS maximum design pumping  
4 pressure, the Reactor Steam Dome Pressure - Low signals are required to be operable and  
5 capable of permitting initiation of the ECCS.

6  
7 For the Table 3.3.5.2-1 Functions 1.b, 1.c, and 2.b, LPCS and LPCI Systems Low Pressure  
8 Coolant Injection and Low Pressure Core Spray Pump Discharge Flow - Low (Bypass), these  
9 instruments are provided to protect the associated low pressure ECCS pump from overheating  
10 when the pump is operating and the associated injection valve is not fully open. The minimum  
11 flow line valve is opened when low flow is sensed, and the valve is automatically closed when  
12 the flow rate is adequate to protect the pump. ~~Use for Version "A" TS:~~ [Where applicable  
13 allowable values specified are high enough to ensure that the pump flow rate is sufficient to  
14 protect the pump, yet low enough to ensure that the closure of the minimum flow valve is  
15 initiated to allow full flow into the core.]

16  
17 For the Table 3.3.5.2-1 Functions 1.d and 2.c, LPCS and LPCI Systems, Manual Initiation, the  
18 manual initiation pushbutton channels introduce signals into the appropriate ECCS logic to  
19 provide manual initiation capability. There is one pushbutton for each subsystem in the two  
20 divisions of low pressure ECCS (i.e., Division 1 ECCS, LPCS and LPCI A; Division 2 ECCS,  
21 LPCI B and LPCI C). There are four subsystems, thus four pushbuttons for the low pressure  
22 ECCS. The only manual initiation function required to be operable is that associated with the  
23 ECCS subsystem that is required to be operable by LCO 3.5.2. ~~Use for Version "A" TS:~~ [Since  
24 the channels are mechanically actuated based solely on the position of the pushbuttons, there is  
25 no allowable value for this function.] When this instrument function is inoperable, manual  
26 initiation with the control board push buttons is inoperable. However, the ECCS pumps can be  
27 started manually and valves can be opened manually by the reactor operator. This is not the  
28 preferred condition.

29  
30 For the Table 3.3.5.2-1 Functions 3.a, HPCS System Reactor Vessel Water Level - High, Level  
31 8, the High RPV water level, Level 8 signal, is used to close the HPCS injection valve to prevent  
32 overflow into the main steam lines (MSLs). One instrument channel associated with the HPCS  
33 system is required to be operable to support LCO 3.5.2. ~~Use for Version "A" TS:~~ [The  
34 LCO 3.3.5.2 allowable value is chosen to isolate flow from the HPCS system prior to water  
35 overflowing into the MSLs.]

36  
37 For the Table 3.3.5.2-1 Functions 3.b, HPCS System, Condensate Storage Tank Level – Low,  
38 the low level signal in the Condensate Storage Tank (CST) indicates the lack of an adequate  
39 supply of makeup water from this primary source for HPCS. Normally, the water source for the  
40 suction for HPCS is the CST. If the water level in the CST falls below a preselected level,  
41 instrumentation logic controls valves so suction is then pulled from the Suppression Pool. First  
42 the Suppression Pool suction valve is automatically opened and then the CST suction valve is  
43 automatically closed in a manner to ensure that an adequate supply of makeup water is  
44 available to the HPCS pump. The Condensate Storage Tank Level - Low signals are initiated  
45 from two level transmitters. The Condensate Storage Tank Level - Low Function Allowable  
46 Value is high enough to ensure adequate pump suction head while water is being taken from  
47 the CST.

48

1 For the Table 3.3.5.2-1 Functions 3.c and 3.d, HPCS System, HPCS Pump Discharge Pressure  
2 - High (Bypass) and HPCS System Flow Rate - Low (Bypass), the minimum flow instruments  
3 are provided to protect the HPCS pump from overheating when the pump is operating and the  
4 associated injection valve is not fully open. The minimum flow line valve is opened when low  
5 flow and high pump discharge pressure are sensed, and the valve is automatically closed when  
6 the flow rate is adequate to protect the pump or the discharge pressure is low (indicating the  
7 HPCS pump is not operating).

8  
9 For the Table 3.3.5.2-1 Function 3.e, HPCS System, Manual Initiation, the Manual Initiation  
10 push button channel introduces a signal into the HPCS logic to provide manual initiation  
11 capability. There is one pushbutton for the HPCS system.

12  
13 For the Table 3.3.5.2-1 Function 4.a, BWR/6 RHR System Isolation, Reactor Vessel Water  
14 Level - Low, Level 3, the Function is only required to be operable when automatic isolation of  
15 the associated RHR system penetration flow path is credited in calculating drain time. The  
16 definition of drain time allows crediting the closing of penetration flow paths that are capable of  
17 being automatically isolated by RPV water level isolation instrumentation prior to the RPV water  
18 level dropping below the TAF, but if the instrument function is inoperable, a closed path cannot  
19 be credited and a drain time calculation must be re-performed.

20  
21 For the Table 3.3.5.2-1 Function 5.a, RWCU System Isolation, Reactor Vessel Water Level -  
22 Low Low, Level 2, the Function is only required to be Operable when automatic isolation of the  
23 associated RWCU system penetration flow path is credited in calculating drain time. The  
24 definition of drain time allows crediting the closing of penetration flow paths that are capable of  
25 being automatically isolated by RPV water level isolation instrumentation prior to the RPV water  
26 level dropping below the TAF, but if the instrument function is inoperable, a closed path cannot  
27 be credited and a drain time calculation must be re-performed. This function is not applicable in  
28 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  
29 isolation of the RWCU system in calculating drain time.

### 30 31 3.6 OTHER DIFFERENCES BETWEEN THE CURRENT AND PROPOSED TS 32 REQUIREMENTS

33  
34 Sections **[2.3.3.3 through 2.3.3.5]** *[NOTE: If there are licensee specific changes, adjust section*  
35 *reference as needed]* of this SE describe additional changes to the TSs in which references to  
36 OPDRVs are deleted. The NRC staff has determined that deletion of these references is  
37 appropriate because the specifications governing Reactor Pressure Vessel Water Inventory  
38 Control and associated Instrumentation specifications provide an acceptable alternative set of  
39 controls for ensuring water level is maintained above the TAF.

### 40 41 3.7 TS 3.5.2 – REACTOR PRESSURE VESSEL (RPV) WATER INVENTORY CONTROL 42 REVIEW CONCLUSIONS

43  
44 Safety Limit 2.1.1.3 requires that reactor vessel water level shall be greater than the top of  
45 active irradiated fuel. Maintaining water level above the TAF ensures that the fuel cladding  
46 fission product barrier is protected during shutdown conditions. The changes to the TS  
47 establish new LCO requirements that address the preventive and mitigative equipment and  
48 associated instrumentation that provide an alternative means to support Safety Limit 2.1.1.3  
49 during MODE 4 and 5 operations.

1  
2 *NOTE: NRC staff shall confirm statements in this paragraph are true for the plant. This*  
3 *information should be available in the plant's LAR or FSAR.*

4 LOCAs are postulated accidents that would result from the loss of reactor coolant, at a rate in  
5 excess of the capability of the normal reactor coolant makeup system, from piping breaks in the  
6 reactor coolant pressure boundary. During operation in Modes 4 and 5, the reactor coolant  
7 system is at a low operating temperature (<[200] degrees Fahrenheit) and is depressurized. An  
8 event involving a loss of inventory while in the shutdown condition is judged to not exceed the  
9 capacity of one ECCS subsystem. The accidents that are postulated to occur during shutdown  
10 conditions, the Fuel Handling Accident and the Waste Gas Decay Tank Rupture, do not involve  
11 a loss of inventory. The equipment and instrumentation associated with the Reactor Vessel  
12 Water Inventory Control TS do not provide detection or mitigation related to these design basis  
13 accidents.

14  
15 The revised TS LCO 3.5.2 contains requirements for operability of one ECCS subsystem along  
16 with requirements to maintain a sufficiently long drain time that plant operators would have time  
17 to diagnose and mitigate an unplanned draining event. The NRC staff has determined that the  
18 LCO 3.5.2 and 3.3.5.2 provide for the lowest functional capability or performance levels of  
19 equipment required for safe operation of the facility, and therefore, meet the LCO requirements  
20 of 10 CFR 50.36(c)(2)(i).

21  
22 Additionally, the revised TS LCOs 3.5.2 and 3.3.5.2 provide remedial actions to be taken in the  
23 event the LCO is not satisfied, therefore meeting the requirements of 10 CFR 50.36(c)(2)(i).  
24 The NRC staff has found that the remedial actions provide reasonable assurance that an  
25 unexpected draining event can be prevented or mitigated before the RPV water level would be  
26 lowered to the TAF.

27  
28 The regulation at 10 CFR 50.36(c)(3) requires TSs to include items in the category of SRs,  
29 which are requirements relating to test, calibration, or inspection to assure that the necessary  
30 quality of systems and components is maintained, that facility operation will be within safety  
31 limits, and that the LCOs will be met. The NRC staff reviewed the SRs associated with the new  
32 LCOs 3.5.2 and 3.3.5.2. The NRC staff reviewed the revised SRs and determined that they are  
33 appropriate for ensuring the operability of the equipment and instrumentation specified in LCOs  
34 3.5.2. Therefore, the NRC staff concludes that 10 CFR 50.36(c)(3) is satisfied.

35  
36 *NOTE: NRC staff shall confirm that the licensee did provide TS Bases consistent with the STS*  
37 *Bases changes approved in TSTF-542 and that the any bracketed information in the STS Bases*  
38 *has been filled in with plant-specific information.*

39 The regulation at 10 CFR 50.36(a)(1) states that a summary statement of the bases or reasons  
40 for such specifications, other than those covering administrative controls, shall also be included  
41 in the application, but shall not become part of the TSs. In accordance with the 10 CFR  
42 50.36(a)(1) requirement, the licensee provided TS Bases changes in Attachment 4 of the  
43 licensee's amendment request. The NRC staff has concluded that the TS Bases changes  
44 provided describe the basis for the affected TS and follow the Final Policy Statement on  
45 Technical Specifications Improvements for Nuclear Power Reactors (58 Federal Register  
46 39132).

47  
48 The NRC staff's guidance for review of TSs is in Chapter 16, *Technical Specifications*, of  
49 NUREG-0800, Revision 3, *Standard Review Plan* (March 2010) (ADAMS Accession



1 No. ML100351425). As described therein, as part of the regulatory standardization effort, the  
2 NRC staff has prepared STS for each of the light–water reactor nuclear designs. **[For [PLANT],**  
3 **the representative STS is in [NUREG-1433][NUREG-1434][for BWR/5: NUREG-1433 and**  
4 **NUREG-1434]For BWR/4 plants: [NUREG-1433, Revision 4, contains the STS for BWR/4**  
5 **plants.] For BWR/6 plants: [NUREG-1434, Revision 4, contains the STS for BWR/6 plants.]**  
6 The changes to the TS were reviewed for technical clarity and consistency with customary  
7 terminology and format with the existing requirements. The staff found that the proposed  
8 changes were consistent with TSTF-542 and **[NUREG-1433] and/or [NUREG-1434].**  
9

### 10 3.8 TECHNICAL CONCLUSION

11  
12 The NRC staff evaluated the proposed changes to the TS of proposed drain time definition and  
13 TS 3.5.2 related to RPV WIC and TS 3.3.5.2 which contains the instrumentation necessary to  
14 support TS 3.5.2. Based on the considerations discussed above, the NRC staff concludes that  
15 the proposed revisions to the TS via adding a “DRAIN TIME” definition and TS 3.5.2 and  
16 TS 3.3.5.2 respectively are acceptable.  
17

18 *NOTE: Include other TS changes as necessary.*  
19

### 20 4.0 STATE CONSULTATION

21  
22 *This section is to be prepared by the PM.*  
23

24 *The requirements with respect to State consultation are contained in 10 CFR 50.91(b). 10 CFR*  
25 *50.91(b)(3) and (b)(4) require that: (1) the NRC make a good faith effort to telephone the State*  
26 *official, prior to amendment issuance, to determine if the State has any comments; and (2)*  
27 *consider any comments of the State official. If there are State comments, they should be*  
28 *addressed in this section. Comments received from members of the public should be addressed*  
29 *within the technical evaluation section or in a separate section of the safety evaluation. See*  
30 *ADAMS Accession No. ML102710156 (Safety Evaluation Section 5.0, “Public Comments”) for*  
31 *an example of a safety evaluation which addresses public comments.*  
32

33 In accordance with the Commission's regulations, the **[Name of State]** State official was notified  
34 of the proposed issuance of the amendment. The State official had **[no]** comments. **[If**  
35 **comments were provided, they should be addressed here.]**  
36

### 37 5.0 ENVIRONMENTAL CONSIDERATION

38  
39 *This section is to be prepared by the PM in accordance with current procedures.*  
40

### 41 6.0 CONCLUSION

42  
43 *This section is to be prepared by the PM.*  
44

45 The Commission has concluded, based on the considerations discussed above, that: (1) there  
46 is reasonable assurance that the health and safety of the public will not be endangered by  
47 operation in the proposed manner, (2) there is reasonable assurance that such activities will be  
48 conducted in compliance with the Commission's regulations, and (3) the issuance of the

1 amendment will not be inimical to the common defense and security or to the health and safety  
2 of the public.

3

4 **7.0 REFERENCES**

5

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

8

9 Principal Contributor:

10

11 Date:

**Attachment 3**

**Editorial Corrections to TSTF-542, Revision 2**

**Summary Table**

<b>Location</b>	<b>Comment</b>
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 ~~EF~~, 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 ~~EF~~, 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 ~~EF~~, 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, 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 subsystems(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, 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 3.3.5.2.1.2
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

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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.

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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

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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.*
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BASES

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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.*
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