October 28, 2013

Comanche Peak Nuclear Power Plant, Units 3 & 4
COL Application

Part 4

Technical Specifications Revision 3

Update Tracking Report

Revision 0

Revision History

Revision	Date	Update Description
-	6/28/2012	COLA Revision 3 Transmittal See Luminant Letter no. TXNB-12023 Date 6/28/2012
-	03/04/2013	Updated Sections: 5.5.18, 5.5.19 See Luminant Letter no. TXNB-13006 Date 03/04/2013 Incorporated responses to following RAIs No. 90 S01
0	10/28/2013	Updated Chapters: Specification, Bases

Introduction

Introduction – Tracking Report Revision List

Change ID No.	Section	TS Rev. 3 Page	Reason for change	Change Summary	Rev. of FSAR T/R

*Page numbers for the attached marked-up pages may differ from the revision 3 page numbers due to text additions and deletions. When the page numbers for the attached pages do differ, the page number for the attached page is shown in brackets.

Specifications

Specifications – Tracking Report Revision List

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev. of T/R
RCOL2_16-10 S01	5.5.18 5.5.19	5.5-17 5.5-18	Supplemental Response to RAI No. 90 Luminant Letter no.TXNB-13006 Date 03/04/2013	Provided current revision number to RMTS and SFCP document.	-
CTS-01558	1.3	1.3-10	Consistency with DCD	Added underline to word “AND” and “OR”.	0
CTS-01558	3.3.1 CONDITION D	3.3.1-2	Editorial	Added space between "D.2.1" and "Initiate".	0
CTS-01558	3.3.1 Condition M	3.3.1-6	Editorial	Added comma after "testing".	0
CTS-01558	3.3.1 Condition T	3.3.1-8	Editorial	Added period.	0
CTS-01558	3.3.1 Function 14	3.3.1-18	Editorial	Changed “Actuation” to "actuation" because term does not need to be capitalized.	0
CTS-01558	3.3.2 Condition E	3.3.2-3	Editorial	Added period.	0
CTS-01558	3.3.2	3.3.2-4	Editorial	Added columns for “Condition”, “Required Action”, and “Completion Time”.	0
CTS-01558	3.3.2 CONDITION T	3.3.2-9	Editorial	Added underline to word “AND”.	0
CTS-01558	3.3.2 Condition X	3.3.2-10	Editorial	Changed “Train” to "Trains".	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev. of T/R
CTS-01558	3.3.2 Condition Y	3.3.2-11	Consistency with DCD	Changed “Immediately” to “7 days” in column for Completion Time.	0
CTS-01558	3.3.2 Function 14 b Footnotes Function 16 (New)	3.3.2-24	Consistency with DCD Consistency with DCD Consistency with DCD	Added "(g)" as superscript. Added footnotes (g) and (h). Added item “16. Main Steam Relief Line Isolation” to table.	0
CTS-01558	3.3.3. CONDITION A	3.3.3-1	Editorial	Added underline to word “OR”.	0
CTS-01558	3.3.3. CONDITION C	3.3.3-2	Editorial	Added underline to word “OR”.	0
CTS-01558	3.3.4 CONDITION A	3.3.4-1	Editorial	Added underline to word “OR”.	0
CTS-01558	3.4.5 SURVEILLANCE SR 3.4.5.2	3.4.5-3	Consistency with DCD	Changed SG Secondary side water level from greater than or equal to 13% to 14%	0
CTS-01558	3.4.6 Notes	3.4.6-1	Reflect response to Amended DCD RAI No. 902 MHI Letter No. UAP-HF-13114 (05/28/2013). ADAMS	Note 3 is added.	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev. of T/R
			Accession Number: ML 13151A039		
CTS-01558	3.4.6 Condition C	3.4.6-2	Reflect response to Amended DCD RAI No. 902 MHI Letter No. UAP-HF-13114 (05/28/2013). ADAMS Accession Number: ML 13151A039	wording is clarified for Condition C. Action C.1 is simplified.	0
		3.4.6-3	Consistency with DCD	Changed SG Secondary side water level from greater than or equal to 13% to 14%	
	3.4.6 SR 3.4.6.5 (New)	3.4.6-3 [3.4.6-4]	Reflect response to RAI No. 464 amended MHI Letter No. UAPHF-12223 (08/06/2012) ADAMS Accession Number: ML12221A274	SR 3.4.6.5 is added.	
CTS-01558	3.4.7	3.4.7-1	Consistency with DCD	Changed SG Secondary side water level from greater than or equal to	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev. of T/R
				13% to 14%.	
CTS-01558	3.4.7 Notes Notes 5	3.4.7-1	Reflect response to Amended DCD RAI No. 902 MHI Letter No. UAP-HF-13114 (05/28/2013). ADAMS Accession Number: ML13151A039 Editorial	Notes is re-ordered. Note 5 is added. Various editorial changes.	0
	3.4.7 CONDITION C	3.4.7-3	Reflect response to Amended DCD RAI No. 902 MHI Letter No. UAP-HF-13114 (05/28/2013). ADAMS Accession Number: ML13151A039	(Actions), Condition C is clarified. Required actions for Condition C are simplified.	
	3.4.7 SURVEILLANCE SR 3.4.7.2 3.4.7 SR 3.4.7.5 (New)	3.4.7-4	Consistency with DCD Reflect response to RAI No. 464 amended MHI Letter No. UAPHF-12223 (08/06/2012)	Changed SG Secondary side water level from greater than or equal to 13% to 14%. SR 3.4.7.5 is added.	

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev. of T/R
			ADAMS Accession Number: ML12221A274		
CTS-01558	3.4.8 LCO	3.4.8-1	Reflect amended Response to RAI No. 669 MHI Letter No. UAP-HF-13129 (06/13/2013). ADAMS Accession Number: ML13168A003	LCO 3.4.8 is clarified.	0
	3.4.8 Note 3	3.4.8-1	Reflect response to Amended DCD RAI No. 902 MHI Letter No. UAP-HF-13114 (05/28/2013). ADAMS Accession Number: ML13151A039	Note 3 is added.	
CTS-01558	3.4.8 CONDITION D	3.4.8-2	Reflect response to Amended DCD RAI No. 902 MHI Letter No. UAP-HF-13114 (05/28/2013). ADAMS	Condition D is clarified. Required actions for Condition D are simplified.	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev . of T/R
			Accession Number: ML13151A039		
CTS-01558	3.4.8 CONDITION E and F (New) 3.4.8 SRs 3.4.8.5 through 3.4.8.9 (New)	3.4.8-2 [3.4.8-3] 3.4.8-3 [3.4.8-4, 3.4.8-5]	Reflect amended Response to RAI No. 669 MHI Letter No. UAP-HF-13129 (06/13/2013). ADAMS Accession Number: ML13168A003 Reflect amended Response to RAI No. 669 MHI Letter No. UAP-HF-13129 (06/13/2013). ADAMS Accession Number: ML13168A003	CONDITION E and F are added. SR 3.4.8.5 through 3.4..8.9 are added.	0
CTS-01558	3.4.11	3.4.11-3	Editorial	Added period.	0
CTS-01558	3.4.12 CONDITION E 3.4.12 SR 3.4.12.5	3.4.12-2 3.4.12-3	Editorial Editorial	Added period. Added period.	0
CTS-01558	3.5.2 SR 3.5.2.2 Note	3.5.2-2	Reflect response to RAI No. 464 amended MHI	Note added to SR 3.5.2.2.	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev. of T/R
			Letter No. UAP-HF-12223 (08/06/2012) ADAMS Accession Number: ML12221A274		
CTS-01558	3.5.2 SR 3.5.2.7 (New)	3.5.2-3	Reflect response to RAI No. 464 amended MHI Letter No. UAPHF-12223 (08/06/2012) ADAMS Accession Number: ML12221A274	SR 3.5.2.7 is added.	0
CTS-01558	3.5.4	3.5.4-2	Reflect editorial change to DCD R4. Reflect amended Response to RAI No. 740 MHI Letter No. UAP-HF-11280 (08/31/2011 GSI-191). ADAMS Accession Number: ML 11245A188 Reflect the GSI-191 Closure Plan MHI Letter	RWSP water volume is changed to 597,800 gallons / 79,920 ft3	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev. of T/R
			No. UAP-HF-12135 (06/01/2012). ADAMS Accession Number : ML12157A223		
CTS-01558	3.6.6 SR 3.6.6.2 and SR 3.6.6.4	3.6.6-2	Consistency with DCD	Containment spray pump now called CS/RHR pump.	0
CTS-01558	3.7.9	3.7.9-2	Correction of UHS basin water volume and UHS heat load values to reflect design progress due to layout changes	Changed the UHS basin water inventory from equal to or greater than "2,800,000" gallons to "2,850,000" gallons.	0
CTS-01558	3.7.10 CONDITION F	3.7.10-2	Editorial	Underlined and indented the word "OR".	0
CTS-01558	3.7.12	3.7.12-1	Consistency with DCD	The term "fuel storage pit" was replaced with "spent fuel pit"	0
CTS-01558	3.7.12	3.7.12-1	Editorial	Added underline to word "AND".	0
CTS-01558	3.7.13	3.7.13-1	Consistency with DCD	The term "fuel storage pit" was replaced with "spent fuel pit"	0
CTS-01558	3.8.1 CONDITION	3.8.1-3	Editorial	Added underline to word "AND".	0
CTS-01558	3.8.1	3.8.1-16	Reflected to DCD RAI 962-6578	Revised surveillance Requirements to include GTG nozzle cleaning activity.	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev . of T/R
CTS-01558	3.8.10 CONDITION A	3.8.10-1	Editorial	Added underline to word “OR” and “AND”.	0
CTS-01558	3.9.5 SR 3.9.5.2 (New)	3.9.5-2	Consistency with DCD Reflect response to RAI No. 464 amended MHI Letter No. UAP-HF-12223 (08/06/2012) ADAMS Accession Number: ML12221A274	SR 3.9.5.2 is added.	0
CTS-01558	3.9.6 3.9.6 3.9.6 CONDITION D. (New)	3.9.6-1 3.9.6-1 3.9.6-2 [3.9.6-3]	Reflect amended Response to RAI No. 669 MHI Letter No. UAP-HF-13129 (06/13/2013). ADAMS Accession Number: ML13168A003 Consistency with DCD Reflect amended Response to RAI No. 669 MHI Letter No. UAP-HF-13129 (06/13/2013). ADAMS	SR 3.9.6 is clarified with two conditions. RHR pump is now called CS/RHR pump For Actions, Condition D is added on page 3.9.6-3.	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev. of T/R
			Accession Number: ML13168A003		
CTS-01558	3.9.6 SR 3.9.6.4 (New)	3.9.6-3 [3.9.6-4]	Reflect Response to RAI No. 464 amended MHI Letter No. UAP-HF-12223 (0806/2012) ADAMS Accession Number: ML12221A274	SR 3.9.6.4 is added.	0
CTS-01558	3.4.8 CONDITION F 3.6.2 CONDITION A 3.6.3 CONDITION C 3.7.5 CONDITION A 3.7.5 CONDITION B 3.7.6 CONDITION A 3.8.1 CONDITION A	3.4.8-2 [3.4.8-3] 3.6.2-2, 3.6.2-3 3.6.3-3 3.7.5-1 3.7.5-2 3.7.6-1 3.8.1-2	Editorial	Various editorial changes.	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev. of T/R
CTS-01558	4.0 4.3.1.3 (New)	4.0-2	Consistency with DCD	Added design features for containment storage racks	0
CTS-01558	4.0	4.0-2 [4.0-3]	Consistency with DCD	Minor changes to indentation, grammar, and nomenclature for spent fuel pit	0
CTS-01558	5.5 5.5.11	5.5-11	Consistency with DCD	Changed units of measure	0
CTS-01558	5.5 5.5.16 d. 5.5.17	5.5-16 5.5-17	Consistency with DCD	Added criteria for Type C leak rate tests. Changed reference year for IEEE standard.	0
CTS-01558	5.6 5.6.3 b.	5.6-2	Consistency with DCD	Changed reference year for MUAP-07026-P	0

*Page numbers for the attached marked-up pages may differ from the revision 3 page numbers due to text additions and deletions. When the page numbers for the attached pages do differ, the page number for the attached page is shown in brackets.

1.3 Completion Times

EXAMPLES (continued)

Required Action A.1 has two Completion Times. The 1 hour Completion Time begins at the time the Condition is entered and each "Once per 8 hours thereafter" interval begins upon performance of Required Action A.1.

If after Condition A is entered, Required Action A.1 is not met within either the initial 1 hour or any subsequent 8 hour interval from the previous performance (plus the extension allowed by SR 3.0.2), Condition B is entered. The Completion Time clock for Condition A does not stop after Condition B is entered, but continues from the time Condition A was initially entered. If Required Action A.1 is met after Condition B is entered, Condition B is exited and operation may continue in accordance with Condition A, provided the Completion Time for Required Action A.2 has not expired.

<u>EXAMPLE 1.3-8</u>

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required component inoperable.	A.1 Restore required component to OPERABLE status. <u>OR</u> A.2 Apply the requirements of Specifications 5.5.18	72 hours 72 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. <u>AND</u> B.2 Be in MODE 4.	6 hours 12 hours

CTS-01558

CTS-01558

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. One required train inoperable.	D.1 Restore train to OPERABLE status.	48 hours
	<u>OR</u>	
	D.2.1 Initiate action to fully insert all rods.	48 hours
	<u>AND</u>	
	D.2.2 Place the Rod Control System in a condition incapable of rod withdrawal.	49 hours

CTS-01558

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
L. One required channel inoperable.	-------------------NOTE-------------------- One required channel may be bypassed for up to 12 hours for surveillance testing, provided the other required channels are OPERABLE or placed in the trip condition. --	
	L.1 Place channel in trip.	72 hours
	OR	
	L.2 Reduce THERMAL POWER to < P-7.	78 hours
M. One required train inoperable.	--------------------NOTE------------------- One required train may be bypassed for up to 4 hours for surveillance testing, provided the other required trains are OPERABLE. --	
	M.1 Restore train to OPERABLE status.	24 hours
	OR	
	M.2 Be in MODE 3.	30 hours
N. One required RTB train inoperable.	N.1 Restore train to OPERABLE status.	24 hours
	OR	
	N.2 Apply the requirements of 5.5.18.	24 hours

CTS-01558

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
S. Required Action and associated Completion Time for Condition N, Q, or R not met.	S.1 Be in MODE 3.	6 hours
T. One Main Turbine Stop Valve Position channel inoperable	------------------NOTE------------------ One channel may be bypassed for up to 12 hours for surveillance testing. --- T.1 Place channel in trip. <u>OR</u> T.2 Reduce THERMAL POWER to <P-7.	 12 hours 18 hours
U. One required channel inoperable.	U.1 Place channel in trip. <u>AND</u> U.2 Restore channel to OPERABLE status.	1 hour 72 hours
V. Required Action and associated Completion Time of Condition U not met.	V.1 Be in MODE 3.	6 hours
W. One required channel inoperable.	W.1 Place channel in trip. <u>AND</u> W.2 Restore channel to OPERABLE status.	1 hour 72 hours
X. Required Action and associated Completion Time of Condition W not met.	X.1 Reduce THERMAL POWER to < P-7.	6 hours

CTS-01558

Table 3.3.1-1 (page 5 of 6)
Reactor Trip System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS
14. ECCS ~~A~~actuation	1,2	3 trains	M	SR 3.3.1.6 CTS-01558
15. Reactor Trip System Interlocks				
a. Intermediate Range Neutron Flux, P-6	2[d]	2	O	SR 3.3.1.6 SR 3.3.1.9
b. Low Power Reactor Trips Block, P-7	1	1 per train	P	SR 3.3.1.6
c. Power Range Neutron Flux, P-10	1,2	4	O	SR 3.3.1.6 SR 3.3.1.9
d. Turbine Inlet Pressure, P-13	1	3	P	SR 3.3.1.1 SR 3.3.1.6 SR 3.3.1.8
16. Reactor Trip Breakers (RTBs)	1,2	3 trains[f]	N,S	SR 3.3.1.4 SR 3.3.1.12
	3[a], 4[a], 5[a]	3 trains[f]	D	SR 3.3.1.4 SR 3.3.1.12

(a) With Rod Control System capable of rod withdrawal or one or more rods not fully inserted.

(d) Below the P-6 (Intermediate Range Neutron Flux) interlocks.

(f) Two reactor trip breakers per train.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. One required Containment Pressure channel inoperable.	--------------------NOTE-------------------- One required channel may be bypassed for up to 12 hours for surveillance testing, provided the other required channels are OPERABLE. --	
	E.1 Restore channel to OPERABLE status.	72 hours
	<u>OR</u>	
	E.2.1 Be in MODE 3.	78 hours
	<u>AND</u>	
	E.2.2 Be in MODE 4.	84 hours
F. One channel or required train inoperable.	------------------NOTE--------------------- One Loss of Offsite Power channel may be bypassed for up to 4 hours for surveillance testing, provided the other channels are OPERABLE or placed in the trip condition. --	
	F.1 Restore channel or train to OPERABLE status.	72 hours
	<u>OR</u>	
	F.2.1 Be in MODE 3.	78 hours
	<u>AND</u>	
	F.2.2 Be in MODE 4.	84 hours

CTS-01558

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
G. One train inoperable.	--------------------NOTE------------------- One train may be bypassed for up to 4 hours for surveillance testing, provided the other train is OPERABLE. --	
	G.1 Restore train to OPERABLE status.	24 hours
	OR	
	G.2.1 Be in MODE 3.	30 hours
	AND	
	G.2.2 Be in MODE 4.	36 hours

CTS-01558

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
T. Required Action and associated Completion Time for Condition J or S not met.	T.1 Be in MODE 3. AND T.2 Be in MODE 4.	6 hours 12 hours
U. One or more MCR Outside Air Intake Radiation Functions with one channel inoperable.	U.1 Place one MCREFS train and two MCRATCS trains in the emergency mode.	7 days
V. One or more MCR Outside Air Intake Radiation Functions with two channels inoperable.	V.1 Place one MCREFS train and two MCRATCS trains in the emergency mode. AND V.2.1 Restore one channel to OPERABLE status. OR V.2.2 Place two MCREFS trains and three MCRATCS trains in the emergency mode.	Immediately 7 days 7 days
W. One or more Functions with one train, A or D, inoperable.	--------------------NOTE------------------- This condition is only applicable to Train A or D. For inoperable Train B or C there is no action required. --- W.1 Place the affected train of MCREFS in the emergency mode.	 7 days

CTS-01558

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
X. One or more Functions with two trains, A and D, inoperable.	--------------------NOTE------------------- This condition is only applicable to Trains A and D. Other inoperable two-train combinations are addressed in Condition Y. --	
	X.1 Place one MCREFS train in the emergency mode.	Immediately
	AND	
	X.2.1 Restore one MCREFS train to OPERABLE status (i.e., one train in the emergency mode and one train OPERABLE).	7 days
	OR	
	X.2.2 Place two MCREFS trains in the emergency mode.	7 days
	AND	
	X.3.1 Restore one affected MCRATCS train to OPERABLE status (i.e., three trains OPERABLE).	7 days
	OR	
	X.3.2 Place one affected MCRATCS train in the emergency mode (i.e., one train in the emergency mode and two trains OPERABLE).	7 days

CTS-01558

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
Y. One or more Functions with two trains, except A and D, inoperable.	--------------------NOTE------------------- Inoperable Train A or D affects MCREFS and MCRATCS. Inoperable Train B or C affects MCRATCS. ---	
	Y.1 Restore one affected train to OPERABLE status for the affected subsystem(s).	~~Immediately~~7 days CTS-01558
	OR	
	Y.2 Place one affected train in the emergency mode for the affected subsystem(s).	7 days
Z. Required Action and associated Completion Time for Condition U, V, W, X or Y not met in MODE 1, 2, 3, or 4.	Z.1 Be in MODE 3.	6 hours
	AND	
	Z.2 Be in MODE 5.	36 hours
AA. Required Action and associated Completion Time for Condition U, V, W, X or Y not met during movement of irradiated fuel assemblies.	AA.1 Suspend movement of irradiated fuel assemblies.	Immediately
BB. One required Reactor Trip, P-4 train inoperable.	BB.1 Restore train to OPERABLE status.	48 hours
	OR	
	BB.2.1 Be in MODE 3.	54 hours
	AND	
	BB.2.2 Be in MODE 4.	60 hours

Table 3.3.2-1 (page 11 of 11)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	
14.Block Turbine Bypass and Cooldown Valves					
a. Manual Initiation	1,2,3	Trains A and D	F	SR 3.3.2.5	
b. Actuation Logic and Actuation Outputs	1,2,3	Trains A and D	S,T	SR 3.3.2.2 SR 3.3.2.3	
c. Low-Low T_{avg} Signal	1,2,3[(g)]	3	M,N	SR 3.3.2.1 SR 3.3.2.2 SR 3.3.2.6 SR 3.3.2.7	CTS-01558
15.Manual Control of ESF Components					
a. Safety VDU	1, 2, 3, 4, 5, 6	4 trains	O	SR 3.3.2.2 SR 3.3.2.9	
b. COM-2	1, 2, 3, 4, 5, 6	4 trains	P	SR 3.3.2.2	
c. Actuation Logic and Actuation Outputs	Refer to LCO 3.4 through 3.7 for all requirements applicable to the controlled ESF components.			SR 3.3.2.2 SR 3.3.2.3	
16.Main Steam Relief Line Isolation					CTS-01558
a. Manual Initiation	1,2,3	2 trains per SG	F	SR 3.3.2.5	
b. Actuation Logic and Actuation Outputs	1,2,3	2 trains per SG	G	SR 3.3.2.2 SR 3.3.2.3	
c. Low Main Steam Line Pressure	1,2,3[(h)]	3 per SG	M,N	SR 3.3.2.1 SR 3.3.2.2 SR 3.3.2.6 SR 3.3.2.7	

(g) Low-Low T_{avg} Signal for Cooldown Turbine Bypass Valves is required to be OPERABLE in MODE 3 above the setpoint of Low-Low T_{avg}. Low-Low T_{avg} Signal for Turbine Bypass Valves (except Cooldown Turbine Bypass Valves) is required to be OPERABLE in MODE 3.

(h) Except while manual cooling operation with MSRV or MSDV by the operator.

3.3 INSTRUMENTATION

3.3.3 Post Accident Monitoring (PAM) Instrumentation

LCO 3.3.3 The PAM Instrumentation Function in Table 3.3.3-1, and for all four trains of the PAM Display Function, shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

--NOTE--

Separate Condition entry is allowed for each Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more PAM Instrumentation Functions with one required channel inoperable. OR One train of the PAM Display Function inoperable.	A.1 Restore channel or train to OPERABLE status.	30 days
B. Required Action and associated Completion Time of Condition A not met.	B.1 Initiate action in accordance with Specification 5.6.5.	Immediately

CTS-01558

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. One or more PAM Instrumentation Functions with two required channels inoperable. OR Two trains of the PAM Display Function inoperable.	C.1 OR C.2	Restore one train or one required channel to OPERABLE status. --------------NOTE------------- This alternate action may be used only when the Emergency Feedwater Pit Level is inoperable. ------------------------------------- Apply the requirements of Specification 5.5.18.	7 days 7 days
D. Required Action and associated Completion Time of Condition C not met.	D.1 AND D.2	Be in MODE 3. Be in MODE 4.	6 hours 12 hours

CTS-01558

3.3 INSTRUMENTATION

3.3.4 Remote Shutdown Console (RSC)

LCO 3.3.4 The RSC shall be OPERABLE.

APPLICABILITY: MODES 1, 2 and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required channel or train inoperable for the Display and Control Function. OR One train inoperable for the Transfer of Control Function.	A.1 Restore channel or train to OPERABLE status.	30 days
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	6 hours 12 hours

CTS-01558

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.5.1	Verify required RCS loops are in operation.	In accordance with the Surveillance Frequency Control Program
SR 3.4.5.2	Verify steam generator secondary side water levels are ≥ 14~~3~~% for required RCS loops.	In accordance with the Surveillance Frequency Control Program CTS-01558
SR 3.4.5.3	------------------------------NOTE------------------------- Not required to be performed until 24 hours after a required pump is not in operation. --- Verify correct breaker alignment and indicated power are available to each required pump.	In accordance with the Surveillance Frequency Control Program

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.6 RCS Loops - MODE 4

LCO 3.4.6 Two RCS loops shall be OPERABLE and one RCS loop shall be in operation.

OR

Three Residual Heat Removal (RHR) loops shall be OPERABLE and two RHR loops shall be in operation and all sources of unborated water shall be isolated.

--NOTES--

1. All reactor coolant pumps (RCPs) and CS/RHR pumps may be removed from operation for ≤ 1 hour per 8 hour period provided:

   a. No operations are permitted that would cause introduction of coolant into the RCS with boron concentration less than required to meet the SDM of LCO 3.1.1; and

   b. Core outlet temperature is maintained at least 10°F below saturation temperature.

2. No RCP shall be started with any RCS cold leg temperature ≤ the Low Temperature Overpressure Protection (LTOP) arming temperature specified in the PTLR unless the secondary side water temperature of each steam generator (SG) is ≤ 50°F above each of the RCS cold leg temperatures.

3. Except as prohibited in Note 1 above, an isolation valve for an unborated water source may be opened when in a planned dilution or makeup activity. CTS-01558

APPLICABILITY: MODE 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required loop inoperable.	A.1 Initiate action to restore a second loop to OPERABLE status. AND	Immediately

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	A.2 --------------NOTE-------------- Only required if two RHR loops are OPERABLE. ------------------------------------- Be in MODE 5.	24 hours
B. Two or more required loops inoperable. OR Required loop(s) not in operation.	B.1 Suspend operations that would cause introduction of coolant into the RCS with boron concentration less than required to meet SDM of LCO 3.1.1. AND B.2 Initiate action to restore one loop to OPERABLE status and operation.	Immediately Immediately
C. -----------NOTE----------- Separate Condition entry is allowed for each unborated water source isolation valve. ----------------------------- -----------NOTE----------- Required Action C.2 must be completed whenever Condition C is entered. ----------------------------- ~~One or more valves not secured in closed position.~~<u>One or more isolation valves for an unborated water source not secured in closed position.</u>	C.1 Initiate actions to secure valve in closed position<u>.</u>~~- except during planned dilution or makeup.~~ ~~Following a planned dilution or makeup, isolate all sources of unborated water by initiaing action to secure the valves closed within 15 minutes.~~ AND C.2 Perform SR 3.1.1.1 (SDM verification)	Immediately 4 hours

CTS-01558

CTS-01558

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.6.1	Verify required RHR or RCS loops are in operation. If no RCS loops are in operation, perform SR 3.4.6.4.	In accordance with the Surveillance Frequency Control Program
SR 3.4.6.2	Verify SG secondary side water levels are ≥ 14~~3~~% for required RCS loops.	In accordance with the Surveillance Frequency Control Program
SR 3.4.6.3	------------------------------NOTE------------------------- Not required to be performed until 24 hours after a required pump is not in operation. --- Verify correct breaker alignment and indicated power are available to each required pump.	In accordance with the Surveillance Frequency Control Program
SR 3.4.6.4	------------------------------NOTE------------------------- Not required to be performed unless no RCPs are in operation. --- Verify each valve that isolates unborated water sources is secured in the closed position.	In accordance with the Surveillance Frequency Control Program

CTS-01558

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.4.6.5	-------------------------------NOTE-------------------------- Not required to be performed until 12 hours after entering MODE 4. -- Verify required RHR loop locations susceptible to gas accumulation are sufficiently filled with water.	In accordance with the Surveillance Frequency Control Program

CTS-01558

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.7 RCS Loops - MODE 5, Loops Filled

LCO 3.4.7 Two residual heat removal (~~CS/~~RHR) loops shall be OPERABLE and in operation, and all sources of unborated water shall be isolated and either: CTS-01558

a. One additional RHR loop shall be OPERABLE or

b. The secondary side water level of at least two steam generators (SGs) shall be ≥ 14~~3~~%. CTS-01558

--NOTES--

1. The CS/RHR pumps of the loops in operation may be removed from operation for ≤ 1 hour per 8 hour period provided: CTS-01558

   a. No operations are permitted that would cause introduction of coolant into the RCS with boron concentration less than required to meet the SDM of LCO 3.1.1; and

   b. Core outlet temperature is maintained at least 10°F below saturation temperature.

~~1~~2. One required RHR loop may be inoperable for up to 2 hours for surveillance testing provided that the other two RHR loops are OPERABLE and in operation. CTS-01558

~~2~~3.. No reactor coolant pump shall be started with one or more RCS cold leg temperatures ≤ the Low Temperature Overpressure Protection (LTOP) arming temperature specified in the PTLR unless the secondary side water temperature of each SG is ≤ 50°F above each of the RCS cold leg temperatures. CTS-01558

~~3~~.4. All RHR loops may be removed from operation during planned heatup to MODE 4 when at least one RCS loop is in operation. The requirement for isolation of the unborated water sources is removed as soon as one RCP is in operation. CTS-01558

5. Except as prohibited in Note 1 above, an isolation valve for an unborated water source may be opened when in a planned dilution or makeup activity. CTS-01558

APPLICABILITY: MODE 5 with RCS Loops Filled.

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME	
C. -----------NOTE----------- Separate Condition entry is allowed for each unborated water source isolation valve. ------------------------------ -----------NOTE----------- Required Action C.2 must be completed whenever Condition C is entered. ------------------------------ ~~One or more valves not secured in closed position.~~One or more isolation valves for an unborated water source not secured in closed position.	C.1	Initiate actions to secure valve in closed position.~~ except during planned dilution or makeup.~~ ~~Following a planned dilution or makeup, isolate all source of unborated water by initiaing action to secure the valves closed within 15 minutes.~~	Immediately	CTS-01558
	AND			
	C.2	Perform SR 3.1.1.1 (SDM verification)	4 hours	CTS-01558

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.7.1	Verify required RHR loops are in operation.	In accordance with the Surveillance Frequency Control Program
SR 3.4.7.2	Verify SG secondary side water level is ≥ 14~~3~~% in required SGs.	In accordance with the Surveillance Frequency Control Program CTS-01558
SR 3.4.7.3	------------------------------NOTE------------------------- Not required to be performed until 24 hours after a required pump is not in operation. -- Verify correct breaker alignment and indicated power are available to each required CS/RHR pump.	In accordance with the Surveillance Frequency Control Program
SR 3.4.7.4	------------------------------NOTE------------------------- Not required to be performed unless no RCPs are in operation. -- Verify each valve that isolates unborated water sources is secured in the closed position.	In accordance with the Surveillance Frequency Control Program CTS-01558
SR 3.4.7.5	Verify required RHR loop locations susceptible to gas accumulation are sufficiently filled with water.	In accordance with the Surveillance Frequency Control Program CTS-01558

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.8 RCS Loops - MODE 5, Loops Not Filled

LCO 3.4.8 Three residual heat removal (RHR) loops shall be OPERABLE and two RHR loops shall be in operation, and low-pressure letdown line isolation valve shall be OPERABLE, and all sources of unborated water shall be isolated., with: CTS-01558

a. One OPERABLE safety injection (SI) pump, and

b. Required injection water volume from OPERABLE RWSP and refueling cavity.

--NOTES--

1. One CS/RHR pump may be removed from operation for ≤ 15 minutes when switching from one loop to another provided:

   a. The core outlet temperature is maintained > 10°F below saturation temperature,

   b. No operations are permitted that would cause introduction of coolant into the RCS with boron concentration less than required to meet the SDM of LCO 3.1.1; and

   c. No draining operations to further reduce the RCS water volume are permitted.

2. One required RHR loop may be inoperable for ≤ 2 hours for surveillance testing provided that the other two RHR loops are OPERABLE and in operation.

3. Except as prohibited in Note 1 above, an isolation valve for an unborated water source may be opened when in a planned dilution or makeup activity. CTS-01558

APPLICABILITY: MODE 5 with RCS loops not filled.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required RHR loop inoperable.	A.1 Initiate action to restore RHR loop to OPERABLE status.	Immediately

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. One low-pressure letdown isolation valve inoperable.	B.1	Initiate action to restore low-pressure letdown line isolation valve to OPERABLE status.	Immediately
C. Less than two required RHR loops OPERABLE. OR Less than two Required RHR loops in operation.	C.1	Suspend operations that would cause introduction of coolant into the RCS with boron concentration less than required to meet SDM of LCO 3.1.1.	Immediately
	AND		
	C.2	Initiate action to restore two RHR loops to OPERABLE status and operation.	Immediately
D. -----------NOTE----------- Separate Condition entry is allowed for each unborated water source isolation valve. ------------------------------ -----------NOTE----------- Required Action D.2 must be completed whenever Condition D is entered. ------------------------------ ~~One or more valves not secured in closed position.~~One or more isolation valves for an unborated water source not secured in closed position.	D.1	Initiate actions to secure valve in closed position.~~-~~ ~~except during planned dilution or makeup.~~ ~~Following a planned dilution or makeup, isolate all sources of unborated water by initiaing action to secure the valves closed within 15 minutes.~~	Immediately
	AND		
	D.2	Perform SR 3.1.1.1 (SDM verification)	4 hours

CTS-01558

CTS-01558

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. No SI pump is OPERABLE. OR RWSP and refueling cavity water volume is not within limits. OR RWSP boron concentration is not within limits.	E.1 Initiate action to restore OPERABILITY of SI pump.	Immediately
	AND	
	E.2 Initiate actions to suspend activities that may cause a reduction in RCS water volume.	Immediately
	AND	
	E.3 Initiate actions to restore RWSP and refueling cavity water volume to within limits.	Immediately
	AND	
	E.4 Initiate actions to restore RWSP boron concentration to within limits.	Immediately
F. No RHR loop is in operation.	F.1 Close the equipment hatch and secure with four bolts	4 hours
	AND	
	F.2 Close one door in each air lock.	4 hours
	AND	
	F.3.1 Close each penetration providing direct access from the containment atmosphere to the outside atmosphere with a manual or automatic isolation valve, blind flange, or equivalent. OR	4 hours
	F.3.2 Verify each penetration is capable of being closed by an OPERABLE Containment Purge and Exhaust Isolation System.	4 hours

CTS-01558

CTS-01558

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.8.1	Verify required RHR loops are in operation.	In accordance with the Surveillance Frequency Control Program
SR 3.4.8.2	------------------------------NOTE------------------------- Not required to be performed until 24 hours after a required pump is not in operation. --- Verify correct breaker alignment and indicated power are available to each required CS/RHR pump.	In accordance with the Surveillance Frequency Control Program
SR 3.4.8.3	Perform a complete cycle of each low-pressure letdown line isolation valve.	In accordance with the Surveillance Frequency Control Program
SR 3.4.8.4	------------------------------NOTE------------------------- Not required to be performed unless no RCPs are in operation. --- Verify each valve that isolates unborated water sources is secured in the closed position.	In accordance with the Surveillance Frequency Control Program
SR 3.4.8.5	Verify RHR loop locations susceptible to gas accumulation are sufficiently filled with water.	In accordance with the Surveillance Frequency Control Program
SR 3.4.8.6	Verify the RWSP borated water volume (including water available in the refueling cavity) is ≥ 79,920 ft^3 (597,800 gallons).	In accordance with the Surveillance Frequency Control Program

CTS-01558

CTS-01558

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY	
SR 3.4.8.7	Verify that the RWSP boron concentration is ≥ 4000 ppm and ≤ 4200 ppm.	In accordance with the Surveillance Frequency Control Program	CTS-01558
SR 3.4.8.8	Verify the correct breaker alignment and indicated power is available to the required SI pump.	In accordance with the Surveillance Frequency Control Program	CTS-01558
SR 3.4.8.9	Verify that one SI pump is capable of supplying developed head at the test flow point greater than or equal to the required developed head following a manual start.	In accordance with the Inservice Testing Program	CTS-01558

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
F. More than one block valve inoperable.	F.1	Restore one block valve to OPERABLE status.	2 hours
G. Required Action and associated Completion Time of Condition F not met.	G.1	Be in MODE 3.	6 hours
	AND		
	G.2	Be in MODE 4.	12 hours

CTS-01558

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.11.1	-------------------------------NOTE--------------------------- Not required to be performed with block valve closed in accordance with the Required Actions of this LCO. -- Perform a complete cycle of each block valve.	In accordance with the Surveillance Frequency Control Program
SR 3.4.11.2	Perform a complete cycle of each SDV.	In accordance with the Surveillance Frequency Control Program

ACTIONS

---NOTE---
LCO 3.0.4.b is not applicable when entering MODE 4.

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Three or more SI pumps capable of injecting into the RCS.	A.1	Initiate action to verify a maximum of two SI pumps are capable of injecting into the RCS.	Immediately
B. Two or more charging pumps capable of injecting into the RCS.	B.1	Initiate action to verify a maximum of one charging pump is capable of injecting into the RCS.	Immediately
C. An accumulator not isolated when the accumulator pressure is greater than or equal to the maximum RCS pressure for existing cold leg temperature allowed in the PTLR.	C.1	Isolate affected accumulator.	1 hour
D. Required Action and associated Completion Time of Condition C not met.	D.1	Increase RCS cold leg temperature to > LTOP arming temperature specified in the PTLR.	12 hours
	<u>OR</u>		
	D.2	Depressurize affected accumulator to less than the maximum RCS pressure for existing cold leg temperature allowed in the PTLR.	12 hours
E. One required RHR suction relief valve inoperable in MODE 4, 5, 6.	E.1	Restore required RHR suction relief valve to OPERABLE status.	12 hours
	<u>OR</u>		
	E.2	Depressurize RCS and establish RCS vent of ≥ 4.7 square inches.	12 hours

CTS-01558

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.12.1	Verify a maximum of two SI pumps are capable of injecting into the RCS.	In accordance with the Surveillance Frequency Control Program
SR 3.4.12.2	Verify a maximum of one charging pump is capable of injecting into the RCS.	In accordance with the Surveillance Frequency Control Program
SR 3.4.12.3	Verify each accumulator is isolated.	In accordance with the Surveillance Frequency Control Program
SR 3.4.12.4	Verify RHR suction valve is open for each required RHR suction relief valve.	In accordance with the Surveillance Frequency Control Program
SR 3.4.12.5	-------------------------------NOTE-------------------------- Only required to be performed when complying with LCO 3.4.12.b. --- Verify required RCS vent ≥ 4.7 square inches open.	In accordance with the Surveillance Frequency Control Program CTS-01558

SURVEILLANCE REQUIREMENTS

SURVEILLANCE			FREQUENCY
SR 3.5.2.1	Verify the following valves are in the listed position (with power to the valve operator removed).		In accordance with the Surveillance Frequency Control Program
Number	Function	Position	
SIS-AOV-201B and C	Accumulator Makeup	CLOSED	
SIS-MOV-024A, B, C and D	Safety Injection Pump Full-Flow Test Line Stop	CLOSED	
SR 3.5.2.2	-----------------------------NOTE----------------------------- Not required to be met for system vent flow paths opened under administrative control. --- Verify each SIS 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.		In accordance with the Surveillance Frequency Control Program
SR 3.5.2.3	Verify each SI pump's developed head at the test flow point is greater than or equal to the required developed head.		In accordance with the Inservice Testing Program
SR 3.5.2.4	Verify each ECCS valve manually activated during a design basis accident event in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position.		In accordance with the Inservice Testing Program
SR 3.5.2.5	Verify each SI pump starts automatically on an actual or simulated actuation signal.		In accordance with the Surveillance Frequency Control Program
SR 3.5.2.6	Verify by visual inspection, each SIS train ECC/CS STRAINER is not restricted by debris and shows no evidence of structural distress or abnormal corrosion.		In accordance with the Surveillance Frequency Control Program

CTS-01558

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.5.2.7	Verify ECCS locations susceptible to gas accumulation are sufficiently filled with water.	In accordance with the Surveillance Frequency Control Program

CTS-01558

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.5.4.1	-----------------------------NOTE---------------------------- Only required to be performed when containment air temperature is < 32°F or > 120°F. --- Verify RWSP borated water temperature is ≥ 32°F and ≤ 120°F.	In accordance with the Surveillance Frequency Control Program
SR 3.5.4.2	Verify RWSP borated water volume is ≥ ~~76,600~~79,920 ft^3 (~~573,000~~597,800 gallons).	In accordance with the Surveillance Frequency Control Program
SR 3.5.4.3	Verify RWSP boron concentration is ≥ 4000 ppm and ≤ 4200 ppm.	In accordance with the Surveillance Frequency Control Program
SR 3.5.4.4	Verify isotopic concentration of B-10 in the RWSP is ≥ 19.9% (atom percent).	In accordance with the Surveillance Frequency Control Program

CTS-01558

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	A.2.1 Lock the OPERABLE door closed in the affected air lock. OR A.2.2 --------------NOTE-------------- This Required Action is not applicable in MODE 4. ------------------------------------- Apply the requirements of Specification 5.5.18. <u>AND</u> A.3 --------------NOTE-------------- Air lock doors in high radiation areas may be verified locked closed by administrative means. ------------------------------------- Verify the OPERABLE door is locked closed in the affected air lock.	24 hours 24 hours Once per 31 days
B. One or more containment air locks with containment air lock interlock mechanism inoperable.	-------------------NOTES------------------ 1. Required Actions B.1, B.2, and B.3 are not applicable if both doors in the same air lock are inoperable and Condition C is entered. 2. Entry and exit of containment is permissible under the control of a dedicated individual. --- B.1 Verify an OPERABLE door is closed in the affected air lock. <u>AND</u>	1 hour

CTS-01558

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
	B.2.1	Lock an OPERABLE door closed in the affected air lock. OR	24 hours
	B.2.2	--------------NOTE-------------- This Required Action is not applicable in MODE 4. ------------------------------------- Apply the requirements of Specification 5.5.18.	24 hours
	AND		
	B.3	--------------NOTE-------------- Air lock doors in high radiation areas may be verified locked closed by administrative means. ------------------------------------- Verify an OPERABLE door is locked closed in the affected air lock.	Once per 31 days
C. One or more containment air locks inoperable for reasons other than Condition A or B.	C.1	Initiate action to evaluate overall containment leakage rate per LCO 3.6.1.	Immediately
	AND		
	C.2	Verify a door is closed in the affected air lock.	1 hour
	AND		
	C.3.1	Restore air lock to OPERABLE status. OR	24 hours

CTS-01558

CTS-01558

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. ------------NOTE------------ Only applicable to penetration flow paths with two containment isolation valves. --------------------------------- One or more penetration flow paths with two containment isolation valves inoperable for reasons other than Condition D.	B.1	Isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, or blind flange.	1 hour
C. ------------NOTE------------ Only applicable to penetration flow paths with only one containment isolation valve and a closed system. --------------------------------- One or more penetration flow paths with one containment isolation valve inoperable.	C.1.1	Isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, or blind flange. OR	72 hours
	C.1.2	-------------NOTE-------------- This Required Action is not applicable in MODE 4. ------------------------------------ Apply the requirements of Specification 5.5.18.	72 hours
	AND		

CTS-01558

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.6.6.1	Verify each containment spray 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.	In accordance with the Surveillance Frequency Control Program
SR 3.6.6.2	Verify each ~~containment spray~~CS/RHR pump's developed head at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.6.6.3	Verify each automatic containment spray valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	In accordance with the Surveillance Frequency Control Program
SR 3.6.6.4	Verify each ~~containment spray~~CS/RHR pump starts automatically on an actual or simulated actuation signal.	In accordance with the Surveillance Frequency Control Program
SR 3.6.6.5	Verify each spray nozzle is unobstructed.	At first refueling AND In accordance with the Surveillance Frequency Control Program

CTS-01558

CTS-01558

3.7 PLANT SYSTEMS

3.7.5 Emergency Feedwater System (EFWS)

LCO 3.7.5 Four EFW trains shall be OPERABLE with all EFW pump discharge cross-connect line isolation valves in all trains closed.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

--NOTE--
LCO 3.0.4.b is not applicable when entering MODE 1.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One steam supply to one turbine driven EFW pump inoperable. OR ------------NOTE------------ Only applicable if MODE 2 has not been entered following refueling. --------------------------------- One turbine driven EFW pump inoperable in MODE 3 following refueling.	A.1 Restore affected equipment to OPERABLE status. OR --------------NOTE-------------- When the EFW pump discharge cross-connect line isolation valves are closed. ------------------------------------- A.2 Open all EFW pump discharge cross-connect line isolation valves.	7 days 7 days

CTS-01558

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. One EFW train inoperable in MODE 1, 2, or 3 for reasons other than Condition A.	B.1	Restore EFW train to OPERABLE status.	72 hours
	OR		
		--------------NOTE-------------- When the EFW pump discharge cross-connect line isolation valves are closed. -------------------------------------	
	B.2	Open all EFW pump discharge cross-connect line isolation valves.	72 hours
C. Required Action and associated Completion Time for Condition A or B not met. OR Two EFW trains inoperable in MODE 1, 2, or 3.	C.1	Be in MODE 3.	6 hours
	AND		
	C.2	Be in MODE 4.	12 hours
D. Three EFW trains inoperable in MODE 1, 2, or 3.	D.1	--------------NOTE-------------- LCO 3.0.3 and all other LCO Required Actions requiring MODE changes are suspended until one additional EFW train is restored to OPERABLE status. -------------------------------------	
		Initiate action to restore one additional EFW train to OPERABLE status.	Immediately

CTS-01558

3.7 PLANT SYSTEMS

3.7.6 Emergency Feedwater Pit (EFW Pit)

LCO 3.7.6 Two EFW Pits shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or both EFW Pits inoperable.	A.1 Verify by administrative means OPERABILITY of backup water supply.	4 hours AND Once per 12 hours thereafter
	AND	
	A.2.1 Restore both EFW Pits to OPERABLE status. OR	7 days
	A.2.2 Apply the requirements of Specification 5.5.18.	7 days
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	6 hours
	AND	
	B.2 Be in MODE 4.	12 hours

CTS-01558

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.6.1	Verify each EFW Pit level is ≥ 204,850 gallons.	In accordance with the Surveillance Frequency Control Program

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. Required Action and associated Completion Time of Condition A, B, C, or D not met. OR UHS inoperable for reasons other than Condition A, B, C, or D.	E.1 Be in MODE 3. AND E.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.9.1	Verify each required UHS basin water inventory is ≥ 2,8~~0~~50,000 gallons.	In accordance with the Surveillance Frequency Control Program
SR 3.7.9.2	Verify water temperature of UHS is ≤ 93°F.	In accordance with the Surveillance Frequency Control Program
SR 3.7.9.3	Operate each cooling tower fan for ≥ 15 minutes.	In accordance with the Surveillance Frequency Control Program
SR 3.7.9.4	Verify each cooling tower fan starts automatically on an actual or simulated actuation signal.	In accordance with the Surveillance Frequency Control Program
SR 3.7.9.5	Verify each UHS transfer pump starts on manual actuation.	In accordance with the Inservice Testing Program

CTS-01558

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. Required Action and associated Completion Time of Condition A, B, or C not met in MODE 1, 2, 3, or 4.	D.1	Be in MODE 3.	6 hours
	<u>AND</u>		
	D.2	Be in MODE 5.	36 hours
E. Required Action and associated Completion Time of Condition A or B not met during movement of irradiated fuel assemblies.	E.1	Place OPERABLE MCRVS trains in emergency mode.	Immediately
	<u>OR</u>		
	E.2	Suspend movement of irradiated fuel assemblies.	Immediately
F. Required MCRVS inoperable during movement of irradiated fuel assemblies. <u>OR</u> Required MCRVS inoperable due to inoperable CRE boundary during movement of irradiated fuel assemblies.	F.1	Suspend movement of irradiated fuel assemblies.	Immediately
G. Required MCRVS inoperable in MODE 1, 2, 3, or 4 for reasons other than Condition C.	G.1	Enter LCO 3.0.3.	Immediately

CTS-01558

3.7 PLANT SYSTEMS

3.7.12 Spent Fuel Storage Pit Water Level CTS-01558

LCO 3.7.12 The spent fuel storage pit water level shall be ≥ 23 ft over the top of irradiated fuel assemblies seated in the storage racks.

APPLICABILITY: During movement of irradiated fuel assemblies in the fuel storage pit.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Spent Ffuel storage pit water level not within limit.	A.1 --------------NOTE-------------- LCO 3.0.3 is not applicable. ------------------------------------- Suspend movement of irradiated fuel assemblies in the spent fuel storage pit.	 Immediately

CTS-01558
CTS-01558

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.12.1	Verify the spent fuel storage pit water level is ≥ 23 ft above the top of the irradiated fuel assemblies seated in the storage racks.	At the start of any spent fuel movement campaign AND In accordance with the Surveillance Frequency Control Program

CTS-01558
CTS-01558

3.7 PLANT SYSTEMS

3.7.13 Spent Fuel ~~Storage~~ Pit Boron Concentration CTS-01558

LCO 3.7.13 The spent fuel ~~storage~~ pit boron concentration shall be ≥ 4000 ppm.

APPLICABILITY: When fuel assemblies are stored in the spent fuel ~~storage~~ pit and a spent fuel ~~storage~~ pit verification has not been performed since the last movement of fuel assemblies in the spent fuel ~~storage~~ pit.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Spent ~~F~~fuel ~~storage~~ pit boron concentration not within limit.	--------------------NOTE------------------- LCO 3.0.3 is not applicable. ---	CTS-01558
	A.1 Suspend movement of fuel assemblies in the spent fuel ~~storage~~ pit.	Immediately CTS-01558
	AND	
	A.2.1 Initiate action to restore spent fuel ~~storage~~ pit boron concentration to within limit.	Immediately CTS-01558
	OR	
	A.2.2 Initiate action to perform a spent fuel ~~storage~~ pit verification.	Immediately CTS-01558

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.13.1	Verify the spent fuel ~~storage~~ pit boron concentration is within limit.	In accordance with the Surveillance Frequency Control Program CTS-01558

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	OR A.3.2 -------------NOTE-------------- This Required Action is not applicable in MODE 4. ----------------------------------- Apply the requirements of Specification 5.5.18.	 72 hours
B. One required Class 1E GTG inoperable.	B.1 Perform SR 3.8.1.1 for the required offsite circuit(s).	1 hour AND Once per 8 hours thereafter
	AND	
	B.2 Declare required feature(s) supported by the inoperable Class 1E GTGs inoperable when its required redundant feature in a train with an OPERABLE Class 1E GTG is inoperable.	4 hours from discovery of Condition B concurrent with inoperability of redundant required feature(s)
	AND	
	B.3.1 Determine OPERABLE Class 1E GTGs are not inoperable due to common cause failure.	24 hours
	OR	
	B.3.2 Perform SR 3.8.1.2 for OPERABLE Class 1E GTGs.	24 hours

CTS-01558

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	AND	
	B.4.1 Restore required Class 1E GTGs in three trains to OPERABLE status.	72 hours
	OR	
	B.4.2 -------------NOTE-------------- This Required Action is not applicable in MODE 4. ---------------------------------- Apply the requirements of Specification 5.5.18	72 hours
C. Two required offsite circuits inoperable.	C.1 Declare required feature(s) inoperable when its redundant required feature(s) is inoperable	12 hours from discovery of Condition C concurrent with inoperability of redundant required features
	AND	
	C.2.1 Restore one required offsite circuit to OPERABLE status.	24 hours
	OR	
	C.2.2 -------------NOTE-------------- This Required Action is not applicable in MODE 4. ---------------------------------- Apply the requirements of Specification 5.5.18.	24 hours

CTS-01558

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.19	Verify when started simultaneously from standby condition, each Class 1E GTG achieves: a. In ≤ 100 seconds, voltage ≥ 6762 V and frequency ≥ 59.4 Hz and b. Steady state voltage ≥ 6762 V and ≤ 7038 V, and frequency ≥ 59.4 Hz and ≤ 60.6 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.20	Perform cleaning of fuel nozzles for each Class 1E gas turbine generator.	Once per 50 gas turbine generator starts

CTS-01558

3.8 ELECTRICAL POWER SYSTEMS

3.8.10 Distribution Systems - Shutdown

LCO 3.8.10 The necessary portions of ac, dc, and ac vital bus electrical power distribution subsystems shall be OPERABLE to support equipment required to be OPERABLE.

APPLICABILITY: MODES 5 and 6,
During movement of irradiated fuel assemblies.

ACTIONS

--NOTE--
LCO 3.0.3 is not applicable.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required ac, dc, or ac vital bus electrical power distribution subsystems inoperable.	A.1 Declare associated supported required feature(s) inoperable.	Immediately
	<u>OR</u>	CTS-01558
	A.2.1 Suspend CORE ALTERATIONS.	Immediately
	<u>AND</u>	CTS-01558
	A.2.2 Suspend movement of irradiated fuel assemblies.	Immediately
	<u>AND</u>	CTS-01558
	A.2.3 Suspend operations involving positive reactivity additions that could result in loss of required SDM or boron concentration.	Immediately
	<u>AND</u>	CTS-01558

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
	A.4 Close equipment hatch and secure with four bolts.	4 hours
	AND	
	A.5 Close one door in each air lock.	4 hours
	AND	
	A.6.1 Close each penetration providing direct access from the containment atmosphere to the outside atmosphere with a manual or automatic isolation valve, blind flange, or equivalent.	4 hours
	OR	
	A.6.2 Verify each penetration is capable of being closed by an OPERABLE Containment Purge and Exhaust Isolation System.	4 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.5.1	Verify two RHR loops are in operation and circulating reactor coolant at a flow rate of ≥ 2645 gpm per pump.	In accordance with the Surveillance Frequency Control Program
SR 3.9.5.2	Verify required RHR loop locations susceptible to gas accumulation are sufficiently filled with water.	In accordance with the Surveillance Frequency Control Program

CTS-01558

3.9 REFUELING OPERATIONS

3.9.6 Residual Heat Removal (RHR) and Coolant Circulation - Low Water Level

LCO 3.9.6 Three RHR loops shall be OPERABLE, and two RHR loops shall be in operation, and low-pressure letdown line isolation valve shall be OPERABLE~~.~~, with: CTS-01558

a. One OPERABLE safety injection (SI) pump, and

b. Required injection water volume from OPERABLE RWSP and refueling cavity.

---NOTES---

1. All CS/RHR pumps may be removed from operation for ≤ 15 minutes when switching from one train to another provided: CTS-01558

   a. The core outlet temperature is maintained > 10 degrees F below saturation temperature,

   b. No operations are permitted that would cause introduction of coolant into the Reactor Coolant System (RCS) with boron concentration less than that required to meet the minimum required boron concentration of LCO 3.9.1, and

   c. No draining operations to further reduce RCS water volume are permitted.

2. One required RHR loop may be inoperable for up to 2 hours for surveillance testing, provided that the other RHR loops are OPERABLE and in operation.

APPLICABILITY: MODE 6 with the water level < 23 ft above the top of reactor vessel flange.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Less than the required number of RHR loops OPERABLE.	A.1 Initiate action to restore required RHR loops to OPERABLE status. OR	Immediately

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
	C.5.1	Close each penetrations providing direct access from the containment atmosphere to the outside atmosphere with a manual or automatic isolation valve, blind flange, or equivalent.	4 hours
	OR		
	C.5.2	Verify each penetration is capable of being closed by an OPERABLE Containment Purge and Exhaust Isolation System.	4 hours
D. No SI pump is OPERABLE. OR RWSP and refueling cavity water volume is not within limits. OR RWSP boron concentration is not within limits.	D.1	Initiate action to restore OPERABILITY of SI pump.	Immediately
	AND		
	D.2	Initiate actions to suspend activities that may cause a reduction in RCS water volume.	Immediately
	AND		
	D.3	Initiate actions to restore RWSP and refueling cavity water volume to within limits.	Immediately
	AND		
	D.4	Initiate actions to restore RWSP boron concentration to within limits.	Immediately

CTS-01558

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.6.1	Verify two RHR loops are in operation and circulating reactor coolant at a flow rate of ≥ 2645 gpm per pump.	In accordance with the Surveillance Frequency Control Program
SR 3.9.6.2	Verify correct breaker alignment and indicated power available to the required CS/RHR pump that is not in operation.	In accordance with the Surveillance Frequency Control Program
SR 3.9.6.3	Perform a complete cycle of each low-pressure letdown line isolation valve.	In accordance with the Surveillance Frequency Control Program
SR 3.9.6.4	Verify RHR loop locations susceptible to gas accumulation are sufficiently filled with water.	In accordance with the Surveillance Frequency Control Program

CTS-01558

CTS-01558

4.0 DESIGN FEATURES

4.3 Fuel Storage

4.3.1 Criticality

4.3.1.1 The spent fuel storage racks are designed and shall be maintained with:

a. Fuel assemblies having a maximum U-235 enrichment of 5.0 weight percent,

b. k_{eff} ≤ 0.95 if fully flooded with unborated water, which includes an allowance for uncertainties as described in Subsection 9.1.1 of the FSAR, and | CTS-01558

c. A nominal 11.1 inch center to center distance between fuel assemblies placed in spent fuel storage racks.

4.3.1.2 The new fuel storage racks are designed and shall be maintained with:

a. Fuel assemblies having a maximum U-235 enrichment of 5.0 weight percent,

b. k_{eff} ≤ 0.95 if fully flooded with unborated water, which includes an allowance for uncertainties as described in Subsection 9.1.1 of the FSAR,

c. k_{eff} ≤ 0.98 if moderated by aqueous foam, which includes an allowance for uncertainties as described in Subsection 9.1.1 of the FSAR, and

d. A nominal 16.9 inch center to center distance between fuel assemblies placed in the storage racks.

4.3.1.3 The containment racks are designed and shall be maintained with: CTS-01558

a. Fuel assemblies having a maximum U-235 enrichment of 5.0 weight percent,

b. k_{eff} ≤ 0.95 if fully flooded with unborated water, which includes an allowance for uncertainties as described in Subsection 9.1.1 of the FSAR, and

c. A nominal 16.9 inch center-to-center distance between fuel assemblies placed in the containment racks.

4.3.2 Drainage

The spent fuel ~~storage~~ pit is designed and shall be maintained to prevent inadvertent draining of the pit below 23 ft above the top of irradiated fuel assemblies seated in the storage racks. CTS-01558

4.3.3 Capacity

The spent fuel ~~storage~~ pit is designed and shall be maintained with a storage capacity limited to no more than 900 fuel assemblies. CTS-01558

5.5.11 Ventilation Filter Testing Program (continued)

d. Demonstrate for each of the ESF systems that the pressure drop across the combined HEPA filters, the prefilters, and the charcoal adsorbers is less than the value specified below when tested in accordance with Regulatory Guide 1.52, Revision 3, and ASME N510-1989 at the system flowrate specified below ± 10%.

ESF Ventilation System	Delta P	Flowrate	
MCREFS	~~1600 kPa~~ 6.4 in. water gage	3600 cfm	CTS-01558
AEES	~~800 kPa~~ 3.2 in. water gage	5600 cfm	CTS-01558

e. Demonstrate that the heaters for each of the ESF systems dissipate the value specified below ± 10% when tested in accordance with ASME N510-1989.

ESF Ventilation System	Wattage
MCREFS	18,000 watts

The provisions of SR 3.0.2 and SR 3.0.3 are applicable to the VFTP test frequencies.

5.5 Programs and Manuals

5.5.16 Containment Leakage Rate Testing Program

a. A program shall establish the leakage rate testing of the containment as required by 10 CFR 50.54(o) and 10 CFR 50, Appendix J, Option B. This program shall be in accordance with the guidelines contained in Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program," dated September, 1995:

1. The visual examination of containment concrete surfaces intended to fulfill the requirements of 10 CFR 50, Appendix J, Option B testing, will be performed in accordance with the requirements of and frequency specified by the ASME Section XI Code, Subsection IWL, except where relief has been authorized by the NRC.

2. The visual examination of the steel liner plate inside containment intended to fulfill the requirements of 10 CFR 50, Appendix J, Option B, will be performed in accordance with the requirements of and frequency specified by the ASME Section XI Code, Subsection IWE, except where relief has been authorized by the NRC.

b. The calculated peak containment internal pressure for the design basis loss of coolant accident, P_a, is 59.5 psig. The containment design pressure is 68 psig.

c. The maximum allowable containment leakage rate, L_a, at P_a, shall be 0.10% of containment air weight per day.

d. Leakage rate acceptance criteria are:

1. Primary ~~C~~containment leakage rate acceptance criterion is 1.0 L_a. During the first unit startup following testing in accordance with this program, the leakage rate acceptance criteria for primary containment are < 0.60 L_a for the Type B and C tests combined and < 0.75 L_a for Type A tests. For the containment penetration areas, the acceptance criterion is < 0.50 L_a for Type C tests. CTS-01558 CTS-01558

2. Air lock testing acceptance criteria are:

a. Overall air lock leakage rate is ≤ 0.05 L_a when tested at ≥ P_a.

b. For each door, leakage rate is ≤ 0.01 L_a when pressurized to ≥ 10 psig.

e. The provisions of SR 3.0.3 are applicable to the Containment Leakage Rate Testing Program.

f. Nothing in these Technical Specifications shall be construed to modify the testing Frequencies required by 10 CFR 50, Appendix J.

5.5.17 Battery Monitoring and Maintenance Program

This Program provides for battery restoration and maintenance, based on the recommendations of IEEE Standard 450-~~1995~~2002, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications," or of the battery manufacturer including the following: CTS-01558

a. Actions to restore battery cells with float voltage < 2.13 V, and

b. Actions to equalize and test battery cells that had been discovered with electrolyte level below the minimum established design limit.

5.5.18 Configuration Risk Management Program (CRMP)

This program provides controls for Completion Times. The program shall ensure that the assessment of configuration-specific risk to support the extension of Completion Times, and reassessment of configuration changes, and implementation of compensatory measures and actions at the appropriate risk thresholds are performed sufficient to assure the associated Limiting Conditions for Operation are met.

a. When entering into this specification, the following actions shall be taken in accordance with NEI 06-09 (as used in this specification, NEI 06-09 refers to Revision 0 as modified and supplemented by "Comanche Peak Nuclear Power Units 3 and 4 Technical Specifications Methodology for Risk-Managed Technical Specifications and Surveillance Frequency Control Program," Revision ~~[x]~~2). RCOL2_16-10 S01

   1. Within the completion time of the referencing specification determine that the plant configuration is acceptable beyond the completion time,

      AND

   2. Calculate the Risk-Informed Completion Time (RICT),

      AND

   3. Restore required subsystems or components to operable status within the RICT or 30 days, whichever is less.

   OR

   Take the ACTIONs required in the referencing specification for the required action and associated completion time not met.

b. The RICT shall be recalculated whenever plant configuration change occurs, in accordance with NEI 06-09.

5.6.3 CORE OPERATING LIMITS REPORT (COLR)

a. Core operating limits shall be established prior to each cycle, or prior to any remaining portion of a cycle, and shall be documented in the COLR for the following:

2.1.1, “Reactor Core SLs”
3.1.1, “SHUTDOWN MARGIN (SDM)”
3.1.3, “Moderator Temperature Coefficient (MTC)”
3.1.5, “Shutdown Bank Insertion Limits”
3.1.6, “Control Bank Insertion Limits”
3.2.1, “Heat Flux Hot Channel Factor ($F_Q(Z)$ (CAOC-W(Z) Methodology)”
3.2.2, “Nuclear Enthalpy Rise Hot Channel Factor ($F^N_{\Delta H}$)”
3.2.3, “AXIAL FLUX DIFFERENCE (Constant Axial Offset Control (CAOC) Methodology)”
3.3.1, “Reactor Trip System (RTS) Instrumentation”
3.4.1, “RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits”
3.9.1, “Boron Concentration”

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

1. MUAP-07026-P, “Mitsubishi Reload Evaluation Methodology”, ~~December 2007~~August, 2013. CTS-01558

   (Methodology for Specifications 2.1.1 - Reactor Core SLs, 3.1.1 - SHUTDOWN MARGIN, 3.1.3 - Moderator Temperature Coefficient, 3.1.5 - Shutdown Bank Insertion Limits, 3.1.6 - Control Bank Insertion Limits, 3.2.1 - Heat Flux Hot Channel Factor, 3.2.2 - Nuclear Enthalpy Rise Hot Channel Factor, 3.2.3 - AXIAL FLUX DIFFERENCE (Constant Axial Offset Control), 3.3.1 - Reactor Trip System (RTS) Instrumentation, and 3.9.1 - Boron Concentration.)

2. WCAP-8385, “Power Distribution Control and Load Following Procedures - Topical Report,” September 1974 (Westinghouse Proprietary) and WCAP-8403 (Non-Proprietary).

   (Methodology for Specification 3.2.3 - AXIAL FLUX DIFFERENCE (Constant Axial Offset Control).)

Bases

Bases – Tracking Report Revision List

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev. of T/R
CTS-01558	B 3.1.3 REFERENCES 3.	B 3.1.3.-6	Consistency with DCD	Changed reference year for MUAP-07026-P	0
CTS-01558	B 3.1.8 BACKGROUND a.	B 3.1.8-2	Consistency with DCD	Changed reference year for ANSI/ANS-19.6.1	0
CTS-01558	B 3.1.8 APPLICABLE SAFETY ANALYSES	B 3.1.8-3	Consistency with DCD	Changed reference year for ANSI/ANS-19.6.1	0
CTS-01558	B 3.1.8 REFERENCES	B 3.1.8-8	Consistency with DCD	Changed reference year for ANSI/ANS-19.6.1 and MUAP-07026-P	0
CTS-01558	B 3.1.9 APPLICABLE SAFETY ANALYSES	B 3.1.9-4	Consistency with DCD	Changed reference year for ANSI/ANS-19.6.1	0
CTS-01558	B 3.1.9 REFERENCES	B 3.1.9-8	Consistency with DCD	Changed reference year for ANSI/ANS-19.6.1 and MUAP-07026-P	0
CTS-01558	B 3.3.1 BACKGROUND	B 3.3.1-2	Editorial	Changed “as found” to "as-found" to add missing hyphen.	0
CTS-01558	B 3.3.1 BACKGROUND	B 3.3.1-8	Editorial	Deleted “accuracy”.	0
CTS-01558	B 3.3.1 BACKGROUND	B 3.3.1-9	Consistency with DCD	Added two paragraphs from DCD section B 3.3.1 that discuss the Class 1E Electrical Room HVAC System.	0
CTS-01558	B 3.3.1 APPLICABLE SAFETY ANALYSES	B 3.3.1-19	Editorial	Added comma after "i.e." in the parenthetical remark in the first sentence.	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev. of T/R
CTS-01558	B 3.3.1 APPLICABLE SAFETY ANALYSES 15 a.	B 3.3.1-29	Editorial	Change “eading” (sic) to "reading" to correct spelling error.	0
CTS-01558	B 3.3.1 ACTION	B 3.3.1-37	Editorial	Added space between "Function" and "is".	0
CTS-01558	B 3.3.1 ACTION	B 3.3.1-38	Editorial	Change to "ensures" to “ensures” to correct verb tense.	0
CTS-01558	B 3.3.1 SURVEILLANCE REQUIREMENTS	B 3.3.1-59	Editorial	Deleted “the frequency”.	0
CTS-01558	B 3.3.1 SURVEILLANCE REQUIREMENTS REFERNCES 2, 11 and 12	B 3.3.1-65	Editorial Consistency with DCD	Added space between "FSAR" and "Section". Changed revision number of reference from “2” to “3”.	0
CTS-01558	B 3.3.2 BACKGROUND	B 3.3.2-6	Editorial	Deleted ",".	0
CTS-01558	B 3.3.2 APPLICABLE SAFETY ANALYSES 2	B 3.3.2-18	Editorial	Changed “containment spray” to “CS/RHR” to correct the name of the CS/RHR pumps.	0
CTS-01558	B 3.3.2 APPLICABLE SAFETY ANALYSES (2)	B 3.3.2-27	Editorial	Deleted ")". Changed “the” to “this” to correct spelling error.	0
CTS-01558	B 3.3.2 APPLICABLE SAFETY ANALYSES c.	B 3.3.2-30	Consistency with DCD Consistency with DCD	Added "the protection function actuation. Therefore,”. This splits a run-on sentence. Added "requires only two additional channels to provide the protection function".	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev. of T/R
CTS-01558	B 3.3.2 APPLICABLE SAFETY ANALYSES	B 3.3.2-32	Editorial	Changed " msut" (sic) to "must" to correct spelling error.	0
CTS-01558	B 3.3.2 APPLICABLE SAFETY ANALYSES f.	B 3.3.2-36	Editorial	Changed "all" to "All" in term "Trip of all Main Feedwater Pumps".	0
CTS-01558	B 3.3.2 APPLICABLE SAFETY ANALYSES c.	B 3.3.2-37	Editorial	Changed "require" to "required" to correct verb tense.	0
CTS-01558	B 3.3.2 APPLICABLE SAFETY ANALYSES 11.	B 3.3.2-43	Editorial	Added space between "interlocks" and "are".	0
CTS-01558	B 3.3.2 APPLICABLE SAFETY ANALYSES a.	B 3.3.2-44	Editorial	Added period after "setpoint".	0
CTS-01558	B 3.3.2 APPLICABLE SAFETY ANALYSES 13.	B 3.3.2-47	Editorial	Added period after "3.7.10".	0
CTS-01558	B 3.3.2 APPLICABLE SAFETY ANALYSES 14. a. and b.	B 3.3.2-51	Consistency with DCD Consistency with DCD Editorial	Added "in MODES 1, 2 and 3. In MODES 4, 5 and 6, the average coolant temperature is below the Low-Low Tavg Signal setpoint and this Function is not required to be OPERABLE .". Deleted sentence. Added space between "Each" and "Turbine".	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev . of T/R
CTS-01558	B 3.3.2 APPLICABLE SAFETY ANALYSES 14. a. and b.	B 3.3.2-52 [B 3.3.2-53]	Consistency with DCD	Changed description of Low-Low Tavg signal.	0
CTS-01558	B 3.3.2 APPLICABLE SAFETY ANALYSES 14. C.	B 3.3.2-53 [B 3.3.2-54 through B 3.3.2-56]	Consistency with DCD	Inserted replacement text.	0
CTS-01558	B 3.3.2 APPLICABLE SAFETY ANALYSES 15 B.1, B.2.1 and B.2.2.	B 3.3.2-55 [B 3.3.2-58]	Editorial	Deleted "out".	0
CTS-01558	B 3.3.2 ACTIONS F.1, F.2.1, and F.2.2	B 3.3.2-60 [B 3.3.2-63]	Consistency with DCD Consistency with DCD	Deleted "and" Changed to ", and" and Added bullet "Main Steam Relief Line Isolation".	0
CTS-01558	B 3.3.2 ACTIONS	B 3.3.2-61 [B 3.3.2-64]	Consistency with DCD Consistency with DCD	Deleted "and". Added ", and Main Steam Relief Line Isolation" after "Valves".	0
CTS-01558	B 3.3.2 ACTIONS	B 3.3.2-62 [B 3.3.2-65]	Consistency with DCD Consistency with DCD	Deleted "and" Changed to ", and" and Added bullet "Main Steam Relief Line Isolation".	0
CTS-01558	B 3.3.2 ACTIONS	B 3.3.2-72 [B 3.3.2-75]	Editorial	Changed to "considers" to correct verb tense.	0
CTS-01558	B 3.3.2 SURVEILLANCE REQUIREMENTS	B 3.3.2-83 [B 3.3.2-86]	Editorial	Changed to ",".	0
CTS-01558	B 3.3.2 SURVEILLANCE REQUIREM	B 3.3.2-84 [B 3.3.2-87]	Editorial	Delete extra period.	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev . of T/R
	ENTS				
CTS-01558	B 3.3.2 REFERENCES	B 3.3.2-89 [B 3.3.2-92]	Editorial Consistency with DCD	Deleted hyphen. Changed revision number of reference from “2” to “3”.	0
CTS-01558	B 3.3.3 LCO	B 3.3.3-3	Editorial	Changed to "ensures” to “ensures” to correct verb tense.	0
CTS-01558	B 3.3.3 REFERENCES	B 3.3.3-18	Consistency with DCD	Changed revision number of reference from “2” to “3”.	0
CTS-01558	B 3.3.4 ACTIONS A.1	B 3.3.4-4	Editorial	Added period after “inoperable”.	0
CTS-01558	B 3.3.4 REFERENCES	B 3.3.4-9	Consistency with DCD	Changed revision number of reference from “2” to “3”.	0
CTS-01558	B 3.3.4 Table B 3.3.4-1 (Sheet 2 of 2)	B 3.3.4-11	Consistency with DCD	Added “e. CCW Pump Discharge Pressure 1 per Required Pump”	0
CTS-01558	B 3.3.4 Table B 3.3.4-2 (Sheet 2 of 3)	B 3.3.4-13	Consistency with DCD Consistency with DCD	Added “1st” between “Outlet” and “Valve”. Added bullet “c. CS/RHR Hx CCW Outlet 2nd Valve 1 per Required Pump”.	0
CTS-01558	B 3.3.5 REFERENCES	B 3.3.5-9	Consistency with DCD	Changed revision number of reference from “2” to “3”.	0
CTS-01558	B 3.3.6 APPLICABLE SAFETY ANALYSES 1. f.	B 3.3.6-11	Editorial	Added space between "set" and "and".	0
CTS-01558	B 3.3.6 ACTIONS	B 3.3.6-15	Editorial	Deleted extra period.	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev. of T/R
CTS-01558	B 3.3.6 SURVEILLANCE REQUIREMENTS SR 3.3.6.5	B 3.3.6-18	Editorial	Changed "Automatic Actuation Logic" to "automatic actuation logic".	0
CTS-01558	B 3.3.6 REFERENCES	B 3.3.6-19	Consistency with DCD	Changed revision number of reference from "4" to "5" and "2" to "3".	0
CTS-01558	B 3.4.2 APPLICABLE SAFETY ANALYSES	B 3.4.2-2	Consistency with DCD	Changed to nominal temperature for criticality.	0
CTS-01558	B 3.4.5 SURVEILLANCE REQUIREMENTS SR 3.4.5.2	B 3.4.5-6	Consistency with DCD	Changed SG Secondary side water level from greater than or equal to 13% to 14%	0
CTS-01558	B 3.4.6 BACKGROUND	B 3.4.6-1	Consistency with DCD	"residual" is changed to "containment spray/residual"	0
CTS-01558	B 3.4.6 BACKGROUND	B 3.4.6-1	Reflect response to RAI No. 986 MHI Letter No. UAP-HF-13104 (04/25/2013). ADAMS Accession Number: ML13119A164	Discussion of the Safeguards Component Area HVAC System is added to background.	0
CTS-01558	LCO	B 3.4.6-2	Reflect response to Amended DCD RAI No. 902 MHI Letter No. UAP-HF-13114 (05/28/2013). ADAMS Accession Number: ML 13151A039	Discussion of isolating unborated water from the RCS is added to LCO discussion.	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev . of T/R
	LCO b.	B 3.4.6-2 [B 3.4.6-3]	Reflect response to Amended DCD RAI No. 902 MHI Letter No. UAP-HF-13114 (05/28/2013). ADAMS Accession Number: ML 13151A039	Discussion of Note 3 is added to LCO.	
	LCO	B 3.4.6-3 [B 3.4.6-4]	Reflect response to DCD RAI No. 464 amended MHI Letter No. UAP-HF-12223 (08/06/2012) ADAMS Accession Number ML12221A274	Management of gas voids is important to RHRS operability.	
	ACTIONS	B 3.4.6-5 [B 3.4.6-6]	Reflect response to Amended DCD RAI No. 902 MHI Letter No. UAP-HF-13114 (05/28/2013). ADAMS Accession Number: ML 13151A039	Part of Action C is deleted.	
CTS-01558	SURVEILLANCE REQUIREMENTS	B 3.4.6-6 [B 3.4.6-7]	Consistency with DCD	Changed SG Secondary side water level from greater than or equal to 13% to 14%	0
	SURVEILLANCE REQUIREMENTS	B 3.4.6-7 [B 3.4.6-8]	Reflect response to Amended DCD RAI No. 902 MHI Letter No. UAP-HF-13114 (05/28/2013) ADAMS Accession Number: ML13151A039	"Verify" is changed to "Verification"	
	SURVEILLANCE REQUIREMENTS SR 3.4.6.5 (NEW)	B 3.4.6-7 [B 3.4.6-8 and B 3.4.6-9]	Reflect response to DCD RAI No. 464 amended MHI Letter No. UAP-HF-12223 (08/06/2012) ADAMS Accession Number	SR 3.4.6.5 is added.	

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev . of T/R
			ML12221A274 Editorial	 Various editorial changes made.	
CTS-01558	B 3.4.7 BACKGROUND	B 3.4.7-1	Consistency with DCD Consistency with DCD	"residual" is changed to "containment spray/residual" Changed SG Secondary side water level from greater than or equal to 13% to 14%	0
	B 3.4.7 BACKGROUND	B 3.4.7-2 B 3.4.7-3	Reflect response to DCD RAI No. 986 MHI Letter No. UAP-HF-13104 (04/25/2013) ADAMS Accession Number : ML13119A164	Discussion of the Safeguards Component Area HVAC System is added to background.	
	LCO	B 3.4.7-2	Reflect response to Amended DCD RAI No. 902 MHI Letter No. UAP-HF-13114 (05/28/2013) ADAMS Accession Number: ML13151A039	Part of LCO in 2nd paragraph is deleted by seeing the Note5.	
CTS-01558	B 3.4.7 LCO	B 3.4.7-3 [B 3.4.7-4]	Reflect response to Amended DCD RAI No. 902 MHI Letter No. UAP-HF-13114 (05/28/2013) ADAMS	Discussion of Note 5 is added.	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev. of T/R
			Accession Number: ML13151A039		
CTS-01558	LCO	B 3.4.7-4	Reflect response to DCD RAI No. 464 amended MHI Letter No. UAP-HF-12223 (08/06/2012) ADAMS Accession Number ML12221A274 Editorial	Management of gas voids is important to RHRS operability. Various editorial changes.	0
	APPLICABILITY ACTION	B 3.4.7-4.through B 3.4.7-6 [B 3.4.7-5 through B 3.4.7-7, B 3.4.7-8]	Consistency with DCD	Changed SG Secondary side water level from greater than or equal to 13% to 14%	
	ACTIONS	B 3.4.7-5 [B 3.4.7-6]	Reflect response to Amended DCD RAI No. 902 MHI Letter No. UAP-HF-13114 (05/28/2013) ADAMS Accession Number: ML13151A039	Part of Action C.1 is deleted.	
	B 3.4.7 SURVEILLANCE REQUIREMENT SR 3.4.7.5(New)	B 3.4.7-7 [B 3.4.7-8, B 3.4.7-9]	Reflect response to DCD RAI No. 464 amended MHI Letter No. UAP-HF-12223 (08/06/2012) ADAMS Accession Number ML12221A274	SR 3.4.7.5 is added.	

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev . of T/R
CTS-01558	B 3.4.7 SURVEILLANCE REQUIREMENT SR 3.4.7.5(New) B 3.4.8 BACKGROUND	B 3.4.7-7 [B 3.4.7-8] B 3.4.8-1[B 3.4.-8-2]	Reflect response to Amended DCD RAI No. 902 MHI Letter No. UAP-HF-13114 (05/28/2013) ADAMS Accession Number: ML13151A039 Reflect amended response to DCD RAI No. 669 MHI Letter No. UAP-HF-13129 (06/13/2013). ADAMS Accession Number: ML13168A003	"Verify" is changed to "Verification" Discussion of having an additional source of injection water is added (PRA).	0
CTS-01558	B 3.4.8 BACKGROUND	B 3.4.8-1[B 3.4.-8-2]	Reflect response to DCD RAI No. 986 MHI Letter No. UAP-HF-13104 (04/25/2013) ADAMS Accession Number : ML13119A164	Discussion of the Safeguards Component Area HVAC System is added to background.	0
CTS-01558	B 3.4.8 LCO	B 3.4.8-2 [B 3.4.8-3]	Reflect amended response to DCD RAI No. 669 MHI Letter No. UAP-HF-13129 (06/13/2013). ADAMS Accession Number: ML13168A003	Added LCO regarding having at least one SI pump operable.	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev . of T/R
CTS-01558	B 3.4.8 LCO	B 3.4.8-2	Reflect response to Amended DCD RAI No. 902 MHI Letter No. UAP-HF-13114 (05/28/2013). ADAMS Accession Number: ML 13151A039	Part of LCO in 2nd paragraph is deleted by seeing the Note 3.	0
	B 3.4.8 LCO	B 3.4.8-2 [B 3.4.8-3]	Reflect response to Amended DCD RAI No. 902 MHI Letter No. UAP-HF-13114 (05/28/2013). ADAMS Accession Number: ML 13151A039	Discussion of Note 3 is added.	
	ACTIONS	B 3.4.8-4 [B 3.4.8-6] B 3.4.8-5 [B 3.4.8-6, B 3.4.8-7]	Reflect response to DCD RAI No. 464 amended MHI Letter No. UAP-HF-12223 (08/06/2012) ADAMS Accession Number ML12221A274	Management of gas voids is important to RHRS operability.	
	ACTIONS	B 3.4.8-4 [B 3.4.8-5]	Reflect response to Amended DCD RAI No. 902 MHI Letter No. UAP-HF-13114 (05/28/2013). ADAMS Accession Number: ML 13151A039	Part of Action D.1 is deleted.	
CTS-01558	ACTION	B 3.4.8-5 [B 3.4.8-6, B 3.4.8-7]	Reflect amended response to DCD RAI No. 669 MHI Letter No. UAP-HF-13129 (06/13/2013). ADAMS Accession Number:	Added discussion of Actions E and F. Added discussion of the importance of the RHR loop requirements being met.	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev . of T/R
			ML13168A003		
CTS-01558	SURVEILLANCE REQUIREMENTS	B 3.4.8-7 [B 3.4.8-8]	Reflect response to Amended DCD RAI No. 902 MHI Letter No. UAP-HF-13114 (05/28/2013). ADAMS Accession Number: ML 13151A039	"Verify" is changed to "Verification"	0
CTS-01558	B 3.4.8 SURVEILLANCE REQUIREMENTS SR 3.4.8.5 (New) B 3.4.8 SURVEILLANCE REQUIREMENTS SR 3.4.8.6 through SR 3.4.8.9 (New)	B 3.4.8-7 [B 3.4.8-8] B 3.4.8-7 [B 3.4.8-9 , B 3.4.8-10]	Reflect response to DCD RAI No. 464 amended MHI Letter No. UAP-HF-12223 (08/06/2012) ADAMS Accession Number ML12221A274 Reflect amended response to DCD RAI No. 669 MHI Letter No. UAP-HF-13129 (06/13/2013). ADAMS Accession Number: ML13168A003	3.4.8.5 is added. 3.4.8.6 through SR 3.4.8.9 are added.	0
CTS-01558	B 3.4.9 APPLICABLE SAFETY ANALYSES	B 3.4.9-2 B 3.4.9-4	Consistency with DCD Reflect response to DCD RAI No. 399 MHI Letter No. UAP-HF-11160 (05/30/2011). ADAMS Accession Number : ML11152A238	Changed to less than or equal to 5% power.	0
CTS-01558	B 3.4.12 BACKGROUND	B 3.4.12-2	Consistency with DCD Reflect NRC request (Resolution for SER	Changed RHR to CS/RHR	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev . of T/R
			Confirmatory Item: CISRP-16-STSB-146-1804/89)		
CTS-01558	B 3.4.14 SURVEILLANCE REQUIREMENTS SR 3.4.14.1	B 3.4.14-5	Consistency with DCD	RCS PIV testing interval changed from 12 months to 24 months.	0
CTS-01558	B 3.5.2 BACKGROUND	B 3.5.2-1 [B 3.5.2-1, B 3.5.2-2]	Reflect response to DCD RAI No. 986 MHI Letter No. UAP-HF-13104 (04/25/2013) ADAMS Accession Number : ML13119A164	Discussion of the Safeguards Component Area HVAC System is added to background.	0
CTS-01558	B 3.5.2 LCO B 3.5.2 SURVEILLANCE REQUIREMENTS SR 3.5.2.2	B 3.5.2-4 B 3.5.2-6 [B 3.5.2-7]	Reflect response to DCD RAI No. 464 amended MHI Letter No. UAP-HF-12223 (08/06/2012) ADAMS Accession Number ML12221A274 Reflect response to DCD RAI No. 464 amended MHI Letter No. UAP-HF-12223 (08/06/2012) ADAMS Accession Number ML12221A274	Management of gas voids is important to RHRS operability. Discussion of a note modification to SR 3.5.2.2 is added.	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev. of T/R
CTS-01558	B 3.5.2 SURVEILLANCE REQUIREMENTS SR 3.5.2.7 (New)	B 3.5.2-7 [B 3.4.2-8, B 3.4.2-9]	Reflect response to DCD RAI No. 464 amended MHI Letter No. UAP-HF-12223 (08/06/2012) ADAMS Accession Number ML12221A274	SR 3.5.2.7 is added.	0
CTS-01558	B 3.5.3 LCO	B 3.5.3-1	Reflect response to DCD RAI No. 464 amended MHI Letter No. UAP-HF-12223 (08/06/2012) ADAMS Accession Number ML12221A274	Management of gas voids is important to RHRS operability.	0
CTS-01558	B 3.5.4 APPLICABLE SAFETY ANALYSES	B 3.5.4-2	Consistency with DCD Reflect the GSI-191 Closure Plan MHI Letter No. UAP-HF-12135 (06/01/2012). ADAMS Accession Number: ML12221A274	For the LBLOCA analysis, changed the min recirculation water vol limit to 43,000 cubic ft (321,700 gal). RWSP water volume changed to 79,920 cubic ft (597,800 gal).	0
CTS-01558	B 3.6.6 BACKGROUND, APPLICABLE SAFETY ANALYSES, SURVEILLANCE REQUIREMENTS	B 3.6.6.-1 through B 3.6.6.-3 B 3.6..6-5 B 3.6.6-6	Consistency with DCD Reflect response to RAI No. 986 MHI Letter No. UAP-HF-13104 (04/25/2013). ADAMS Accession Number: ML13119A164	Containment spray pump changed to CS/RHR pump. Discussion of the Safeguards Component Area HVAC System is added to background.	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev . of T/R
CTS-01558	B 3.7.5-1 BACKGROUND	B 3.7.5-1	Consistency with DCD Reflect response to DCD RAI No. 986 MHI Letter No. UAP-HF-13104 Date 04/25/2013 ADAMS Accession Number ML:13119A164	Added discussion regarding the Emergency Feedwater Pump Area HVAD System	0
CTS-01558	B 3.7.7 BACKGROUND	B 3.7.7-1	Editorial correction	Replaced "Containment Spray/Residual Heat Removal System" with "residual heat removal (RHR) system"	0
CTS-01558	B 3.7.7 BACKGROUND	B 3.7.7-1	Editorial correction	The term "fuel storage pool" was replaced with "spent fuel pit"	0
CTS-01558	B 3.7.7 BACKGROUND	B 3.7.7-1	Added discussion in accordance with DCD RAI 986-6979 response ADAMS Accession Number: ML13119A164	Added discussion regarding the Safety Related Component Area HVAC System	0
CTS-01558	B 3.7.7 APPLICABLE SAFETY ANALYSES	B 3.7.7-2	Editorial correction	Replaced "CS/RHR" with "RHR"	0
CTS-01558	B 3.7.7 SURVEILLANCE REQUIREMENTS SR 3.7.7.3	B 3.7.7-5 [B 3.7.7-6]	Editorial correction	Changed valve numbering for "NCS-AOV-57A/B" and "NCS-AOV-058A/B" to "NCS-AOV-057A/B" and "NCS-AOV-58A/B" respectively	0
CTS-01558	B 3.7.8 BACKGROUND	B 3.7.8-1 [B 3.7.8-2]	Editorial corrections	Replaced "containment spray/residual heat removal (CS/RHR)" with "residual heat removal (RHR) and replaced	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev . of T/R
				CS/RHR with RHR	
CTS-01558	B 3.7.8 BACKGROUND	B 3.7.8-1	Added discussion in accordance with DCD RAI 986-6979 response ADAMS Accession Number: ML13119A164	Added discussion regarding the Safety Related Component Area HVAC System	0
CTS-01558	B 3.7.9 BACKGROUND	B 3.7.9-1	Added discussion in accordance with DCD RAI 986-6979 response ADAMS Accession Number: ML13119A164	Add discussion regarding the Safety Related Component Area HVAC System	0
CTS-01558	B 3.7.9 LCO	B 3.7.9-2	Correction to criteria number	Revised “Criterion 3 of 10 CFR 50.36(d)(2)(ii)” to “Criterion 3 of 10 CFR 50.36(c)(2)(ii)”	0
CTS-01558	B 3.7.9 LCO	B 3.7.9-2	Correction of UHS basin water volume and UHS heat load values to reflect design progress due to layout changes	Changed the minimum required UHS basin water level from “2,800,000” gallons to “2,850,000” gallons	0
CTS-01558	B 3.7.9 SURVEILLANCE REQUIREMENTS SR 3.7.9.1	B 3.7.9-4	Correction of UHS basin water volume and UHS heat load values to reflect design progress due to layout changes	Changed the UHS basin minimum required water level and usable water level from “2,800,000” gallons to “2,850,000” gallons	0
CTS-01558	B 3.7.10 BACKGROUND	B 3.7.10-3	Reflect response to DCD RAI No. 986 MHI Letter No. UAP-HF-13104 Date 04/25/2013 ADAMS Accession Number: ML13119A164	Changed the flow rate of a single train of MCREFS from less than or equal to “1200” to “600” cfm	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev. of T/R
CTS-01558	B 3.7.10 BACKGROUND	B 3.7.10-3	Added discussion in accordance with DCD RAI 986-6979 response ADAMS Accession Number: ML13119A164	Added discussion regarding requirements for the MCRATCS train to be considered OPERABLE.	0
CTS-01558	B 3.7.10 BACKGROUND	B 3.7.10-3	Deleted paragraph in accordance with DCD RAI 986-6979 response ADAMS Accession Number : ML13119A164	Removed paragraph regarding the periodic surveillance pressurization tests.	0
CTS-01558	B 3.7.11 BACKGORUND	B 3.7.11-2	Added discussion in accordance with DCD RAI 986-6979 response ADAMS Accession Number: ML13119A164	Added discussion regarding the Safety Related Component Area HVAC System.	0
CTS-01558	B 3.7.12 B 3.7.13	B 3.7.12-1 B 3.7.12-2 B 3.7.13-1 B 3.7.13-2	Consistency with DCD	The term “fuel storage pit” was replaced with “spent fuel pit”.	0
CTS-01558	B 3.8.1 SURVEILLANCE REQUIREMENTS	B 3.8.1-25	Consistency with DCD Rev. 4	Clarification of power factor for Class 1E GTG.	0
CTS-01558	B 3.8.1 SURVEILLANCE REQUIREMENTS SR 3.8.1.20 (New)	B 3.8.1-29 [B 3.8.1-30]	Consistency with DCD Rev. 4	RAI 962-6578 Revised surveillance Requirements to include GTG nozzle cleaning activity.	0
CTS-01558	B 3.8.4 BACKGROUND	B 3.8.4-2[B 3.8.4-3]	Consistency with DCD Rev. 4	RAI 986-6979 Revised support function of the ECWS and the Class 1 E electrical room HVAC system.	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev. of T/R
CTS-01558	B 3.8.7 BACKGROUND	B 3.8.7-1	Consistency with DCD Rev. 4	RAI 986-6979 Revised to include the support function of the ECWS and the Class 1 E electrical room HVAC system.	0
CTS-01558	B 3.8.9 BACKGROUND	B 3.8.9-2	Consistency with DCD Rev. 4	RAI 986-6979 Revised to include the support function of the ECWS and the Class 1 E electrical room HVAC system.	0
CTS-01558	B 3.9.5 BACKGROUND	B 3.9.5-1	Reflect response to RAI No. 986 MHI Letter No. UAP-HF-13104 (04/25/2013). ADAMS Accession Number: ML13119A164	Discussion of the Safeguards Component Area HVAC System is added to background.	0
CTS-01558	LCO SURVEILLANCE REQUIREMENTS SR 3.9.5.2 (New)	B 3.9.5-2 [B 3.9.5-3] B 3.9.5-4 [B 3.9.5-5, B 3.9.5-6]	Reflect response to DCD RAI No. 464 amended MHI Letter No. UAP-HF-12223 (08/06/2012) ADAMS Accession Number: ML12221A274 Reflect response to DCD RAI No. 464 amended MHI Letter No. UAP-HF-12223 (08/06/2012) ADAMS Accession Number: ML12221A274	Management of gas voids is important to RHRS operability. SR 3.9.5.2 is added.	0
CTS-01558	B 3.9.6 Background	B 3.9.6-1	Reflect response to DCD RAI No. 986 MHI Letter No. UAP-HF-13104 (04/25/2013).	Discussion of the Safeguards Component Area HVAC System is added to background.	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev . of T/R
			ADAMS Accession Number: ML13119A164 Reflect amended Response to RAI No. DCD 669 MHI Letter No. UAP-HF-13129 (06/13/2013). ADAMS Accession Number: ML13168A003	Discussion of having an additional source of injection water is added (PRA).	
CTS-01558	LCO	B 3.9.6-2	Reflect amended Response to RAI No. DCD 669 MHI Letter No. UAP-HF-13129 (06/13/2013). ADAMS Accession Number: ML13168A003	Added LCO regarding having at least one SI pump operable.	0
CTS-01558	LCO	B 3.9.6-2 [B 3.9.6-3]	Reflect response to RAI No. 464 amended MHI Letter No. UAPHF-12223 (08/06/2012) ADAMS Accession Number: ML12221A274 Consistency with DCD	Management of gas voids is important to RHRS operability. RHR pump or Containment spray pump changed to CS/RHR pump.	0
CTS-01558	ACTIONS	B 3.9.6-4 [B 3.9.6-5]	Reflect amended Response to RAI No. DCD 669 MHI Letter	Added Action D.	0

Change ID No.	Section	TS Rev 3 Page*	Reason for change	Change Summary	Rev. of T/R
			No. UAP-HF-13129 (06/13/2013). ADAMS Accession Number: ML13168A003		
CTS-01558	SURVEILLANCE REQUIREMENTS SR 3.9.6.4 (New) SURVEILLANCE REQUIREMENTS SR 3.9.6.5 through 3.9.6.8(New)	B 3.9.6-4 [B 3.9.6-6] B 3.9.6-4 [B 3.9.6-7, B 3.9.6-8]	Reflect response to RAI No. 464 amended MHI Letter No. UAPHF-12223 (08/06/2012) ADAMS Accession Number: ML12221A274 Reflect amended Response to RAI No. DCD 669 MHI Letter No. UAP-HF-13129 (06/13/2013). ADAMS Accession Number: ML13168A003	SR 3.9.6.4 is adde/ SR 3.9.5 through SR 3.9.6.8 are added.	0
CTS-01558	B 3.1.2 ACTIONS B 3.1.5 ACTIONS B 3.2.1 ACTIONS B 3.2.2 ACTIONS B 3.2.3 ACTIONS	B 3.1.2-5 B 3.1.5-4 B 3.2.1-5 B 3.2.2-4 B 3.2.3-5	Editorial	Various editorial changes.	0

*Page numbers for the attached marked-up pages may differ from the revision 3 page numbers due to text additions and deletions. When the page numbers for the attached pages do differ, the page number for the attached page is shown in brackets.

BASES

ACTIONS (continued)

B.1 CTS-01558

If the core reactivity cannot be restored to within the 1% Δk/k limit, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours. If the SDM for MODE 3 is not met, then the boration required by SR 3.1.1.1 would occur. The allowed Completion Time is reasonable, based on operating experience, for reaching MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.1.2.1

Core reactivity is verified by periodic comparisons of measured and predicted RCS boron concentrations. The comparison is made, considering that other core conditions are fixed or stable, including control rod position, moderator temperature, fuel temperature, fuel depletion, xenon concentration, and samarium concentration. The Surveillance is performed prior to entering MODE 1 as an initial check on core conditions and design calculations at BOC. The SR is modified by a Note. The Note indicates that the normalization of predicted core reactivity to the measured value must take place within the first 60 effective full power days (EFPD) after each fuel loading. This allows sufficient time for core conditions to reach steady state, but prevents operation for a large fraction of the fuel cycle without establishing a benchmark for the design calculations. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 26, GDC 28, and GDC 29.

2. FSAR Chapter 15.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.1.3.2

In similar fashion, the LCO demands that the MTC be less negative than the specified value for EOC full power conditions. This measurement may be performed at any THERMAL POWER, but its results must be extrapolated to the conditions of RTP and all banks withdrawn in order to make a proper comparison with the LCO value. Because the RTP MTC value will gradually become more negative with further core depletion and boron concentration reduction, a 300 ppm SR value of MTC should necessarily be less negative than the lower LCO limit. The 300 ppm SR value is sufficiently less negative than the lower LCO limit value to ensure that the LCO limit will be met when the 300 ppm Surveillance criterion is met.

SR 3.1.3.2 is modified by three Notes that include the following requirements:

a. The SR is not required to be performed until 7 effective full power days (EFPDs) after reaching the equivalent of an equilibrium RTP all rods out (ARO) boron concentration of 300 ppm.

b. If the 300 ppm Surveillance limit is exceeded, it is possible that the Lower limit on MTC could be reached before the planned EOC. Because the MTC changes slowly with core depletion, the Frequency of 14 effective full power days is sufficient to avoid exceeding the Lower limit.

c. The Surveillance limit for RTP boron concentration of 60 ppm is conservative. If the measured MTC at 60 ppm is more positive than the 60 ppm Surveillance limit, the Lower limit will not be exceeded because of the gradual manner in which MTC changes with core burnup.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 11.

2. FSAR Chapter 15.

3. MUAP-07026-P, “Mitsubishi Reload Evaluation Methodology”, ~~December, 2007~~August, 2013 CTS-01558

BASES

ACTIONS (continued)

The allowed Completion Time of 2 hours provides an acceptable time for evaluating and repairing minor problems without allowing the plant to remain in an unacceptable condition for an extended period of time.

B.1 CTS-01558

If the shutdown banks cannot be restored to within their insertion limits within 2 hours, the unit must be brought to a MODE where the LCO is not applicable. The allowed Completion Time of 6 hours is reasonable, based on operating experience, for reaching the required MODE from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.1.5.1

Verification that the shutdown banks are within their insertion limits prior to an approach to criticality ensures that when the reactor is critical, or being taken critical, the shutdown banks will be available to shut down the reactor, and the required SDM will be maintained following a reactor trip. This SR and Frequency ensure that the shutdown banks are withdrawn before the control banks are withdrawn during a unit startup.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 10, GDC 26, and GDC 28.

2. 10 CFR 50.46.

3. FSAR Section 15.1, 15.4 and Subsection 15.0.0.2.5.

BASES

BACKGROUND (continued)

operation, and after each refueling. The PHYSICS TESTS requirements for reloaded fuel cycles ensure that the operating characteristics of the core are consistent with the design predictions, and that the core can be operated as designed (Ref. 4).

PHYSICS TESTS procedures are written and approved in accordance with established formats. The procedures include all information necessary to permit a detailed execution of the testing required to ensure that the design intent is met. PHYSICS TESTS are performed in accordance with these procedures, and test results are approved prior to continued power escalation and long term power operation.

The PHYSICS TESTS required for reload fuel cycles (Ref. 4) in MODE 1 are listed below:

a. Power Distribution – Intermediate Power,

b. Power Distribution – Full Power, and

c. HZP to HFP reactivity difference.

These tests are performed in MODE 1. These and other supplementary tests may be required to calibrate the nuclear instrumentation or to diagnose operational problems. These tests may cause the operating controls and process variables to deviate from their LCO requirements during their performance. The last two tests are performed at ≥ 90% RTP.

a. The Power Distribution – Intermediate Power Test measures the power distribution of the reactor core at intermediate power levels at least one time by 30% RTP and between 40% and 80% RTP. This test uses the incore flux detectors to measure core power distribution. The requirements for the Flux Symmetry Test described in ANSI/ANS-19.6.1-2011~~05~~ (Ref. 4) are satisfied by the Power Distribution Test. CTS-01558

BASES

BACKGROUND (continued)

b. The Power Distribution – Full Power Test measures the power distribution of the reactor core at ≥ 90% RTP using incore flux detectors.

c. The HZP to HFP reactivity difference simply measures the critical boron concentration at > 90% RTP, with all rods fully withdrawn, the lead control bank being at or near its fully withdrawn position, and with the core at equilibrium xenon conditions.

For initial startups, there are two currently required tests that violate the referenced LCO. The Axial Flux Difference Instrumentation Calibration Test and Axial Power Distribution Oscillation Test, performed at approximately 50% and 75% RTP, require large axial flux difference that exceed the limits specified in the relevant LCO. And the Rod Cluster Control Assembly Misalignment Measurement and Radial Power Distribution Oscillation Test, performed at approximately 50% RTP, require individual rod misalignments that exceed the limits specified in the relevant LCO.

APPLICABLE SAFETY ANALYSES

The fuel is protected by an LCO, which preserves the initial conditions of the core assumed during the safety analyses. The methods for development of the LCO, which are superseded by this LCO, are described in Ref. 5. The above mentioned PHYSICS TESTS, and other tests that may be required to calibrate nuclear instrumentation or to diagnose operational problems, may require the operating controls or process variables to deviate from their LCO limitations.

FSAR Section 14.2(Ref. 6) defines requirements for initial testing of the facility, including PHYSICS TESTS. The zero, low power, and power tests are summarized in this section. Requirements for reload fuel cycle PHYSICS TESTS are defined in ANSI/ANS-19.6.1-2011~~05~~ (Ref. 4). CTS-01558
Although these PHYSICS TESTS are generally accomplished within the limits for all LCOs, conditions may occur when one or more LCOs must be suspended to make completion of PHYSICS TESTS possible or practical. This is acceptable as long as the fuel design criteria are not violated. When one or more of the requirements specified in LCO 3.1.4, “Rod Group Alignment Limits,” LCO 3.1.5, “Shutdown Bank Insertion Limits,” LCO 3.1.6, “Control Bank Insertion Limits,” LCO 3.2.3, “AXIAL FLUX DIFFERENCE (AFD),” or LCO 3.2.4, “QUADRANT POWER TILT RATIO (QPTR)” are suspended for PHYSICS TESTS, the fuel design criteria are preserved as long as the requirements of LCO 3.2.1, “Heat Flux Hot Channel Factor ($F_Q(Z)$),” and LCO 3.2.2, “Nuclear Enthalpy Rise Hot Channel Factor ($F^N_{\Delta H}$),” are satisfied, power level is maintained ≤ 85% RTP, and SDM is within the limits specified in the COLR.

BASES

REFERENCES

1. 10 CFR 50, Appendix B, Section XI
2. 10 CFR 50.59.
3. Regulatory Guide 1.68, Revision 3, March, 2007.
4. ANSI/ANS-19.6.1-201105, November 29, 2005January 13, 2011 CTS-01558
5. MUAP-07026-P, “Mitsubishi Reload Evaluation Methodology”, December, 2007August, 2013 CTS-01558
6. FSAR Section 14.2.

BASES

BACKGROUND (continued)

temperature change. The ITC is the total reactivity change divided by the total temperature change. The test is repeated by reversing the direction of the temperature change, and the final ITC is the average of the two calculated ITCs. Performance of this test could violate LCO 3.4.2, "RCS Minimum Temperature for Criticality."

APPLICABLE SAFETY ANALYSES

The fuel is protected by LCOs that preserve the initial conditions of the core assumed during the safety analyses. The methods for development of the LCOs that are excepted by this LCO are described in Ref. 5. The above mentioned PHYSICS TESTS, and other tests that may be required to calibrate nuclear instrumentation or to diagnose operational problems, may require the operating control or process variables to deviate from their LCO limitations.

FSAR Section 14.2 (Ref.6) defines requirements for initial testing of the facility, including PHYSICS TESTS. The zero, low power, and power tests are summarized in this section. Requirements for reload fuel cycle PHYSICS TESTS are defined in ANSI/ANS-19.6.1-2011~~05~~ (Ref. 4). CTS-01558 Although these PHYSICS TESTS are generally accomplished within the limits for all LCOs, conditions may occur when one or more LCOs must be suspended to make completion of PHYSICS TESTS possible or practical. This is acceptable as long as the fuel design criteria are not violated. When one or more of the requirements specified in LCO 3.1.3, "Moderator Temperature Coefficient (MTC)," LCO 3.1.4, LCO 3.1.5, LCO 3.1.6, and LCO 3.4.2 are suspended for PHYSICS TESTS, the fuel design criteria are preserved as long as the power level is limited to ≤ 5% RTP the reactor coolant temperature is kept ≥ 541°F, and SDM is within the limits provided in the COLR.

The PHYSICS TESTS include measurement of core nuclear parameters or the exercise of control components that affect process variables. Among the process variables involved are AFD and QPTR, which represent initial conditions of the unit safety analyses. Also involved are the movable control components (control and shutdown rods), which are required to shut down the reactor. The limits for these variables are specified for each fuel cycle in the COLR.

BASES

SURVEILLANCE REQUIREMENTS (continued)

d. Fuel burnup based on gross thermal energy generation,

e. Xenon concentration,

f. Samarium concentration,

g. Isothermal temperature coefficient (ITC), when below the zero power testing range,

h. Moderate defect, when above the zero power testing range, and

i. Doppler defect, when above the zero power testing range.

Using the ITC accounts for Doppler reactivity in this calculation when the reactor is subcritical or critical but below the zero power testing range, and the fuel temperature will be changing at the same rate as the RCS.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. 10 CFR 50, Appendix B, Section XI.

2. 10 CFR 50.59.

3. Regulatory Guide 1.68, Revision 3, March, 2007.

4. ANSI/ANS-19.6.1-201105, ~~November 29, 2005~~January 13, 2011. CTS-01558

5. MUAP-07026-P, "Mitsubishi Reload Evaluation Methodology", ~~December, 2007~~August, 2013 CTS-01558

6. FSAR Section 14.2.

ACTIONS (continued)

A.3 CTS-01558

Reduction in the Overpower ΔT trip setpoints (value of K_4) by ≥ 1% for each 1% by which $F_Q^C(Z)$ exceeds its limit, is a conservative action for protection against the consequences of severe transients with unanalyzed power distributions. The Completion Time of 72 hours is sufficient considering the small likelihood of a severe transient in this time period, and the preceding prompt reduction in THERMAL POWER in accordance with Required Action A.1. The maximum allowable Overpower ΔT trip setpoints initially determined by Required Action A.3 may be affected by subsequent determinations of $F_Q^C(Z)$ and would require Overpower ΔT trip setpoint reductions within 72 hours of the $F_Q^C(Z)$ determination, if necessary to comply with the decreased maximum allowable Overpower ΔT trip setpoints. Decreases in $F_Q^C(Z)$ would allow increasing the maximum allowable Overpower ΔT trip setpoints.

A.4

Verification that $F_Q^C(Z)$ has been restored to within its limit, by performing SR 3.2.1.1 and SR 3.2.1.2 prior to increasing THERMAL POWER above the limit imposed by Required Action A.1, ensures that core conditions during operation at higher power levels and future operation are consistent with safety analyses assumptions.

Condition A is modified by a Note that requires Required Action A.4 to be performed whenever the Condition is entered. This ensures that SR 3.2.1.1 and SR 3.2.1.2 will be performed prior to increasing THERMAL POWER above the limit of Required Action A.1, even when Condition A is exited prior to performing Required Action A.4. Performance of SR 3.2.1.1 and SR 3.2.1.2 are necessary to assure $F_Q(Z)$ is properly evaluated prior to increasing THERMAL POWER.

B.1

If it is found that the maximum calculated value of $F_Q(Z)$ that can occur during normal maneuvers, $F_Q^W(Z)$, exceeds its specified limits, there exists a potential for $F_Q^C(Z)$ to become excessively high if a normal operational

BASES

APPLICABILITY (continued)

transferred to the coolant to require a limit on the distribution of core power. Specifically, the design bases events that are sensitive to $F^N_{\Delta H}$ in other modes (MODES 2 through 5) have significant margin to DNB, and therefore, there is no need to restrict $F^N_{\Delta H}$ in these modes.

ACTIONS

A.1.1

With $F^N_{\Delta H}$ exceeding its limit, the unit is allowed 4 hours to restore $F^N_{\Delta H}$ to within its limits. This restoration may, for example, involve realigning any misaligned rods or reducing power enough to bring $F^N_{\Delta H}$ within its power dependent limit. When the $F^N_{\Delta H}$ limit is exceeded, the DNBR limit is not likely violated in steady state operation, because events that could significantly perturb the $F^N_{\Delta H}$ value (e.g., static control rod misalignment) are considered in the safety analyses. However, the DNBR limit may be violated if a DNB limiting event occurs. Thus, the allowed Completion Time of 4 hours provides an acceptable time to restore $F^N_{\Delta H}$ to within its limits without allowing the plant to remain in an unacceptable condition for an extended period of time.

Condition A is modified by a Note that requires that Required Actions A.2 and A.3 must be completed whenever Condition A is entered. Thus, if power is not reduced because this Required Action is completed within the 4 hour time period, Required Action A.2 nevertheless requires another measurement and calculation of $F^N_{\Delta H}$ within 24 hours in accordance with SR 3.2.2.1.

However, if power is reduced below 50% RTP, Required Action A.3 requires that another determination of $F^N_{\Delta H}$ must be done prior to exceeding 50% RTP, prior to exceeding 75% RTP, and within 24 hours after reaching or exceeding 95% RTP. In addition, Required Action A.2 is performed if power ascension is delayed past 24 hours.

A.1.2.1 and A.1.2.2 CTS-01558

If the value of $F^N_{\Delta H}$ is not restored to within its specified limit either by adjusting a misaligned rod or by reducing THERMAL POWER, the alternative option is to reduce THERMAL POWER to < 50% RTP in accordance with Required Action A.1.2.1 and reduce the Power Range Neutron Flux - High trip setpoints to ≤ 55% RTP in accordance with

BASES

ACTIONS

A.1

With the AFD outside the target band and THERMAL POWER ≥ 90% RTP, the assumptions used in the accident analyses may be violated with respect to the maximum heat generation. Therefore, a Completion Time of 15 minutes is allowed to restore the AFD to within the target band because xenon distributions change little in this relatively short time.

B.1 CTS-01558

If the AFD cannot be restored within the target band, then reducing THERMAL POWER to < 90% RTP places the core in a condition that has been analyzed and found to be acceptable, provided that the AFD is within the acceptable operation limits provided in the COLR.

The allowed Completion Time of 15 minutes provides an acceptable time to reduce power to < 90% RTP without allowing the plant to remain in an unanalyzed condition for an extended period of time.

C.1

With THERMAL POWER < 90% RTP but ≥ 50% RTP, operation with the AFD outside the target band is allowed for up to 1 hour if the AFD is within the acceptable operation limits provided in the COLR. With the AFD within these limits, the resulting axial power distribution is acceptable as an initial condition for accident analyses assuming the then existing xenon distributions. The 1 hour cumulative penalty deviation time restricts the extent of xenon redistribution. Without this limitation, unanalyzed xenon axial distributions may result from a different pattern of xenon buildup and decay. The reduction to a power level < 50% RTP puts the reactor at a THERMAL POWER level at which the AFD is not a significant accident analysis parameter.

If the indicated AFD is outside the target band and outside the acceptable operation limits provided in the COLR, the peaking factors assumed in accident analysis may be exceeded with the existing xenon condition. (Any AFD within the target band is acceptable regardless of its relationship to the acceptable operation limits.) The Completion Time of 30 minutes allows for a prompt, yet orderly, reduction in power.

BASES

BACKGROUND (continued)

Technical Specifications contain Allowable Values related to the OPERABILITY of equipment required for safe operation of the facility. The Allowable Value accommodates expected drift in the analog components of the channel that would have been specifically accounted for in the setpoint methodology for calculating the Nominal Trip Setpoint and thus the automatic protective action would still have ensured that the SL would not be exceeded with the "as--found" settings of the protective device. Therefore, the device would still be OPERABLE since it would have performed its safety function and the only corrective action required would be to recalibrate the device to account for further drift during the next surveillance interval. CTS-01558

However, there is also some point beyond which the device would have not been able to perform its function due, for example, to greater than expected drift. This value needs to be specified in the Technical Specifications in order to define OPERABILITY of the devices and is designated as the Allowable Value.

The Allowable Value, recorded and maintained in a document established by the Setpoint Control Program (SCP), is considered a limiting value such that a channel is OPERABLE if the as-found value does not exceed the Allowable Value during CHANNEL CALIBRATION. The Allowable Value is applicable to automatic protection instrumentation functions for Reactor Trip, ESFAS actuation and permissive interlocks.

For analog measurements, the CHANNEL CALIBRATION verifies the channel accuracy at five calibration settings corresponding to 0%, 25%, 50%, 75% and 100% of the instrument range. For binary measurements, the CHANNEL CALIBRATION verifies the accuracy of the channel's state change at the required setpoint. As such, the Allowable Value accounts for the expected instrument loop uncertainties, such as drift, during the surveillance interval. In this manner, the actual setting of the device will still meet the LSSS definition and ensure that a SL is not exceeded at any given point of time as long as the device has not drifted beyond that expected during the surveillance interval.

Note that, although the channel is "OPERABLE" under these circumstances, the channel shall be left adjusted to a value within the established channel Calibration Tolerance (CT) band, in accordance with uncertainty assumptions stated in the referenced setpoint methodology (as-left criteria), and confirmed to be operating within the statistical allowances of the uncertainty terms assigned. The Calibration Tolerance, recorded and maintained in a document established by the SCP, is applicable to automatic protection instrumentation functions for Reactor Trip, ESFAS actuation and permissive interlocks.

BASES

BACKGROUND (continued)

The Nominal Trip Setpoint (i.e., LSSS) is the value at which the digital bistable or binary sensor is set. The Nominal Trip Setpoint value ensures the safety analysis limits are met for the surveillance interval selected when a channel is adjusted based on the stated channel uncertainties. Any channel is considered to be properly adjusted when the "as-left" ~~accuracy~~ value is within the established Calibration Tolerance (CT) band, in accordance with the methods and assumptions of the SCP. The Nominal Trip Setpoint value (i.e., expressed as a value without inequalities) for digital bistables, is confirmed during the MIC. The Nominal Trip Setpoint value (i.e., expressed as a value with inequalities) for binary sensors is confirmed during the CHANNEL CALIBRATION. CTS-01558

Nominal Trip Setpoints and Allowable Values, consistent with the requirements of the SCP, ensure that SLs are not violated during AOOs and that the consequences of Postulated Accidents (PAs) will be acceptable, provided the unit is operated from within the LCOs at the onset of the AOO or PA and the equipment functions as designed.

Within the PSMS controllers, Nominal Trip Setpoints and Time Constants are digital settings maintained in non-volatile software memory within each Reactor Protection System (RPS) train. Digital settings have no potential for variation due to time, environmental drift or component aging; therefore, these digital settings have no surveillance tolerance. Each PSMS controller has continuous automatic self-testing, which verifies that the digital Nominal Trip Setpoint and Time Constant settings are correct. Nominal Trip Setpoints and Time Constants are also verified periodically through the MIC which must be conducted with the affected PSMS controller out of service. A designated instrument channel is taken out of service for periodic CHANNEL CALIBRATION. SRs for the channels and trains are specified in the SRs section.

The Allowable Value is the maximum deviation that can be measured during CHANNEL CALIBRATION, whereby the channel is considered OPERABLE. This value includes the deviations that are included in the calculations that determined the Nominal Trip Setpoint. The “expected as-found value” shall be as specified in the plant-specific setpoint analysis. The expected as-found value reflects the expected normal drift of actual plant equipment, so that a degraded device can be identified before the Allowable Value limit is reached. The expected as-found value is also referred to as the Performance Test Acceptance Criteria (PTAC). The PTAC, recorded and maintained in a document established by the SCP, is applicable to automatic protection instrumentation functions for Reactor Trip, ESFAS actuation and permissive interlocks.

BASES

BACKGROUND (continued)

Reactor Trip Breakers

The RTBs are in the electrical power supply line from the control rod drive motor generator set power supply to the CRDMs. Opening of the RTBs interrupts power to the CRDMs, which allows the shutdown rods and control rods to fall into the core by gravity. There are eight RTBs, two from each of four RTB trains, arranged in a two-out-of-four configuration.

During normal operation the output from the RPS is a voltage signal that energizes the undervoltage coils in the RTBs. When protective action is required, the RPS output voltage signal is removed, the undervoltage coils are de-energized, the breaker trip lever is actuated by the de-energized undervoltage coil, and the RTBs are tripped open. This allows the shutdown rods and control rods to fall into the core. In addition to the de-energization of the undervoltage coils, each breaker is also equipped with a shunt trip device that is energized to trip the breaker open upon receipt of a Reactor Trip signal from the RPS. Either the undervoltage coil or the shunt trip mechanism is sufficient by itself, thus providing a diverse trip mechanism.

The decision logic matrix Functions are described in the functional diagrams included in Reference 2. In addition to the Reactor Trip or ESF, these diagrams also describe the various "permissive interlocks" that are associated with unit conditions. Each train has built in continuous automatic self-testing that automatically tests the decision logic Functions while the unit is at power. When any one or two trains are taken out of service for testing, the other two trains are capable of providing unit monitoring and protection until the testing has been completed.

The Class 1E Electrical Room HVAC System is a support system and provides temperature control for the Reactor Trip Breaker Rooms where the RTBs are located. The system includes electric heating coils, chilled water cooling coils, fans, filters, ductwork, dampers, and instrumentation and controls necessary to perform the support function. The Essential Chilled Water System is a support system and provides chilled water to the air handling unit cooling coil. The Essential Service Water System supports operation of the essential chiller. CTS-01558

The Class 1E Electrical Room HVAC System trains are each sized to satisfy 100% of the cooling and heating demand of two Reactor Trip Breaker Rooms. For RTBs to be OPERABLE, one of the associated Class 1E Electrical Room HVAC System trains, including its associated train of the Essential Chilled Water System and Essential Service Water System, must be in operation, and capable of performing its support function.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The Overtemperature ΔT trip Function is calculated for each loop as described in FSAR Section 7.2.1.4.3.1 (Ref. 2). Trip occurs if Overtemperature ΔT is indicated in two loops. The pressure and temperature signals are used for other control functions. The interface from the safety channels in the PSMS to the PCMS is through the SSA. When three or more temperature and pressure channels are OPERABLE, the SSA ensures an input failure to the control system does not result in erroneous control system action that would require the protection function actuation. Therefore the protection function requires only two additional channels to provide the protection function actuation (i.e., three channels total). When there are less than three OPERABLE temperature and pressure channels, the SSA cannot prevent erroneous control system operation due to an input failure. This is reflected in the LCO Completion Times for temperature and pressure channels, since there are only three required channels. CTS-01558

Note that this Function also provides a signal to generate a turbine runback prior to reaching the Nominal Trip Setpoint. A turbine runback will reduce turbine power and reactor power. A reduction in power will normally alleviate the Overtemperature ΔT condition and may prevent a Reactor Trip.

The LCO requires three channels of the Overtemperature ΔT trip Function to be OPERABLE. Note that the Overtemperature ΔT Function receives input from channels shared with other RTS Functions. Failures that affect multiple Functions require entry into the Conditions applicable to all affected Functions.

In MODE 1 or 2, the Overtemperature ΔT trip must be OPERABLE to prevent DNB. In MODE 3, 4, 5, or 6, this trip Function does not have to be OPERABLE because the reactor is not operating and there is insufficient heat production to be concerned about DNB.

The cycle dependent variables for this Function are specified in the COLR.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The LCO requires three trains of ECCS Actuation to be OPERABLE in MODE 1 or 2.

A Reactor Trip is initiated every time an ECCS Actuation signal is present. Therefore, this trip Function must be OPERABLE in MODE 1 or 2, when the reactor is critical, and must be shut down in the event of an accident. In MODE 3, 4, 5, or 6, the reactor is not critical, and this trip Function does not need to be OPERABLE.

15. Reactor Trip System Interlocks

Reactor protection interlocks are provided to ensure Reactor Trips are in the correct configuration for the current unit status. They back up operator actions to ensure protection system Functions are not bypassed during unit conditions under which the safety analysis assumes the Functions are not bypassed. Therefore, the interlock Functions do not need to be OPERABLE when the associated Reactor Trip functions are outside the applicable MODES. These are:

a. Intermediate Range Neutron Flux, P-6

The Intermediate Range Neutron Flux, P-6 interlock is actuated when any NIS intermediate range channel goes approximately one decade above the minimum channel reading. If both channels drop below the setpoint, the permissive will automatically be defeated. The LCO requirement for the P-6 interlock ensures that the following Functions are performed: CTS-01558

- on increasing power, the P-6 interlock allows the manual block of the NIS Source Range, Neutron Flux Reactor Trip. This prevents a premature block of the source range trip and allows the operator to ensure that the intermediate range is OPERABLE prior to leaving the source range. When the source range trip is blocked, the high voltage to the detectors is also removed,

- on decreasing power, the P-6 interlock automatically energizes the NIS source range detectors and enables the NIS Source Range Neutron Flux Reactor Trip, and

BASES

ACTIONS (continued)

This action addresses the train orientation for this Function. With one required train inoperable, the inoperable train must be restored to OPERABLE status within 72 hours. If the affected Function cannot be restored to OPERABLE status within the allowed 72 hour Completion Time, the unit must be placed in a MODE in which the requirement does not apply. To achieve this status, action must be initiated within the same 72 hours to ensure that all rods are fully inserted, and the Rod Control System must be placed in a condition incapable of rod withdrawal within the next hour. The additional hour provides sufficient time to accomplish the action in an orderly manner. With rods fully inserted and the Rod Control System incapable of rod withdrawal, this Function is no longer required. CTS-01558

The Completion Time of 72 hours is justified because two trains are adequate to perform the safety function, and there are three automatic actuation trains and two other Manual Reactor Trip Functions OPERABLE. In addition, the Completion Time considers that the Manual Reactor Trip Function, for the inoperable Manual Reactor Trip train, can be actuated from the Safety VDU for that train. Therefore, the ability to initiate a manual Reactor Trip through safety related equipment remains functional in all three trains.

The Completion Time of 72 hours is also justified in the US-APWR reliability and risk analyses, the summary and result of which are documented in FSAR Chapter 19 (Ref. 10).

D.1, D.2.1, and D.2.2

Condition D applies to the following Reactor Trip Functions in MODE 3, 4, or 5 with the Rod Control System capable of rod withdrawal or one or more rods not fully inserted:

- RTBs,
- RTB Undervoltage and Shunt Trip Mechanisms, and
- Automatic Trip Logic.

BASES

ACTIONS (continued)

This action addresses the train orientation for these Functions. With one required train inoperable, the inoperable train must be restored to OPERABLE status within 48 hours. If the affected Function(s) cannot be restored to OPERABLE status within the allowed 48 hour Completion Time, the unit must be placed in a MODE in which the requirement does not apply. To achieve this status, action must be initiated within the same 48 hours to ensure that all rods are fully inserted, and the Rod Control System must be placed in a condition incapable of rod withdrawal within the next hour. The additional hour provides sufficient time to accomplish the action in an orderly manner. With rods fully inserted and the Rod Control System incapable of rod withdrawal, these Functions are no longer required.

The Completion Time of 48 hours is justified because the two remaining OPERABLE trains are adequate to perform the safety function. In addition, the Completion Time considers that the two remaining OPERABLE trains each have continuous automatic self-testing for the Automatic Trip Logic.

The Completion Time of 48 hours is also justified in the US-APWR reliability and risk analyses, the summary and result of which are documented in FSAR Chapter 19 (Ref. 10).

E.1.1, E.1.2, E.2.1, E.2.2, and E.3

Condition E applies to the Power Range Neutron Flux (High Setpoint) Function.

With one channel inoperable, the inoperable channel must be placed in the trip condition within 72 hours. This results in a partial trip condition requiring only one-out-of-three logic for actuation of the two-out-of-four trips.

The Completion Time of 72 hours to place the inoperable channel in the trip condition is justified because the three remaining OPERABLE channels are adequate to perform the safety function. In addition, the Completion Time considers that the three remaining OPERABLE channels have continuous automatic self-testing and continuous automatic CHANNEL CHECKS. In addition, with the remaining three OPERABLE channels, the SSA within the PCMS ensures the control systems can withstand an input failure to the control system without causing erroneous control system operation, which would otherwise require the protection function actuation. CTS-01558

BASES

SURVEILLANCE REQUIREMENTS (continued)

The complete OPERABILITY check from the measurement channel input device to the Reactor Trip Breaker is performed by the combination of the continuous automatic self-testing for the digital devices (the RPS and data communication interfaces), the continuous automatic CHANNEL CHECK (SR 3.3.1.1 and SR 3.3.1.7), the CHANNEL CALIBRATION (SR 3.3.1.8, SR 3.3.1.9 and SR 3.3.1.10), the MIC (SR 3.3.1.6) and the TADOT (SR 3.3.1.4 and SR 3.3.1.11). The CHANNEL CALIBRATION, the MIC and the TADOT, which are manual tests, overlap with the continuous automatic self-testing and confirm the functioning of the continuous automatic self-testing.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.3.1.7

Performance of the CHANNEL CHECK within 4 hours after reducing power below P-6 and ~~the frequency~~ in accordance with the Surveillance Frequency Control Program ensures that 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 instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. A CHANNEL CHECK will detect gross channel failure; thus, it is key to verifying that the instrumentation continues to operate properly between each CHANNEL CALIBRATION. CTS-01558

Agreement criteria are determined based on a combination of the channel instrument uncertainties. If a channel is outside the criteria, it may be an indication that the sensor or the signal processing equipment has drifted outside its limit.

The Surveillance Frequency of 4 hours is based on the need to verify OPERABILITY of the SR instruments within a reasonable time after being re-energized.

BASES

SURVEILLANCE REQUIREMENTS (continued)

REFERENCES

1. Regulatory Guide 1.105, Revision 3, "Setpoints for Safety Related Instrumentation."

2. FSAR Section 7.2. CTS-01558

3. FSAR Chapter 15.

4. IEEE-603-1991.

5. 10 CFR 50.49.

6. MUAP-07004-P, Revision 7, “Safety I&C System Description and Design Process.”

7. MUAP-07005-P, Revision 8, “Safety System Digital Platform -MELTAC-.”

8. 10 CFR 50.36.

9. FSAR Section 6.2.1.

10. FSAR Chapter 19.

11. MUAP-09021-P, Revision ~~2~~3, “Response Time of Safety I&C System.” CTS-01558

12. MUAP-09022-P, Revision ~~2~~3, “US-APWR Instrument Setpoint Methodology.” CTS-01558

13. FSAR Section 7.1.

BASES

BACKGROUND (continued)

Allowable Values and ESFAS Setpoints

The Nominal Trip Setpoints used in the digital bistables or binary sensors are based on the Analytical Limits defined in the accident analysis and the channel uncertainty. The selection of these Nominal Trip Setpoints is such that adequate protection is provided when all sensor and processing Time Delays are taken into account.

To allow for calibration tolerances, instrumentation uncertainties, instrument drift, and severe environment errors for those ESFAS channels that must function in harsh environments as defined by 10 CFR 50.49 (Ref. 5), the Allowable Values and Nominal Trip Setpoints are conservative to protect the Analytical Limits. The methodology identified in the SCP, used to calculate the Allowable Values and Nominal Trip setpoints, incorporates all of the known uncertainties applicable to each channel (Ref. 12). The magnitudes of these uncertainties are factored into the determination of each Nominal Trip Setpoint and Allowable Value.

The Nominal Trip Setpoint entered into the bistable or binary sensor is more conservative than that specified by the Analytical Limit. The Nominal Trip Setpoint accounts for measurement errors detectable by the CHANNEL CALIBRATION and other unmeasurable errors (such as the effects of anticipated environmental conditions), which are both considered in the Allowable Value for CHANNEL CALIBRATION. The Allowable Value serves as the Technical Specification OPERABILITY limit for the purpose of the CHANNEL CALIBRATION. One example of such a change in measurement error is drift during the surveillance interval. If the as-found value does not exceed the Allowable Value, the channel is considered OPERABLE.

The Nominal Trip Setpoint (i.e., LSSS) is the value at which the digital bistable or binary sensor is set. The Nominal Trip Setpoint value ensures the safety analysis limits are met for the surveillance interval selected when a channel is adjusted based on stated channel uncertainties. Any channel is considered to be properly adjusted when the "as-left" value is within the established Calibration Tolerance (CT) band~~,~~ in accordance with the methods and assumptions of the SCP. The Nominal Trip Setpoint value (i.e., expressed as a value without inequalities) for digital bistables, is confirmed during the MIC. The Nominal Trip Setpoint value (i.e., expressed as a value with inequalities) for binary sensors is confirmed during the CHANNEL CALIBRATION. CTS-01558

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

2. Containment Spray

Containment Spray provides two primary functions:

1. Lowers containment pressure and temperature after an HELB in containment, and

2. Reduces the amount of radioactive iodine in the containment atmosphere.

These functions are necessary to:

- Ensure the pressure boundary integrity of the containment structure,

- Limit the release of radioactive iodine to the environment in the event of a failure of the containment structure, and

- Minimize corrosion of the components and systems inside containment following a LOCA.

The Containment Spray actuation signal starts the ~~containment spray~~CS/RHR pumps and aligns the discharge of the pumps to the containment spray nozzle headers in the upper levels of containment. Containment spray is actuated manually or by High 3 Containment Pressure. CTS-01558

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

lines. This signal may be manually bypassed by the operator in MODE 3 below the P-11 setpoint. In MODE 3 below the P-11 setpoint, an SLB inside containment will be terminated by automatic actuation via the High-High Containment Pressure signal. Stuck valve transients and SLBs outside containment will be terminated by the High Main Steam Line Pressure Negative Rate signal for Main Steam Line Isolation in MODE 3 below the P-11 setpoint when ECCS has been manually bypassed.

This Function is not required to be OPERABLE in MODES 4, 5, and 6 because there is insufficient energy in the secondary side of the unit to have an accident.

This Function has a dynamic transfer function. The Time Constants for this Function are recorded and maintained in a document established by the Setpoint Control Program (SCP).

(2) High Main Steam Line Pressure Negative Rate

High Main Steam Line Pressure Negative Rate provides closure of the all MSIVs for an SLB in MODE 3 below the P-11 setpoint, to maintain at least two unfaulted SGs as a heat sink for the reactor, and to limit the mass and energy release to containment. When the operator manually bypasses the Low Main Steam Line Pressure Main Steam Line Isolation signal in MODE 3 below the P-11 setpoint, the High Main Steam Line Pressure Negative Rate signal is automatically enabled. Main Steam Line Pressure provides both control and protection functions, as described previously under ECCS Function 1.e. There are four High Main Steam Line Pressure Negative Rate signals in a two-out-of-four logic configuration. Three OPERABLE channels are sufficient to satisfy requirements with a two-out-of-three logic on each steam line.

High Main Steam Line Pressure Negative Rate must be OPERABLE in MODE 3 below the P-11~~)~~ setpoint. In this MODE, a secondary side break or stuck open valve could result in the rapid depressurization of the main steam line(s). Above the P-11 setpoint, ~~the~~this signal is CTS-01558

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

b. Main Feedwater Isolation - Actuation Logic and Actuation Outputs

Actuation Logic and Actuation Outputs consist of the same features and operate in the same manner as described for ESFAS Function 1.b. All Main Feedwater Isolation Components are distributed to Trains A and D. Both trains must be OPERABLE.

c. Main Feedwater Isolation - High High Steam Generator Water Level

This signal provides protection against excessive feedwater flow. There are four High High Steam Generator Water Level channels in a two-out-of-four logic configuration for each Steam Generator. The ESFAS SG Water Level instruments provide input to the SG Water Level Control System. The interface from the safety channels in the PSMS to the PCMS is through the Signal Selection Algorithm (SSA). When there are three or more OPERABLE High-High Steam Generator Water Level channels for each Steam Generator, the SSA ensures an input failure to the control system does not result in erroneous control system action that would require the protection function actuation. Therefore, the protection function requires only two additional channels to provide the protection function actuation (i.e., three channels total). Three channels total must be OPERABLE. When there are less than three OPERABLE High-High Steam Generator Water Level channels for each Steam Generator, the SSA cannot prevent erroneous control system operation due to an input failure. This is reflected in the LCO Completion Times for High-High Steam Generator Water Level channels, since there are only three required channels for each Steam Generator. CTS-01558

The transmitters (d/p cells) are located inside containment. However, the events that this Function protects against cannot cause a severe environment in containment. Therefore, the Nominal Trip Setpoint reflects only steady state instrument uncertainties.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

With the T_{avg} resistance temperature detectors (RTDs) located inside the containment, it is possible for them to experience adverse environmental conditions during an SLB event. Therefore, the Nominal Trip Setpoint reflects both steady state and adverse environmental instrument uncertainties.

The Main Feedwater Isolation - Low T_{avg} signal is enabled by the Main Feedwater Isolation - Reactor Trip, P-4 interlock, described below.

Coincident with Reactor Trip, P-4

The Main Feedwater Isolation - Low T_{avg} signal is enabled when the reactor is tripped as indicated by the P-4 interlock. Therefore, the requirements for the P-4 interlock are not repeated in Table 3.3.2-1. Instead, Function 11.a, Reactor Trip, P-4, is referenced for the initiating Function and requirements. Note that both Turbine Trip actuation trains, Trains A and D, are actuated when any two-out-of-four RTB trains are actuated.

All Main Feedwater Isolation Functions, except for the sub-function of High-High Steam Generator Water Level, which trips the MFW pumps and closes the MFIVs, and SGWFCVs, muust be OPERABLE in MODES 1, 2 and 3. In MODES 4, 5, and 6, the MFW System is not in service and the Isolation Functions are not required to be OPERABLE. CTS-01558

The sub-function of the MFW Isolation on High-High Steam Generator Water Level, which trips the MFW pumps and closes the MFIVs and SGWFCVs, must be OPERABLE in MODES 1 and 2, and in MODE 3 above the P-11 setpoint.

The sub-function may be manually bypassed by the operator in MODE 3 below the P-11 setpoint. This manual bypass is needed to allow control of steam generator water level using the SGWFCVs under these conditions. The MFIVs and SGWFCVs are configured in series such that the feedwater flow rate is limited by the SGWFCV capacity which is a very small fraction of the nominal feedwater flow. The manual bypass is acceptable because expected feedwater flow due to open SGWFCVs is not a critical concern under these conditions. Sufficient time margin exists for manual SGWFCV closure, if necessary. Therefore, manual bypass of the automatic trip of MFW pumps and automatic closure of MFIVs and SGWFCVs on High-High

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

f. Emergency Feedwater Actuation - Trip of All Main Feedwater Pumps

A Trip of all MFW pumps is an indication of a loss of MFW and the subsequent need for some method of decay heat and sensible heat removal to bring the reactor back to no load temperature and pressure. Each motor driven MFW pump is equipped with redundant breaker position sensing devices. An open supply breaker indicates that the pump is not running. Emergency Feedwater Actuation on Trip of ~~a~~All Main Feedwater Pumps is an anticipatory function that is not credited in the safety analysis. Therefore, this function does not need to meet the single failure criterion; the LCO requires one OPERABLE channel per pump (i.e., one of the redundant breaker position sensing devices on each pump). A trip of all MFW pumps actuates all EFW trains to ensure that at least two SGs are available with water to act as the heat sink for the reactor. CTS-01558

This function must be OPERABLE in MODES 1 and 2. This ensures that at least two SGs are provided with water to serve as the heat sink to remove reactor decay heat and sensible heat in the event of an accident. In MODES 3, 4, and 5, the MFW pumps may be normally shut down, and thus MFW pump trip is not indicative of a condition requiring automatic EFW initiation.

7. Emergency Feedwater Isolation

One of the objectives of EFW Isolation is to prevent SG overfill in the event of SGTR. The Other objective of EFW Isolation is to stop the flow of EFW into the affected SG in the event of MSLB. For both objectives, the EFW Isolation Functions are automatically actuated by High SG Water Level signal, or by Low Main Steam Line Pressure signal. The Function may also be actuated manually. The EFW Isolation Function is actuated separately for each SG, either manually or automatically. EFW Isolation valves are distributed to all four trains, with two trains of valves for each SG.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

a. Emergency Feedwater Isolation - Manual Initiation

This LCO requires 2 EFW Isolation - Manual Initiation trains for each SG. Each Manual Initiation train closes the EFW isolation valve for one train on one SG. Two Manual Initiation trains must be OPERABLE for each SG to ensure each SG can be isolated with a single failure.

b. Emergency Feedwater Isolation - Actuation Logic and Actuation Outputs

Actuation Logic and Actuation Outputs consist of the same features and operate in the same manner as described for ESFAS Function 1.b. Each Actuation Logic and Actuation Outputs train closes the EFW isolation valve for one train on one SG. Two Actuation Logic and Actuation Outputs trains for each SG must be OPERABLE to ensure each SG can be isolation with a single failure.

Manual and automatic initiation of EFW Isolation Functions must be OPERABLE in MODES 1, 2, and 3. In these MODES, the SGs are in operation. In MODES 4, 5, and 6, SGs are not in service and this Function is not required to be OPERABLE. CTS-01558

c. Emergency Feedwater Isolation - High Steam Generator Water Level Coincident with P-4 signal and No Low Main Steam Line Pressure

This signal provides protection against damaged SG overfill. There are four High Steam Generator Water Level channels in a two-out-of-four logic configuration for each Steam Generator. The ESFAS SG Water Level instruments provide input to the SG Water Level Control System. The interface from the safety channels in the PSMS to the PCMS is through the Signal Selection Algorithm (SSA). When three or more High SG Water Level channels are OPERABLE for each Steam Generator, the SSA ensures an input failure to the control system does not result in erroneous control system action that would require the protection function actuation. Therefore, the protection function requires only two additional channels to provide the protection function actuation (i.e., three channels total). Three channels total must be OPERABLE. When there are less than three OPERABLE High SG Water Level channels for each Steam Generator, the SSA cannot prevent erroneous control system operation due to an input failure. This is reflected in the LCO Completion Times for High SG Water Level channels, since there are only three required channels for each Steam Generator.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

For the small break LOCA analysis, the loss of offsite power triggered by Reactor Trip signal is conservatively assumed, which would cause the earliest RCP trip. In case that the automatic RCP trip is enabled, an earlier RCP trip results in earlier flow coastdown leading to more severe consequences.

11. Engineered Safety Features Actuation System Interlocks

To allow some flexibility in unit operations, several interlocks are included as part of the ESFAS. These interlocks permit the operator to bypass some signals, automatically enable other signals, prevent some actions from occurring, and cause other actions to occur. The interlock Functions back up manual actions to ensure bypassable functions are in operation under the conditions assumed in the safety analyses. CTS-01558

a. Engineered Safety Features Actuation System Interlocks - Reactor Trip, P-4

The P-4 Interlock is enabled when RTBs have opened in two-out-of-four RTB trains. RTB position signals from each RTB are interfaced to all PSMS trains via internal PSMS data links so that the P-4 interlock is generated independently within each train. Therefore this LCO requires three trains to be OPERABLE.

This Function allows operators to take manual control of ECCS systems after the initial phase of ECCS Actuation is complete. Once ECCS is overridden, automatic actuation of ECCS cannot occur again until the RTBs have been manually closed. The functions of the P-4 interlock are:

- Trip the main turbine,
- Close MFW Regulation Valves coincident with Low T_{avg},
- Enable a manual override of ECCS Actuation and prevent ECCS reactuation,
- EFW Isolation coincident with High SG Water Level and No Low Main Steam Line Pressure, and
- Trip the Reactor Coolant Pump coincident with ECCS Actuation.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Each of the above Functions except Reactor Coolant Pump Trip is interlocked with P-4 to avert or reduce the continued cooldown of the RCS following a Reactor Trip. An excessive cooldown of the RCS following a Reactor Trip could cause an insertion of positive reactivity with a subsequent increase in generated power. Reactor Coolant Pump Trip function is interlocked with P-4 to prevent the unexpected Reactor Coolant Pump Trip after a small break LOCA. The unexpected Reactor Coolant Pump Trip after a small break LOCA could cause the increasing of the Peak Clad Temperature (PCT). To avoid such these situations, the noted Functions have been interlocked with P-4 as part of the design of the unit control and protection system.

The RTB position switches that provide input to the P-4 interlock only function to energize or de-energize or open or close contacts. Therefore, this Function has no adjustable trip setpoint. CTS-01558

This Function must be OPERABLE in MODES 1, 2, and 3. In these MODES, the reactor may be critical or approaching criticality. This Function does not have to be OPERABLE in MODE 4, 5, or 6 because the main turbine, the MFW System, and the Turbine Bypass System are not in operation.

b. Engineered Safety Features Actuation System Interlocks - Pressurizer Pressure, P-11

The P-11 interlock permits a normal unit cooldown and depressurization without actuation of ECCS, Main Steam Line Isolation, CVCS Isolation, EFW Isolation or Main Feedwater Isolation on High-High SG Water Level.

With two-out-of-four Pressurizer Pressure channels (discussed previously) less than the P-11 setpoint, the operator can manually bypass the Low Pressurizer Pressure and Low Main Steam Line Pressure ECCS Actuation signals, the Low Main Steam Line Pressure Main Steam Line Isolation signal, the CVCS Isolation signal, the EFW Isolation signals, and the High-High SG Water Level Main Feedwater Isolation signal (previously discussed). When the Low Main Steam Line Pressure Main Steam Line Isolation signal is manually bypassed, a Main Steam Line Isolation signal on High Main Steam Line Pressure Negative Rate is enabled. This provides protection for an SLB by closure of the MSIVs.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The Containment Purge Isolation Functions are required OPERABLE in MODES 1, 2, 3, and 4. Under these conditions, the potential exists for an accident that could release significant fission product radioactivity into containment. Therefore, the Containment Purge Isolation instrumentation must be OPERABLE in these MODES.

While in MODES 5 and 6 including fuel handling in progress, the Containment Purge Isolation instrumentation is not required to be OPERABLE. This is because the doses at the exclusion area boundary, at the low population zone outer boundary, and in the MCR are maintained within acceptable limits for the case where a fuel handling accident occurs without the containment being isolated, as described in FSAR Section 15.7.4 (Ref. 10).

13. Main Control Room Isolation

The MCR Isolation function provides an enclosed MCR environment from which the unit can be operated following an uncontrolled release of radioactivity. MCR Isolation controls the Main Control Room HVAC System (MCRVS) which includes two subsytems: Main Control Room Emergency Filtration System (MCREFS) and Main Control Room Air Temperature Control System (MCRATCS), described in the FSAR Chapter 16 Section 3.7.10. CTS-01558

There are four MCR Isolation trains. Trains A and D of MCR Isolation control two 100% capacity trains of subsystem MCREFS, and all four trains of MCR Isolation control four 50% capacity trains of subsystem MCRATCS. Two trains of MCR Isolation, including A or D, must actuate to properly provide the safety function (i.e., isolate and supply filtered air to the MCR) and three trains, including A and D, must be OPERABLE to provide the safety function with a concurrent single failure.

The MCR Isolation actuation instrumentation consists of redundant radiation monitors. A high radiation signal will initiate all four MCR Isolation trains. The MCR operator can also initiate MCR Isolation trains by manual switches in the MCR. MCR Isolation is also actuated by an ECCS Actuation signal.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

14. Block Turbine Bypass and Cooldown Valves

The Block Turbine Bypass and Cooldown Valves function prevents the overcooling of the reactor coolant system when T_{avg} is decreased abnormally.

Block turbine bypass and cooldown valves are distributed to Trains A and D. Both trains must be OPERABLE in MODES 1, 2 and 3. In MODES 4, 5, and 6, the average coolant temperature is below the Low-Low T_{avg} Signal setpoint and this function is not required to be OPERABLE. CTS-01558

a. Block Turbine Bypass and Cooldown Valves - Manual Initiation

Manual Initiation of Block Turbine Bypass and Cooldown Valves can be accomplished from the MCR. There are two switches in the MCR, one for each train. Each Turbine Bypass and Cooldown Valve is blocked from both trains. Therefore, either switch can be initiated to immediately block the opening of all Turbine Bypass and Cooldown Valves. This LCO requires 2 Manual Block Turbine Bypass and Cooldown Valves Actuation switches to be OPERABLE in MODES 1, 2, and 3. In MODES 4, 5 and 6, the average coolant temperature is below the Low-Low T_{avg} Signal setpoint and this Function is not required to be OPERABLE. CTS-01558 CTS-01558

b. Block Turbine Bypass and Cooldown Valves - Actuation Logic and Actuation Outputs

Actuation Logic and Actuation Outputs consist of the same features and operate in the same manner as described for ESFAS Function 1.b. Block Turbine Bypass and Cooldown Valves are distributed to Trains A and D. Both trains must be OPERABLE in MODES 1, 2 and 3. In MODES 4, 5 and 6, the average coolant temperature is below the Low-Low T_{avg} Signal setpoint and this Function is not required to be OPERABLE. CTS-01558

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

~~Low-Low T_{avg} Signal - Low-Low T_{avg} Signal is enabled by the Block Turbine Bypass and Cooldown Valves.~~Low-Low Tavg for Cooldown Turbine Bypass Valves must be OPERABLE in MODES 1 and 2, and MODE 3 above the setpoint of Low-Low Tavg. This signal for Cooldown Turbine Bypass Valves may be manually overridden by the operator when shutting down. This Function for Cooldown Turbine Bypass Valves is not required to be OPERABLE in MODE 3 below the setpoint of Low-Low Tavg, because there is insufficient energy in the SGs and a larger time margin is allowed to block Cooldown Turbine Bypass Valves. When starting up, Low-Low Tavg for Cooldown Turbine Bypass Valves is automatically enabled above the setpoint of Low-Low Tavg Signal. CTS-01558

Low-Low Tavg for Turbine Bypass Valves (except Cooldown Turbine Bypass Valves) must be OPERABLE in MODES 1, 2, and 3.

In MODES 4, 5 and 6, the average coolant temperature is below the Low-Low Tavg Signal setpoint and this Function is not required to be OPERABLE.

15. Manual Control of ESF Components

The Manual Control of ESF Components Function provides credited manual controls for accidents and safe shutdown, as defined for the plant components in LCO 3.4 through 3.7.

a. Manual Control of ESF Components - S-VDU

An S-VDU train consists of a VDU and S-VDU processor. An S-VDU train must be OPERABLE for the same trains and MODES as required for the controlled ESF components. For ESF components with four trains (three required trains), three S-VDU trains must be OPERABLE for the same three trains as the required OPERABLE ESF components. For ESF components with only two required trains, an S-VDU train must be OPERABLE for the same two trains as the required OPERABLE ESF components. However, for Phase B

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

b. Manual Control of ESF Components - COM-2

COM-2 combines the manual control signals from non-safety Operational VDUs with the manual control signals from S-VDUs. The combined signal is interfaced to the Actuation Logic in the SLS for manual control of ESF components. Since COM-2 controls ESF components assigned to all four trains as explained above for the S-VDU, some of which are required in all MODES, four COM-2 trains are required in MODES 1, 2, 3, 4, 5 and 6.

c. Manual Control of ESF Components - Actuation Logic and Actuation Outputs

The Actuation Logic and Actuation Outputs for the Manual Control of ESF Components Function is implemented in the SLS. For ESFAS components, the SLS combines the automatic actuation signals from the ESFAS with the manual control signals from COM-2. For all ESF components the SLS generates Actuation Outputs, based on automatic and/or manual control signals, which control the state of the ESF components. For the Manual Control of ESF Components Function, the Actuation Logic and Actuation Outputs within any SLS controller must be OPERABLE in the same MODES and for the same trains as for the required ESF components. LCO 3.4 through 3.7 provide MODE and train requirements applicable to ESF components.

16. Main Steam Relief Line Isolation CTS-01558

The Main Steam Relief Line Isolation is to prevent the overcooling of the reactor coolant system in the event of MSRV malfunction. For this objective, the Main Steam Relief Line Isolation is automatically actuated by the Low Main Steam Line Pressure signal. The Function may also be actuated manually. The Main Steam Relief Line Isolation function is actuated separately for each steam relief line, either manually or automatically.

The control of the MSRV and the MSRVBV are distributed to two different trains.

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

CTS-01558

a. Main Steam Relief Line Isolation – Manual Initiation

Manual initiation of Main Steam Relief Line Isolation can be accomplished from the MCR. There are two switches for each steam relief line in the MCR, one for each train. Each Manual Initiation train closes either the MSRV or the MSRVBV. Two Manual Initiation trains must be OPERABLE for each steam line to ensure each steam relief line can be isolated even with a single failure.

Manual Initiation of this Function must be OPERABLE in MODES 1, 2, and 3. In MODES 4, 5, and 6, the SGs are not in service and this Function is not required to be OPERABLE.

b. Main Steam Relief Line Isolation – Actuation Logic and Actuation Outputs

Actuation Logic and Actuation Outputs consist of the same features and operate in the same manner as described for ESFAS Function 1.b. Each Actuation Logic and Actuation Outputs train closes either the MSRV or the MSRVBV on one steam relief line. Two Actuation Logic and Actuation Outputs for each steam relief line must be OPERABLE to ensure each steam relief line can be isolated even with a single failure.

Actuation Logic and Actuation Outputs of this Function must be OPERABLE in MODES 1, 2, and 3. In MODES 4, 5, and 6, the SGs are not in service and this Function is not required to be OPERABLE.

c. Main Steam Relief Line Isolation – Low Main Steam Line Pressure

This signal provides protection against overcooling from the affected steam relief line. The inadvertent opening of an MSRV would result in a low steam line pressure.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

CTS-01558

Main Steam Line Pressure provides both control and protection functions, as described previously under ECCS Function 1.e. There are four Low Main Steam Line Pressure channels on each steam line in a two-out-of-four logic configuration. Three OPERABLE channels on each steam line are sufficient to satisfy the protective requirements with a two-out-of-three logic on each steam line.

Low Main Steam Line Pressure must be OPERABLE in MODES 1 and 2, and MODE 3 except when the operator manually controls MSRV or MSDV for cooling. This signal may be manually bypassed by the operator while performing cooling operations for shutting down with manual control of an MSRV or MSDV. This Function is not required to be OPERABLE in MODE 3 while performing those operations because the MSRV and MSRVBV can be closed by the operator. Therefore, the automatic Main Steam Relief Line Isolation on Low Main Steam Line Pressure function is not required under these conditions. When starting up, the Low Main Steam Line Pressure signal is manually enabled after completion of the manual control of MSRV or MSDV by the operator. In MODES 4, 5, and 6, the SGs are not in service and this Function is not required to be OPERABLE.

The ESFAS instrumentation satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii) (Ref. 9).

ACTIONS (continued)

This action addresses the train orientation of the PSMS for the functions listed above. If one required train is inoperable, 72 hours are allowed to return it to an OPERABLE status. Note that for Containment Spray and Phase B Isolation, failure of one or both channels in one train renders the train inoperable. Condition B, therefore, encompasses both situations.

The Completion Time of 72 hours is justified because (1) for ECCS two trains are adequate to perform the safety function and there are three required automatic actuation trains and two other required Manual Initiation trains OPERABLE, (2) for Containment Spray three trains are adequate to perform the safety function and there are four automatic actuation trains and three other Manual Initiation trains OPERABLE, or (3) for Containment Phase A Isolation one train is adequate to perform the safety function and there are two automatic actuation trains and one other Manual Initiation train OPERABLE. The Completion Time also considers that all trains of ECCS can be initiated by the Manual Initiation Function from the two remaining trains, and Containment Spray can be initiated by the Manual Initiation Function from any two ~~out~~ of the three remaining trains. CTS-01558

In addition, the Completion Time considers that each train of all Functions can be manually initiated from the Safety VDU for that train. Therefore, manual initiation through safety related equipment remains functional in all required trains.

The Completion Time of 72 hours is also justified in the US-APWR reliability and risk analyses, the summary and result of which are documented in FSAR Chapter 19 (Ref. 11).

If the train cannot be restored to OPERABLE status, the unit must be placed in a MODE in which the LCO does not apply. This is done by placing the unit in at least MODE 3 within an additional 6 hours (78 hours total time) and in MODE 5 within an additional 30 hours (108 hours total time). The allowable Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

ACTIONS (continued)

Bypass Time of 12 hour is justified because the remaining OPERABLE channels are adequate to perform the safety function. In addition, the remaining OPERABLE channels have continuous automatic self-testing and continuous automatic CHANNEL CHECKS.

The Bypass Time of 12 hours is also justified in the US-APWR reliability and risk analyses, the summary and result of which are documented in FSAR Chapter 19 (Ref. 11).

F.1, F.2.1, and F.2.2

Condition F applies to Loss of Offsite Power.

Condition F also applies to the Manual Initiation for:

- Main Steam Line Isolation,
- Main Feedwater Isolation,
- Emergency Feedwater Actuation,
- Emergency Feedwater Isolation,
- CVCS Isolation, ~~and~~
- Block Turbine Bypass and Cooldown Valves~~.~~, and
- Main Steam Relief Line Isolation

CTS-01558

BASES

ACTIONS (continued)

For all Functions, this action addresses the train orientation of the PSMS. For the Loss of Offsite Power Function, this action also recognizes the lack of manual trip provision for a failed channel.

If one channel or required train is inoperable, 72 hours are allowed to return it to OPERABLE status.

For the Loss of Offsite Power Function, the Completion Time of 72 hours is justified because the two remaining OPERABLE undervoltage devices for each train of the Emergency Feedwater Actuation Function are adequate to perform the safety function. Since the undervoltage devices are dedicated for each of the four Class 1E busses, and two undervoltage devices are adequate to perform the safety function of each bus, the Emergency Feedwater Actuation on Loss of Offsite Power continues to meet the single failure criterion (i.e., three trains of the Emergency Feedwater Actuation Function will still actuate if there is an additional undervoltage device failure on one bus).

For Manual Initiation Functions, the Completion Time of 72 hours is justified because (1) for Emergency Feedwater Actuation the remaining two trains are adequate to perform the safety function and there are three automatic actuation trains and two other Manual Initiation trains OPERABLE, or (2) for Main Steam Line Isolation, Main Feedwater Isolation, Emergency Feedwater Isolation, CVCS Isolation, ~~and~~ Block Turbine Bypass and Cooldown Valves, and Main Steam Relief Line Isolation the remaining train is adequate to perform the safety function and there are two automatic actuation trains and one other Manual Initiation train OPERABLE. The Completion Time also considers that Emergency Feedwater Actuation for all trains can be initiated by the Manual Initiation Function from the two remaining trains. CTS-01558

BASES

ACTIONS (continued)

In addition, the Completion Time for the Manual Initiation Function considers that each train can be manually initiated from the Safety VDU for that train. Therefore, manual initiation through safety related equipment remains functional in all trains.

For all Functions, the Completion Time of 72 hours is also justified in the US-APWR reliability and risk analyses, the summary and result of which are documented in FSAR Chapter 19 (Ref. 11).

If the Function cannot be returned to OPERABLE status, the unit must be placed in MODE 3 within the next 6 hours and MODE 4 within the following 6 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power in an orderly manner and without challenging unit systems. In MODE 4, the unit does not have any analyzed transients or conditions that require the explicit use of the protection functions noted above.

For the Loss of Offsite Power Function a Note is added to allow placing one channel in bypass for up to 4 hours while performing surveillance testing, provided the other channels on the same bus are OPERABLE, or one channel is OPERABLE and the other is placed in the trip condition.

The Bypass Time of 4 hours is justified because the Function remains fully OPERABLE on every bus. In addition, the Bypass Time considers that each OPERABLE train has continuous automatic self-testing.

The 4 hour bypass time is also justified in the US-APWR reliability and risk analyses, the summary and result of which are documented in FSAR Chapter 19 (Ref. 11).

G.1, G.2.1, and G.2.2

Condition G applies to the Actuation Logic and Actuation Outputs for the;

- Emergency Feedwater Isolation,
- CVCS Isolation, ~~and~~
- Turbine Trip Functions~~.~~, and
- Main Steam Relief Line Isolation

CTS-01558

BASES

ACTIONS (continued)

R.1 and R.2

Condition R applies to the Actuation Logic and Actuation Outputs for the following functions:

- ECCS Actuation, and
- Containment Spray,

If the Required Action and associated Completion Time of Condition Q are not met, the unit must be placed in a MODE in which the LCO does not apply. This is done by placing the unit in at least MODE 3 within 6 hours and in MODE 5 within an additional 30 hours (36 hours total time). The Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

S.1 and S.2

Condition S applies to the Actuation Logic and Actuation Outputs for the;

- Main Steam Line Isolation,
- Main Feedwater Isolation, and
- Block Turbine Bypass and Cooldown Valves.

The action addresses the train orientation of the PSMS for these Functions.

If one train is inoperable, 24 hours are allowed to restore the train to OPERABLE status.

The Completion Time of 24 hours is justified because the remaining OPERABLE train is adequate to perform the safety function. In addition, the Completion Time considers that the remaining OPERABLE train has continuous automatic self-testing. CTS-01558

The Completion Time of 24 hours is also justified in the US-APWR reliability and risk analyses, the summary and result of which are documented in FSAR Chapter 19 (Ref. 11).

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.2.2

SR 3.3.2.2 is the performance of a MIC for the ESFAS Instrumentation. This includes the Safety VDU processors, the RPS, the ESFAS, the SLS, and the COM-2.

The PSMS is self-tested automatically on a continuous basis from the digital side of all input modules to the digital side of all output modules. Continuous automatic self-testing encompasses all PSMS safety-related functions including digital Nominal Trip Setpoints, Time Constants, Time Delays and actuation logic functions. The continuous automatic self-testing also encompasses all data communications within a PSMS train, between PSMS trains and between the PSMS and PCMS. The continuous automatic self-testing is described in Reference 6 and Reference 7.

The MIC is a diverse check of the PSMS software memory integrity, consistent with the Setpoint Control Program (SCP), to ensure there is no change to the internal PSMS software that would impact its functional operation, including digital Nominal Trip Setpoints~~.~~, Time Constants~~.~~, Time Delays, actuation logic functions or the continuous automatic self-testing. The MIC is described in Reference 6 and Reference 7. CTS-01558

The capability to generate continuous automatic self-testing fault alarms shall be confirmed OPERABLE during the MIC.

The complete OPERABILITY check from the measurement channel input device to the SLS output device is performed by the combination of the continuous automatic self-testing for the digital devices (the RPS, ESFAS, SLS, and data communication interfaces), the continuous automatic CHANNEL CHECK (SR 3.3.2.1), the CHANNEL CALIBRATION (SR 3.3.2.6), the MIC (SR 3.3.2.2), and the TADOT (SR 3.3.2.3, SR 3.3.2.4, SR 3.3.2.5 and SR 3.3.2.8). The CHANNEL CALIBRATION, the MIC, and the TADOT, which are manual tests, overlap with the continuous automatic self-testing and confirm the functioning of the continuous automatic self-testing.

BASES

SURVEILLANCE REQUIREMENTS (continued)

The complete OPERABILITY check from the Safety VDU (S-VDU) input device to the SLS output device is performed by the combination of the continuous automatic self-testing for the digital devices (Safety VDU processors, COM-2, SLS and data communication interfaces), the SAFETY VDU TEST (SR 3.3.2.9), MIC for the Safety VDU processors, COM-2 and SLS (SR 3.3.2.2) and TADOT for SLS outputs (SR 3.3.2.3). The SAFETY VDU TEST, MIC, and TADOT, which are manual tests, overlap with the automatic self-testing and confirm the functioning of the automatic tests.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.3.2.3

SR 3.3.2.3 is the performance of a TADOT for the Actuation Outputs of all ESFAS Functions, and the Actuation Outputs of the Manual Control of ESF Components Function. This surveillance test actuates the outputs of the SLS.~~,~~ CTS-01558

Therefore, this test is typically conducted in conjunction with testing the plant process components. Since this test is conducted in conjunction with testing for plant process components, this test may be conducted more frequently, as may be required for the plant process components.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

BASES

REFERENCES

1. NUREG-0737, “Clarification of TMI Action Plan Requirements.”

2. FSAR Section 7.3.

3. FSAR Chapter 15.

4. IEEE-603-1991.

5. 10 CFR 50.49.

6. MUAP-07004-P, Revision 7, “Safety I&C System Description and Design Process.”

7. MUAP-07005-P, Revision 8, “Safety System Digital Platform— -MELTAC-.” CTS-01558

8. MUAP-09021-P, Revision ~~2~~3, “Response Time of Safety I&C System.” CTS-01558

9. 10 CFR 50.36.

10. FSAR Section 15.7.4.

11. FSAR Chapter 19.

12. MUAP-09022-P, Revision ~~2~~3, “US-APWR Instrument Setpoint Methodology.” CTS-01558

13. Regulatory Guide 1.105, Revision 3, “Setpoints for Safety Related Instrumentation.”

14. FSAR Chapter 9.4.1.2.2.

BASES

APPLICABLE SAFETY ANALYSES (continued)

The S-VDU, RPS and SLS for each train are packaged in their own cabinet for physical and electrical separation to satisfy separation and independence requirements.

The S-VDU, RPS and SLS have continuous automatic self-testing while in service. When any one train is taken out of service for manual testing, the remaining trains are capable of providing unit monitoring and protection until the testing has been completed.

LCO

The LCO requires all instrumentation performing the PAM Instrumentation Function, listed in Table 3.3.3-1 in the accompanying LCO, to be OPERABLE. A channel is OPERABLE provided the "as-found" value, measured during surveillance testing, does not exceed its associated Allowable Value, and provided the “as-left” value is within the specified calibration tolerance at the completion of each CHANNEL CALIBRATION.

The PAM Instrumentation LCO provides OPERABILITY requirements for Type A variables, which provide information required by the control room operators to perform certain manual actions specified in the unit Emergency Operating Procedures. These manual actions ensure that a system can accomplish its safety function, and are credited in the safety analyses. Additionally, this LCO addresses instruments that have been designated Type B and C.

The OPERABILITY of the PAM Instrumentation ensures there is sufficient information available on selected unit parameters to monitor and assess unit status following an accident.

The number of channels available for PAM Instrumentation Functions is shown in FSAR Chapter 7 Table 7.5-3. For PAM Instrumentation Functions with two channels, the channels are assigned to Trains A and D; both channels are required. For PAM Instrumentation Functions with four channels, the channels are assigned to Trains A, B, C and D; the required number of which is two, three, or four depending on the variable.

LCO 3.3.3 requires two, three or four OPERABLE channels. The specified number of OPERABLE channels ensures no single failure prevents operators from getting the information necessary for them to determine the safety status of the unit, and to bring the unit to and maintain it in a safe condition following an accident. CTS-01558

BASES

REFERENCES

1. Regulatory Guide 1.97, Rev. 4.

2. NUREG-0737, “Clarification of TMI Action Plan Requirements.”

3. MUAP-07004-P, Revision 7, “Safety I&C System Description and Design Process.”

4. FSAR Section 7.5.

5. IEEE 497-2002.

6. MUAP-09022-P, Revision ~~2~~3, “US-APWR Instrument Setpoint Methodology.” CTS-01558

7. MUAP-07005-P, Revision 8, “Safety System Digital Platform -MELTAC-.”

8. FSAR Section 7.1.3.14.

ACTIONS

In all cases where the LCO states "Restore channel or train to OPERABLE status", this means restore the required number of channels or trains to OPERABLE status. Therefore, restoration of an alternate channel or train, other than the failed channel or train, is also acceptable.

A.1

Condition A addresses the situation where one required channel or train for the Display and Control Function is inoperable, or one train for the Transfer of Control Function is inoperable. CTS-01558

The Required Action is to restore the channel or train to OPERABLE status within 30 days. The Completion Time is based on operating experience and the low probability of an event that would require evacuation of the MCR.

B.1 and B.2

Condition B applies when the Required Action and associated Completion Time of Condition A are not met. In this condition, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE 4 within 12 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.3.4.1

SR 3.3.4.1 is the performance of a TADOT for the Transfer of Control Function from the MCR to the RSC, which verifies the RSC Transfer Switches perform their required functions for each PSMS train and the PCMS. Each Transfer Switch is tested up to, and including, the signal status readout on a digital display.

This SR verifies that the controls and interfaces for the Transfer of Control Function are OPERABLE.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 19.
2. 10 CFR 50.36.
3. MUAP-07004-P , Revision 7, “Safety I&C System Description and Design Process.”
4. FSAR Section 7.4.
5. MUAP-07005-P , Revision 8, “Safety System Digital Platform – MELTAC.”
6. MUAP-09022-P, Revision ~~2~~3, “US-APWR Instrument Setpoint Methodology.” CTS-01558
7. FSAR Section 7.1.3.14.

Table B 3.3.4-1 (Sheet 2 of 2)
Remote Shutdown Console Instrumentation

FUNCTION	REQUIRED NUMBER OF CHANNELS
6. Main Steam Supply System	
a. Main Steam Line Pressure	2 per Line
7. Component Cooling Water System	
a. CCW Surge Tank Water Level	1 per Required Tank Compartment
b. CCW Header Pressure	1 per Required Pump
c. CCW Header Flow	1 per Required Pump
d. CCW Supply Temperature	1 per Required Pump
e. CCW Pump Discharge Pressure	1 per Required Pump
8. Essential Service Water System	
a. CCW Hx ESW Flow	1 per Required Pump
b. ESW Header Pressure	1 per Required Pump
9. Refueling Water Storage System	
a. RWSP Water Level (Wide Range)	2
10. Nuclear Instrumentation	
a. Source Range Neutron Flux	2
11. UHS Instrumentation	
a. UHS Basin Water level	2 per Basin
b. UHS Basin Temperature	1 per Basin

CTS-01558

Table B 3.3.4-2 (Sheet 2 of 3)
Remote Shutdown Console Control

FUNCTION	REQUIRED NUMBER OF TRAINS
6. Emergency Feedwater System	
a. EFW Pump (Motor-Driven or Turbine Driven)	3
b. EFW Control Valve	1 per SG
c. EFW Isolation Valve	1 per SG
d. T/D-EFW Pump MS Line Steam Isolation Valve	1 per Required Pump
e. T/D-EFW Pump Actuation Valve	1 per Required Pump
7. Main Steam Supply System	
a. Main Steam Depressurization Valve	1 per SG
b. Main Steam Relief Valve Block Valve	1 per SG
c. Main Steam Isolation Valve	1 per SG
d. Main Steam Bypass Isolation Valve	1 per SG
8. Component Cooling Water System	
a. CCW Pump	3
b. CS/RHR Hx CCW Outlet 1st Valve	1 per Required Pump
c. CS/RHR Hx CCW Outlet 2nd Valve	1 per Required Pump
9. Essential Service Water System	
a. ESW Pump	3
b. ESW Pump Discharge Valve	1 per Required Pump
10. Steam Generator Blowdown System	
a. SGBD Line Containment Isolation Valve	1 per SG
b. SGBD Line Isolation Valve	1 per SG
c. SGBD Sampling Line Containment Isolation Valve	1 per SG
11. Heating, Ventilation, and Air Conditioning	
a. MCR Air Handling Unit & Damper	3
b. Class 1E Electrical Room Air Handling Unit & Damper	3

CTS-01558

BASES

SURVEILLANCE REQUIREMENTS (continued)

The scope of this TADOT is limited to the GTG control outputs of the SLS, including the interface of those outputs to the GTG. However, this test is typically conducted in conjunction with testing the complete GTG including the fuel system and other GTG engine components, in accordance with LCO 3.8.1. Since this test is conducted in conjunction with testing the GTG components, this test may be conducted more frequently, as may be required for the GTG components.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. FSAR Section 8.3.1.

2. MUAP-07004-P, Revision 7, “Safety I&C System Description and Design Process.”

3. MUAP-07005-P, Revision 8, “Safety System Digital Platform -MELTAC-.”

4. 10 CFR 50.36.

5. FSAR Chapter 19.

6. FSAR Chapter 15.

7. MUAP-09022-P, Revision ~~2~~3, “US-APWR Instrument Setpoint Methodology.” CTS-01558

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

f. Rod Drive Motor-Generator Set Trip Device

This LCO requires two Rod Drive Motor-Generator Set

Trip Device subsystems, one for each Motor-Generator set, to be OPERABLE. This is because each subsystem trips one Motor-Generator set and both Motor-Generator sets must be tripped for this Reactor Trip Function. The DAS cannot initiate a Reactor Trip with a failure of a Rod Drive Motor-Generator Set Trip Device. CTS-01558

2. Emergency Feedwater Actuation

a. Manual Initiation

Manual Initiation consists of the same features and operates in the same manner as described for DAS Function 1.a. One channel is required to be OPERABLE.

b. Actuation Logic and Actuation Outputs

Actuation Logic and Actuation Outputs consist of the same features and operate in the same manner as described for DAS Function 1.b. Four subsystems are required to be OPERABLE.

c. Low Steam Generator Water Level

The Low Steam Generator Water Level channels consist of the same features and operate in the same manner as described for DAS Function 1.e. One Low SG Water Level channel for each DAAC subsystem is required to be OPERABLE on any 3 Steam Generators.

The DAS Emergency Feedwater (EFW) Actuation automatic function is automatically blocked when status signals are received indicating that the PSMS ESFAS EFW function has actuated correctly. Correct actuation is indicated when status signals are received from limit switch contacts on the steam inlet valves to the turbine driven EFW pumps or from auxiliary contacts on the motor starters controlling the motor driven EFW pumps.

ACTIONS (continued)

The Completion Time of 30 days is justified because the DAS is a separate and diverse non-safety backup system. In addition, the Completion Time considers that the remaining OPERABLE channels and Actuation Logic and Actuation Outputs subsystems are adequate to perform the DAS Function.. CTS-01558

The Required Actions are modified by two Notes. Note 1 allows placing the Actuation Logic of one subsystem or one required channel in bypass for up to 4 hours while performing surveillance testing, provided the Actuation Logic in the other subsystems or the other required channels are OPERABLE. This Note does not allow a bypass with one channel or subsystem in the tripped condition, as for the RTS and ESFAS, to avoid a spurious DAS actuation.

The Bypass Time of 4 hours for Actuation Logic and channels is justified because the remaining OPERABLE channels or subsystems are adequate to perform the safety function.

Note 2 allows placing the Actuation Outputs of two subsystems in bypass for up to 4 hours while performing surveillance testing of the Actuation Outputs from the other subsystems, or surveillance testing of the Rod Drive Motor-Generator Set Trip Devices. This bypass avoids spurious DAS actuation, because the Actuation Outputs and Rod Drive Motor-Generator Set Trip Devices must be actuated for these tests and they do not have bypass test capability.

When the Actuation Outputs of DAAC 1 or DAAC 3 are tested, this Note allows bypassing the Actuation Outputs of DAAC 2 and DAAC 4, to prevent spurious signals that would result in a spurious reactor trip or ESF actuation. When the Actuation Outputs of DAAC 2 or DAAC 4 are tested, this Note allows bypassing the Actuation Outputs of DAAC 1 and DAAC 3, to prevent spurious signals that would result in a spurious reactor trip or ESF actuation.

When Rod Drive Motor-Generator Set Trip Device 1 is tested, this Note allows bypassing the Actuation Outputs of DAAC 2 and DAAC 4, to prevent spurious signals that would trip Rod Drive Motor-Generator Set Trip Device 2 and cause a spurious reactor trip. When Rod Drive Motor-Generator Set Trip Device 2 is tested, this Note allows bypassing the Actuation Outputs of DAAC 1 and DAAC 3, to prevent spurious signals that would trip Rod Drive Motor-Generator Set Trip Device 1 and cause a spurious reactor trip.

SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.3.6.4

An ACTUATION LOGIC TEST is performed on each of the four Diverse Automatic Actuation Cabinet subsystems. All possible logic combinations are tested for each protection function. Verification of each Logic module, and Output module is included in this test.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.3.6.5

A TADOT is performed for the Manual Initiation/Control and Actuation Outputs of all DAS functions. This test actuates the outputs to the PSMS Power Interface modules. Through overlap with the ACTUATION LOGIC TEST, the TADOT confirms these outputs can be generated from the Manual Initiation/Control switches and from the ~~A~~automatic ~~A~~actuation CTS-01558
~~L~~logic.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.3.6.6

A TADOT for the Rod Drive Motor-Generator set trip devices is performed by actuating the Manual Initiation switch from the control room and by verifying actuation of the Rod Drive Motor-Generator set trip device. Through overlap with the ACTUATION LOGIC TEST, the TADOT confirms the Rod Drive Motor-Generator set trip devices can be actuated from the Manual Initiation/Control switches and from the ~~A~~automatic ~~A~~actuation CTS-01558
~~L~~logic.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

BASES

REFERENCES

1. MUAP-07006-P-A, Revision 2, “Defense-in-Depth and Diversity.”

2. MUAP-07014-P, Revision ~~4~~5, “Defense-in-Depth and Diversity Coping Analysis.” CTS-01558

3. FSAR Section 7.8.

4. 10 CFR 50.49.

5. 10 CFR 50.36.

6. FSAR Chapter 15.

7. MUAP-09022-P, Revision ~~2~~3, “US-APWR Instrument Setpoint Methodology.” CTS-01558

8. U.S. Nuclear Regulatory Commission, Standard Review Plan, Branch Technical Position 7-19, “Guidance for Evaluation of Diversity and Defense-in-Depth in Digital Computer-Based Instrumentation and Control Systems.”

BASES

APPLICABLE SAFETY ANALYSES (continued)

All low power safety analyses assume initial RCS loop temperatures ≥ the HZP temperature of 5571°F (Ref. 1). The minimum temperature for criticality limitation provides a small band, 6°F, for critical operation below HZP. This band allows critical operation below HZP during plant startup and does not adversely affect any safety analyses since the MTC is not significantly affected by the small temperature difference between HZP and the minimum temperature for criticality. CTS-01558

The RCS minimum temperature for criticality satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

Compliance with the LCO ensures that the reactor will not be made or maintained critical (k_{eff} ≥ 1.0) at a temperature less than a small band below the HZP temperature, which is assumed in the safety analysis. Failure to meet the requirements of this LCO may produce initial conditions inconsistent with the initial conditions assumed in the safety analysis.

APPLICABILITY

In MODE 1 and MODE 2 with k_{eff} ≥ 1.0, LCO 3.4.2 is applicable since the reactor can only be critical (k_{eff} ≥ 1.0) in these MODES.

The special test exception of LCO 3.1.8, "PHYSICS TESTS Exceptions - MODE 2," permits PHYSICS TESTS to be performed at ≤ 5% RTP with RCS loop average temperatures slightly lower than normally allowed so that fundamental nuclear characteristics of the core can be verified. In order for nuclear characteristics to be accurately measured, it may be necessary to operate outside the normal restrictions of this LCO. For example, to measure the MTC at beginning of cycle, it is necessary to allow RCS loop average temperatures to fall below $T_{no\ load}$, which may cause RCS loop average temperatures to fall below the temperature limit of this LCO.

ACTIONS

A.1

If the parameters that are outside the limit cannot be restored, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to MODE 2 with K_{eff} < 1.0 within 30 minutes. Rapid reactor shutdown can be readily and practically achieved within a 30 minute period. The allowed time is reasonable, based on operating experience, to reach MODE 2 with K_{eff} < 1.0 in an orderly manner and without challenging plant systems.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.5.2

SR 3.4.5.2 requires verification of SG OPERABILITY. SG OPERABILITY is verified by ensuring that the secondary side narrow range water level is ≥ 14~~3~~% for required RCS loops. If the SG secondary side narrow range water level is < 14~~3~~%, the tubes may become uncovered and the associated loop may not be capable of providing the heat sink for removal of the decay heat. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. CTS-01558

SR 3.4.5.3

Verification that each required RCP is OPERABLE ensures that safety analyses limits are met. The requirement also ensures that an additional RCP can be placed in operation, if needed, to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power availability to each required RCP. Alternatively, verification that a pump is in operation also verifies proper breaker alignment and power availability. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note that states the SR is not required to be performed until 24 hours after a required pump is not in operation.

REFERENCES None.

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.6 RCS Loops - MODE 4

BASES

BACKGROUND

In MODE 4, the primary function of the reactor coolant is the removal of decay heat and the transfer of this heat to either the steam generator (SG) secondary side coolant or the component cooling water via the containment spray/residual heat removal (CS/RHR) heat exchangers. The secondary function of the reactor coolant is to act as a carrier for soluble neutron poison, boric acid. CTS-01558

The reactor coolant is circulated through four RCS loops connected in parallel to the reactor vessel, each loop containing an SG, a reactor coolant pump (RCP), and appropriate flow, pressure, level, and temperature instrumentation for control, protection, and indication. The RCPs circulate the coolant through the reactor vessel and SGs at a sufficient rate to ensure proper heat transfer and to prevent boric acid stratification.

In MODE 4, either RCPs or RHR loops can be used to provide forced circulation. The intent of this LCO is to provide forced flow from at least one RCP or two RHR loop for decay heat removal and transport. The flow provided by one RCP loop or RHR loop is adequate for decay heat removal. The other intent of this LCO is to require that additional paths be available to provide redundancy for decay heat removal.

Additionally, forced coolant circulation provided by at least one RCP ensures that the concentration of soluble boron in the reactor coolant is homogeneous. However, when no RCPs are operating, all isolation valves for reactor makeup water sources containing unborated water that are connected to the Reactor Coolant System (RCS) must be secured closed to prevent unplanned boron dilution of the reactor coolant. This will ensure that an inadvertent boron dilution event does not occur under reduced flow conditions where unborated water could stratify in the RCS.

The Safeguards Component Area HVAC System is a support system that provides temperature control for the CS/RHR Pump Room and CS/RHR Heat Exchanger Room, and includes electric heating coils, cooling coils, fans, ductwork, dampers, and instrumentation and controls necessary to perform the support function. The Essential Chilled Water System is a support system and provides chilled water to the air handling unit cooling coil. The Essential Service Water System supports operation of the essential chiller. For each RHR loop required to be OPERABLE, the associated train of Safeguards Component Area HVAC System, including its associated train of the Essential Chilled Water System and Essential Service Water System, must be in operation, or available to operate on demand, and capable of performing its related support function. CTS-01558

BASES

APPLICABLE SAFETY ANALYSES	In MODE 4, RCS circulation is considered in the determination of the time available for mitigation of the accidental boron dilution event. The prevention of an accidental boron dilution event is ensured by requiring that all sources of unborated water be isolated from the RCS when RCS circulation is not provided by at least one operating RCP. CTS-01558 RCS Loops - MODE 4 satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).
LCO	The purpose of this LCO is to require that at least two RCS loops or three RHR loops are OPERABLE in MODE 4 and that one of the RCS loops or two of the RHR loops are in operation. Any one RCS loop or two RHR loops in operation provides enough flow to remove the decay heat from the core with forced circulation. An additional loop is required to be OPERABLE to provide redundancy for heat removal. ~~However, consistency with the Chapter 15.4.6 Safety Analysis (Reference 1) assumptions requires that unborated water sources be isolated from the RCS when only RHR pumps are used to provide forced circulation.~~ CTS-01558 Additionally, this LCO requires that all sources of unborated water be isolated from the RCS to prevent an inadvertent boron dilution event in MODE 4 with no running RCPs (Reference 1). However, planned dilution and makeup operations are sometimes required during MODE 4 with no RCPs running to compensate for transient conditions which result in a continuous change in the RCS mass (see discussion of Note 3 below). Note 1 permits all RCPs or CS/RHR pumps to be removed from operation for ≤ 1 hour per 8 hour period. The purpose of the Note is to permit tests that are designed to validate various accident analyses values. One of the tests performed during the startup testing program is the validation of rod drop times during cold conditions, both with and without flow. The no flow test may be performed in MODE 3, 4, or 5 and requires that the pumps be stopped for a short period of time. The Note permits the stopping of the pumps in order to perform this test and validate the assumed analysis values. If changes are made to the RCS that would cause a change to the flow characteristics of the RCS, the input values must be revalidated by conducting the test again. The 1 hour time period is adequate to perform the test, and operating experience has shown that boron stratification is not a problem during this short period with no forced flow.

BASES

LCO (continued)

Utilization of Note 1 is permitted provided the following conditions are met along with any other conditions imposed by initial startup test procedures:

a. No operations are permitted that would dilute the RCS boron concentration with coolant with boron concentrations less than required to meet SDM of LCO 3.1.1, therefore maintaining the margin to criticality. Boron reduction with coolant at boron concentrations less than required to assure SDM is maintained is prohibited because a uniform concentration distribution throughout the RCS cannot be ensured when in natural circulation and

b. Core outlet temperature is maintained at least 10°F below saturation temperature, so that no vapor bubble may form and possibly cause a natural circulation flow obstruction.

Note 2 requires that the secondary side water temperature of each SG be ≤ 50°F above each of the RCS cold leg temperatures before the start of an RCP with any RCS cold leg temperature ≤ Low Temperature Overpressure Protection (LTOP) arming temperature specified in the PTLR. This restraint is to prevent a low temperature overpressure event due to a thermal transient when an RCP is started.

Note 3 permits the opening of isolation valves for unborated water sources for when in a planned and procedurally controlled dilution or makeup activity provided that this activity is not prohibited by Note 1. Planned dilution and makeup operations are sometimes required to compensate for transient conditions which result in a continuous change in the RCS mass. CTS-01558

Procedures should minimize to the extent practicable the time unborated water sources are not isolated during the conduct of these operations. Once such an operation is complete the exception no longer applies and action to close the valves must be initiated immediately. It is expected that any unborated water isolation valve used in the planned activity will be secured in the closed position within 15 minutes following the planned activity.

BASES

LCO (continued)

An OPERABLE RCS loop comprises an OPERABLE RCP and an OPERABLE SG, which has the minimum water level specified in SR 3.4.6.2.

Similarly for the RHR System, an OPERABLE RHR loop comprises an OPERABLE CS/RHR pump capable of providing forced flow to an OPERABLE CS/RHR heat exchanger. RCPs and CS/RHR pumps are OPERABLE if they are capable of being powered and are able to provide forced flow if required. Management of gas voids is important to RHR System OPERABILITY. CTS-01558

APPLICABILITY

In MODE 4, this LCO ensures forced circulation of the reactor coolant to remove decay heat from the core and to provide proper boron mixing. One loop of RCS or two loops of RHR provides sufficient circulation for the removal of decay heat from the core. However, two loops of RHR do not provide sufficient circulation to provide proper boron mixing. Therefore, the LCO requires that the valves used to isolate unborated water sources be secured in the closed position when no RCPs are running. Additional loops consisting of RCS and RHR loops are required to be OPERABLE to meet single failure considerations.

Operation in other MODES is covered by:

LCO 3.4.4, "RCS Loops - MODES 1 and 2,"

LCO 3.4.5, "RCS Loops - MODE 3,"

LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled,"

LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled,"

LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation - High Water Level" (MODE 6), and

LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation - Low Water Level" (MODE 6).

ACTIONS (continued)

B.1 and B.2

If two or more required loops are inoperable or a required loop(s) are not in operation, except during conditions permitted by Note 1 in the LCO section, all operations involving introduction of coolant into the RCS with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 must be suspended and action to restore one RCS or RHR loop to OPERABLE status and operation must be initiated. The required margin to criticality must not be reduced in this type of operation. Suspending the introduction of coolant into the RCS of coolant with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 is required to assure continued safe operation. With coolant added without forced circulation, unmixed coolant could be introduced to the core, however coolant added with boron concentration meeting the minimum SDM maintains acceptable margin to subcritical operations. The immediate Completion Times reflect the importance of maintaining operation for decay heat removal. The action to restore must be continued until the required loop(s) are restored to OPERABLE status and operation.

C.1

ACTION C has ~~been modified by~~ two Notes. The first Note allows separate Condition entry for each unborated water source isolation valve. The second Note requires that Required Action C.2 be completed whenever Condition C is entered. CTS-01558

Preventing inadvertent dilution of the reactor coolant boron concentration when there is insufficient RCS mixing is dependent on maintaining the unborated water isolation valves secured closed when there are no RCPs operating. Securing the valves in the closed position ensures that the valves cannot be inadvertently opened. ~~Planned dilution and makeup operations are sometimes required to compensate for transient conditions which result in a continuous change in the RCS mass. This ACTION allows exception to the requirement to isolate all sources of unborated water for the purpose of performing these planned and procedurally controlled operations, but requires that the isolation status be quickly restored (within 15 minutes) following the planned activity.~~ The Completion Time of immediately requires an operator to initiate actions to close an open valve and secure the isolation valve in the closed position in a timely manner. Once actions are initiated, they must be continued until the valves are secured in the closed position. CTS-01558

BASES

ACTIONS (continued)

C.2

Due to the potential of having diluted the boron concentration of the reactor coolant, SR 3.1.1.1 (verification of boron concentration) must be performed whenever Condition C is entered to demonstrate that the required boron concentration exists. The Completion Time of 4 hours is sufficient to obtain and analyze a reactor coolant sample for boron concentration.

SURVEILLANCE REQUIREMENTS

SR 3.4.6.1

This SR requires verification that the required RCS or RHR loop is in operation. Verification includes flow rate, temperature, or pump status monitoring, which help ensure that forced flow is providing heat removal. In the event that no RCPs are operating to provide sufficient mixing conditions to satisfy~~v~~ the Chapter 15 Safety Analysis assumption the operator is instructed to perform SR 3.4.6.4 to isolate all sources of unborated water to prevent an inadvertent dilution. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. CTS-01558

SR 3.4.6.2

SR 3.4.6.2 requires verification of SG OPERABILITY. SG OPERABILITY is verified by ensuring that the secondary side narrow range water level is ≥ 14~~3~~%. If the SG secondary side narrow range water level is < 14~~3~~%, the tubes may become uncovered and the associated loop may not be capable of providing the heat sink necessary for removal of decay heat. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. CTS-01558

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.6.3

Verification that each required pump is OPERABLE ensures that an additional RCS or CS/RHR pump can be placed in operation, if needed, to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available to each required pump. Alternatively, verification that a pump is in operation also verifies proper breaker alignment and power availability. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note that states the SR is not required to be performed until 24 hours after a required pump is not in operation.

SR 3.4.6.4

~~Verify~~Verification that unborated water sources are isolated from the RCS when operating with RHR loops in service and no RCPs running ensures that an inadvertent boron dilution cannot occur under plant conditions that do not provide adequate boron mixing. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. CTS-01558

This SR is modified by a Note that state that the SR is not required to be performed if any RCP is in operation.

SR 3.4.6.5 CTS-01558

RHR System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required RHR loop(s) and may also prevent water hammer, pump cavitation, and pumping of noncondensible gas into the reactor vessel.

Selection of RHR System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

BASES

SURVEILLANCE REQUIREMENTS (continued)

CTS-01558

The RHR System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds the acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation the RHR system is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

This SR is modified by a Note that states the SR is not required to be performed until 12 hours after entering MODE 4. In a rapid shutdown, there may be insufficient time to verify all susceptible locations prior to entering MODE 4.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

REFERENCES 1. Subsection 15.4.6

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.7 RCS Loops - MODE 5, Loops Filled

BASES

BACKGROUND

In MODE 5 with the RCS loops filled, the primary function of the reactor coolant is the removal of decay heat and transfer this heat either to the steam generator (SG) secondary side coolant via natural circulation (Ref. 1) or the component cooling water via the containment spray/residual heat removal (CS/RHR) heat exchangers. While the principal means for decay heat removal is via the RHR System, the SGs via natural circulation (Ref. 1) are specified as a backup means for redundancy. Even though the SGs cannot produce steam in this MODE, they are capable of being a heat sink due to their large contained volume of secondary water. As long as the SG secondary side water is at a lower temperature than the reactor coolant, heat transfer will occur. The rate of heat transfer is directly proportional to the temperature difference. The secondary function of the reactor coolant is to act as a carrier for soluble neutron poison, boric acid. CTS-01558

In MODE 5 with RCS loops filled, the reactor coolant is circulated by means of four RHR loops connected to the RCS, each loop containing a CS/RHR heat exchanger, a CS/RHR pump, and appropriate flow and temperature instrumentation for control, protection, and indication.

The number of loops in operation can vary to suit the operational needs. The intent of this LCO is to provide forced flow from at least two RHR loops for decay heat removal and transport. The flow provided by two RHR loops is adequate for decay heat removal. The other intent of this LCO is to require that a third path be available to provide redundancy for heat removal.

The LCO provides for redundant paths of decay heat removal capability. The first two paths can be RHR loops that must be OPERABLE and in operation. The third path can be another OPERABLE RHR loop or maintaining two SGs with secondary side water levels ≥ 14~~3~~% to provide an alternate method for decay heat removal via natural circulation (Ref. 1). CTS-01558

The CS/RHR pumps do not provide sufficient circulation of water through the RCS to ensure that the concentration of soluble boron in the reactor coolant is homogeneous. Therefore, all isolation valves for reactor makeup water sources containing unborated water that are connected to the RCS must be secured closed to prevent unplanned boron dilution of the reactor coolant. CTS-01558

BASES

BACKGROUND (continued)

The Safeguards Component Area HVAC System is a support system that provides temperature control for the CS/RHR Pump Room and CS/RHR Heat Exchanger Room, and includes electric heating coils, cooling coils, fans, ductwork, dampers, and instrumentation and controls necessary to perform the support function. The Essential Chilled Water System is a support system and provides chilled water to the air handling unit cooling coil. The Essential Service Water System supports operation of the essential chiller. For each RHR loop required to be OPERABLE, the associated train of Safeguards Component Area HVAC System, including its associated train of the Essential Chilled Water System and Essential Service Water System, must be in operation, or available to operate on demand, and capable of performing its related support function. CTS-01558

APPLICABLE SAFETY ANALYSES	In MODE 5, RCS circulation is considered in the determination of the time available for mitigation of the accidental boron dilution event. The prevention of an accidental boron dilution event is ensured by requiring that all sources of unborated water be isolated from the RCS when RCS circulation is only provided by the CS/RHR pumps. CTS-01558 RCS Loops - MODE 5 (Loops Filled) satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).
LCO	The purpose of this LCO is to require that at least two of the RHR loops be OPERABLE and in operation with an additional RHR loop OPERABLE or two SGs with secondary side water level ≥ 143%. Two RHR loops provide sufficient forced circulation to perform the safety functions of the reactor coolant under these conditions. An additional RHR loop is required to be OPERABLE to meet single failure considerations. However, if the standby RHR loop is not OPERABLE, an acceptable alternate method is two SGs with their secondary side water levels ≥ 143%. Should one of the operating RHR loops fail, the SGs could be used to remove the decay heat via natural circulation. CTS-01558 CTS-01558 Additionally, this LCO requires that all sources of unborated water be isolated from the RCS to prevent an inadvertent boron dilution event in MODE 5. However, planned dilution and makeup operations are sometimes required during MODE 5 to compensate for transient conditions which result in a continuous change in the RCS mass (see discussion of Note 5 below). This LCO allows exception to the requirement to isolate all sources of unborated water for the purpose of performing these planned and procedurally controlled operations, but requires that the isolation status be immediately restored following the planned actions. CTS-01558

BASES

LCO (continued)

Note 1 permits all CS/RHR pumps to be removed from operation ≤ 1 hour per 8 hour period. The purpose of the Note is to permit tests designed to validate various accident analyses values. One of the tests performed during the startup testing program is the validation of rod drop times during cold conditions, both with and without flow. The no flow test may be performed in MODE 3, 4, or 5 and requires that the pumps be stopped for a short period of time. The Note permits stopping of the pumps in order to perform this test and validate the assumed analysis values. If changes are made to the RCS that would cause a change to the flow characteristics of the RCS, the input values must be revalidated by conducting the test again. The 1 hour time period is adequate to perform the test, and operating experience has shown that boron stratification is not likely during this short period with no forced flow.

Utilization of Note 1 is permitted provided the following conditions are met, along with any other conditions imposed by initial startup test procedures:

a. No operations are permitted that would dilute the RCS boron concentration with coolant with boron concentrations less than required to meet SDM of LCO 3.1.1, therefore maintaining the margin to criticality. Boron reduction with coolant at boron concentrations less than required to assure SDM is maintained is prohibited because a uniform concentration distribution throughout the RCS cannot be ensured when in natural circulation and

b. Core outlet temperature is maintained at least 10°F below saturation temperature, so that no vapor bubble may form and possibly cause a natural circulation flow obstruction.

Note 2 allows one RHR loop to be inoperable for a period of up to 2 hours, provided that the other two required RHR loops ~~is~~are OPERABLE and in operation. This permits periodic surveillance tests to be performed on the inoperable loop during the only time when such testing is safe and possible. CTS-01558

Note 3 requires that the secondary side water temperature of each SG be ≤ 50°F above each of the RCS cold leg temperatures before the start of a reactor coolant pump (RCP) with an RCS cold leg temperature ≤ Low Temperature Overpressure Protection (LTOP) arming temperature specified in the PTLR. This restriction is to prevent a low temperature overpressure event due to a thermal transient when an RCP is started.

LCO (continued)

Note 4 provides for an orderly transition from MODE 5 to MODE 4 during a planned heatup by permitting removal of RHR loops from operation when at least one RCS loop is in operation. This Note provides for the transition to MODE 4 where an RCS loop is permitted to be in operation and replaces the RCS circulation function provided by the RHR loops. The requirement for isolation of the unborated water sources is removed as soon as one RCP is in operation.

Note 5 permits the opening of isolation valves for unborated water sources for when in a planned and procedurally controlled dilution or makeup activity provided that this activity is not prohibited by Note 1. Planned dilution and makeup operations are sometimes required to compensate for transient conditions which result in a continuous change in the RCS mass. Procedures should minimize to the extent practicable the time unborated water sources are not isolated during the conduct of these operations. Once such an operation is complete the exception no longer applies and action to close the valves must be initiated immediately. It is expected that any unborated water isolation valve used in the planned activity will be secured in the closed position within 15 minutes following the planned activity. CTS-01558

CS/RHR pumps are OPERABLE if they are capable of being powered and are able to provide flow if required. A SG can perform as a heat sink via natural circulation when it has an adequate water level and is OPERABLE.

Management of gas voids is important to RHR System OPERABILITY. CTS-01558

BASES

APPLICABILITY

In MODE 5 with RCS loops filled, this LCO requires forced circulation of the reactor coolant to remove decay heat from the core. Two loops of RHR provides sufficient circulation for these purposes. However, one additional RHR loop is required to be OPERABLE, or the secondary side water level of at least two SGs is required to be ≥ 14~~3~~%. Two loops of RHR do not provide sufficient circulation to provide proper boron mixing. Therefore, the LCO requires that the valves used to isolate unborated water sources be secured in the closed position when no RCPs are running. CTS-01558

Operation in other MODES is covered by:

LCO 3.4.4, "RCS Loops - MODES 1 and 2;"

LCO 3.4.5, "RCS Loops - MODE 3;"

LCO 3.4.6, "RCS Loops - MODE 4;"

LCO 3.4.8, "RCS Loops - MODE 5, Loops Not Filled;"

LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation -High Water Level" (MODE 6)," and

LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation - Low Water Level" (MODE 6)."

ACTIONS

A.1 and A.2

If two RHR loops are OPERABLE and in operation and either the required SGs have secondary side water levels < 143%, or one required RHR loop is inoperable, redundancy for heat removal is lost. Action must be initiated immediately to restore a third RHR loop to OPERABLE status or to restore the required SG secondary side water levels. Either Required Action will restore redundant heat removal paths. The immediate Completion Time reflects the importance of maintaining the availability of two paths for heat removal. CTS-01558

B.1 and B.2

If less than two RHR loops are in operation, except during conditions permitted by Note 1, or if less than two loops are OPERABLE, all operations involving introduction of coolant into the RCS with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 must be suspended and action to restore two RHR loops to OPERABLE status and operation must be initiated. Suspending the introduction of coolant into the RCS of coolant with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 is required to assure continued safe operation. With coolant added without forced circulation, unmixed coolant could be introduced to the core, however coolant added with boron concentration meeting the minimum SDM maintains acceptable margin to subcritical operations. The immediate Completion Times reflect the importance of maintaining operation for heat removal.

C.1

ACTION C has ~~been modified by~~ two Notes. The first Note allows separate Condition entry for each unborated water source isolation valve. The second Note requires that Required Action C.2 be completed whenever Condition C is entered. CTS-01558

Preventing inadvertent dilution of the reactor coolant boron concentration when there is insufficient RCS mixing is dependent on maintaining the unborated water isolation valves secured closed when there are no RCPs operating. Securing the valves in the closed position ensures that the valves cannot be inadvertently opened. ~~Planned dilution and makeup operations are sometimes required to compensate for transient conditions which result in a continuous change in the RCS mass. This ACTION allows exception to the requirement to isolate all sources of unborated water for the purpose of performing these planned and procedurally controlled operations, but requires that the isolation status be quickly restored (within 15 minutes) following the planned activity.~~ The Completion Time of immediately requires an operator to initiate actions to close an open valve CTS-01558

BASES

ACTIONS (continued)

and secure the isolation valve in the close position in a timely manner. Once actions are initiated, they must be continued until the valves are secured in the closed position.

C.2

Due to the potential of having diluted the boron concentration of the reactor coolant, SR 3.1.1.1 (verification of boron concentration) must be performed whenever Condition C is entered to demonstrate that the required boron concentration exists. The Completion Time of 4 hours is sufficient to obtain and analyze a reactor coolant sample for boron concentration.

SURVEILLANCE REQUIREMENTS

SR 3.4.7.1

This SR requires verification that the required loops are in operation. Verification includes flow rate, temperature, or pump status monitoring, which help ensure that forced flow is providing heat removal. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.4.7.2

Verifying that at least two SGs are OPERABLE by ensuring their secondary side narrow range water levels are ≥ 14~~3~~% ensures an alternate decay heat removal method via natural circulation in the event that the second RHR loop is not OPERABLE. If two RHR loops are OPERABLE, this Surveillance is not needed. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. CTS-01558

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.7.3

Verification that each required CS/RHR pump is OPERABLE ensures that an additional pump can be placed in operation, if needed, to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available to each required CS/RHR pump. Alternatively, verification that a pump is in operation also verifies proper breaker alignment and power availability. If secondary side water level is ≥ 14~~3~~% in at least two SGs, this Surveillance is not needed. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. CTS-01558

This SR is modified by a Note that states the SR is not required to be performed until 24 hours after a required pump is not in operation.

SR 3.4.7.4

~~Verify~~Verification that unborated water sources are isolated from the RCS when operating with RHR loops in service and no RCPs running ensures that an inadvertent boron dilution cannot occur under plant conditions that do not provide adequate boron mixing. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. CTS-01558

This SR is modified by a Note that state that the SR is not required to be performed if any RCP is in operation.

SR 3.4.7.5 CTS-01558

RHR System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required RHR loop(s) and may also prevent water hammer, pump cavitation, and pumping noncondensible gas into the reactor vessel.

Selection of RHR System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

SURVEILLANCE REQUIREMENTS (continued)

The RHR System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds an acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits. CTS-01558

RHR System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

REFERENCES

1. NRC Information Notice 95-35, "Degraded Ability of Steam Generators to Remove Decay Heat by Natural Circulation."

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.8 RCS Loops - MODE 5, Loops Not Filled

BASES

BACKGROUND

In MODE 5 with the RCS loops not filled, the primary function of the reactor coolant is the removal of decay heat generated in the fuel, and the transfer of this heat to the component cooling water via the containment spray/residual heat removal (CS/RHR) heat exchangers. The steam generators (SGs) are not available as a heat sink when the loops are not filled. The secondary function of the reactor coolant is to act as a carrier for the soluble neutron poison, boric acid. CTS-01558

In MODE 5 with the RCS loops not filled, only CS/RHR pumps can be used for coolant circulation. The number of pumps in operation can vary to suit the operational needs. The intent of this LCO is to provide forced flow from at least two CS/RHR pumps for decay heat removal and transport and to require that three paths be available to provide redundancy for heat removal.

The CS/RHR pumps do not provide sufficient circulation of water through the RCS to ensure that the concentration of soluble boron in the reactor coolant is homogeneous. Therefore, all isolation valves for reactor makeup water sources containing unborated water that are connected to the RCS must be secured closed to prevent unplanned boron dilution of the reactor coolant. CTS-01558

In MODE 5 with the RCS loops not filled, low-pressure letdown line isolation valves are automatically closed upon detection of RCS loop lowlevel signal to prevent loss of RCS inventory. The function is effective to prevent core damage during plant shutdown, based on probabilistic risk assessment.

In Mode 5 with the RCS not filled, one additional source of injection water (beyond a CS/RHR pump) will reduce the calculated core damage frequency. One safety injection (SI) pump can provide this injection source. A water source is also required. CTS-01558

BASES

BACKGROUND (continued)

The Safeguards Component Area HVAC System is a support system that provides temperature control for the CS/RHR Pump Room and CS/RHR Heat Exchanger Room, and includes electric heating coils, cooling coils, fans, ductwork, dampers, and instrumentation and controls necessary to perform the support function. The Essential Chilled Water System is a support system and provides chilled water to the air handling unit cooling coil. The Essential Service Water System supports operation of the essential chiller. For each RHR loop required to be OPERABLE, the associated train of Safeguards Component Area HVAC System, including its associated train of the Essential Chilled Water System and Essential Service Water System, must be in operation, or available to operate on demand, and capable of performing its related support function. CTS-01558

APPLICABLE SAFETY ANALYSES

In MODE 5, RCS circulation is considered in the determination of the time available for mitigation of the accidental boron dilution event. The flow provided by two RHR loops is adequate for heat removal. The prevention of an accidental boron dilution event is ensured by requiring that all sources of unborated water be isolated from the RCS when RCS circulation is not provided by at least one operating RCP.

RCS loops in MODE 5 (loops not filled) satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).

The need for one SI pump is based on the PRA insight that maintaining at least one RCS injection function operable results in a reduction in core damage risk during shutdown conditions (Mode 5) with the RCS partially filled. CTS-01558

LCO

The purpose of this LCO is to require that at least three RHR loops be OPERABLE and two of these loops be in operation. An OPERABLE loop is one that has the capability of transferring heat from the reactor coolant at a controlled rate. Heat cannot be removed via the RHR System unless forced flow is used. A minimum of two running CS/RHR pumps meets the LCO requirement for two loops in operation. An additional RHR loop is required to be OPERABLE to meet single failure considerations.

Additionally, this LCO requires that all sources of unborated water be isolated from the RCS to prevent an inadvertent boron dilution event in MODE 5. However, planned dilution and makeup operations are sometimes required during MODE 5 to compensate for transient conditions which result in a continuous change in the RCS mass (see discussion of Note 3 below). ~~This LCO allows exception to the requirement to isolate all sources of unborated water for the purpose of performing these planned and procedurally controlled operations, but requires that the isolation status be immediately restored following the planned actions.~~ CTS-01558

BASES

LCO (continued)

The LCO requires the low-pressure letdown line isolation valves to be OPERABLE to mitigate the effects associated with loss of RCS inventory.

The LCO also requires that one SI pump be OPERABLE such that in response to a manual operator start the pump can provide sufficient water to mitigate a drain-down event while in Mode 5 with the RCS partially filled. The LCO requires that a source of water (i.e., reactor water storage pit (RWSP) and water available from the refueling cavity) be available and contain the necessary volume of water. The capability to provide injection water is important to achieve defense-in-depth during Mode 5 with the RCS partially filled. The ability of the pump to provide flow to the RCS while partially filled (and at near atmospheric pressure) and have electrical power are the criteria necessary to be OPERABLE in Mode 5. No pump automatic start features are required to be OPERABLE in Mode 5 as these capabilities were not credited in the PRA. CTS-01558

Note 1 permits one CS/RHR pump to be removed from operation for ≤ 15 minutes when switching from one loop to another. The circumstances for stopping one CS/RHR pump is to be limited to situations when the outage time is short and core outlet temperature is maintained > 10°F below saturation temperature. The Note prohibits boron dilution with coolant at boron concentrations less than required to assure SDM of LCO 3.1.1 is maintained or draining operations when RHR forced flow is stopped.

Note 2 allows one RHR loop to be inoperable for a period of ≤ 2 hours, provided that the other two required loops are OPERABLE and in operation. This permits periodic surveillance tests to be performed on the inoperable loop during the only time when these tests are safe and possible.

Note 3 permits the opening of isolation valves for unborated water sources for when in a planned and procedurally controlled dilution or makeup activity provided that this activity is not prohibited by Note 1. Planned dilution and makeup operations are sometimes required to compensate for transient conditions which result in a continuous change in the RCS mass. Procedures should minimize to the extent practicable the time unborated water sources are not isolated during the conduct of these operations. Once such an operation is complete the exception no longer applies and action to close the valves must be initiated immediately. It is expected that any unborated water isolation valve used in the planned activity will be secured in the closed position within 15 minutes following the planned activity. CTS-01558

BASES

LCO (continued)

An OPERABLE RHR loop is comprised of an OPERABLE CS/RHR pump capable of providing forced flow to an OPERABLE CS/RHR heat exchanger. CS/RHR pumps are OPERABLE if they are capable of being powered and are able to provide flow if required. Management of gas voids is important to RHR System OPERABILITY. CTS-01558

APPLICABILITY

In MODE 5 with loops not filled, this LCO requires core heat removal and coolant circulation by the RHR System. However, the RHR system does not provide sufficient RCS circulation to ensure proper boron mixing. Therefore, the LCO requires that the valves used to isolate unborated water sources be secured in the closed position.

Operation in other MODES is covered by:

LCO 3.4.4, "RCS Loops - MODES 1 and 2,"

LCO 3.4.5, "RCS Loops - MODE 3,"

LCO 3.4.6, "RCS Loops - MODE 4,"

LCO 3.4.7, "RCS Loops - MODE 5, Loops Filled,"

LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation - High Water Level (MODE 6)," and

LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation - Low Water Level (MODE 6)."

ACTIONS

A.1

If one required RHR loop is inoperable, redundancy for RHR is lost. Action must be initiated to restore a third loop to OPERABLE status. The immediate Completion Time reflects the importance of maintaining the availability of three paths for heat removal.

B.1

If one low-pressure letdown isolation valve is inoperable, the automatic isolation function to prevent loss of RCS inventory is lost. Action must be initiated to restore the valve to OPERABLE status. The immediate Completion Time reflects the importance of maintaining the availability of three paths for heat removal.

ACTIONS (continued)

C.1 and C.2

If less than two required loops are OPERABLE or less than two required loops in operation, except during conditions permitted by Note 1, all operations involving introduction of coolant into the RCS with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 must be suspended and action must be initiated immediately to restore two RHR loops to OPERABLE status and operation. The required margin to criticality must not be reduced in this type of operation. Suspending the introduction of coolant into the RCS of coolant with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 is required to assure continued safe operation. With coolant added without forced circulation, unmixed coolant could be introduced to the core, however coolant added with boron concentration meeting the minimum SDM maintains acceptable margin to subcritical operations. The immediate Completion Time reflects the importance of maintaining operation for heat removal. The action to restore must continue until two loops are restored to OPERABLE status and operation.

D.1

ACTION D has ~~been modified by~~ two Notes. The first Note allows separate Condition entry for each unborated water source isolation valve. The second Note requires that Required Action D.2 be completed whenever Condition D is entered. CTS-01558

Preventing inadvertent dilution of the reactor coolant boron concentration when there is insufficient RCS mixing is dependent on maintaining the unborated water isolation valves secured closed when there are no RCPs operating. Securing the valves in the closed position ensures that the valves cannot be inadvertently opened. ~~Planned dilution and makeup operations are sometimes required to compensate for transient conditions which result in a continuous change in the RCS mass. This ACTION allows exception to the requirement to isolate all sources of unborated water for the purpose of performing these planned and procedurally controlled operations, but requires that the isolation status be quickly restored (within 15 minutes) following the planned activity.~~ The Completion Time of immediately requires an operator to initiate actions to close an open valve and secure the isolation valve in the closed position in a timely manner. Once actions are initiated, they must be continued until the valves are secured in the closed position. CTS-01558

BASES

ACTIONS (continued)

D.2

Due to the potential of having diluted the boron concentration of the reactor coolant, SR 3.1.1.1 (verification of boron concentration) must be performed whenever Condition C is entered to demonstrate that the required boron concentration exists. The Completion Time of 4 hours is sufficient to obtain and analyze a reactor coolant sample for boron concentration.

E.1, E.2, E.3, E.4 CTS-01558

In the event that no SI pump is available to inject water into the RCS, the RWSP does not contain sufficient water volume (SR 3.4.8.6), or boron concentration is not within limits (SR 3.4.8.7) to mitigate a RCS drain-down event in Mode 5 while the RCS is partially filled, then actions must be initiated immediately to restore this capability. The PRA indicates that the availability of an injection water source reduces the core damage frequency. Additionally, until such capability is restored, any activity that could result in lowering RCS water volume must be suspended. The immediate COMPLETION TIME reflects the importance of maintaining water injection capability while the RCS is in a partially filled condition.

F.1, F.2, F.3.1 and F.3.2

If no RHR loop is in operation, the following actions must be taken:

a. The equipment hatch must be closed and secured with four bolts,

b. One door in each air lock must be closed, and

c. Each penetration providing direct access from the containment atmosphere to the outside atmosphere must be either closed by a manual or automatic isolation valve, blind flange, or equivalent, or verified to be capable of being closed by an OPERABLE Containment Purge and Exhaust Isolation System.

BASES

ACTIONS (continued)

With RHR loop requirements not met, the potential exists during an RCS drain down event for the coolant to boil and release radioactive gas to the containment atmosphere. Performing the actions stated above ensures that all containment penetrations are either closed or can be closed so that the dose limits are not exceeded. The Completion Time of 4 hours allows fixing of most CS/RHR pumps problems and is reasonable, based on the availability of the standby RHR loop and one SI train for injection water, and on the low probability of the coolant boiling in that time. CTS-01558

SURVEILLANCE REQUIREMENTS

SR 3.4.8.1

This SR requires verification every 12 hours that the required loops are in operation. Verification includes flow rate, temperature, or pump status monitoring, which help ensure that forced flow is providing heat removal. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.4.8.2

Verification that each required CS/RHR pump is OPERABLE ensures that an additional pump can be placed in operation, if needed, to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available to each required pump. Alternatively, verification that a CS/RHR pump is in operation also verifies proper breaker alignment and power availability. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note that states the SR is not required to be performed until 24 hours after a required pump is not in operation.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.8.3

SR 3.4.8.3 requires a complete cycle of each low-pressure letdown isolation valve. This requirements mean confirmation of OPERABILITY of Instrumentation and its control (Setpoints, Channel Checks, Channel Calibrations) and valve. Operating a low-pressure letdown isolation valve through one complete cycle ensures that the low-pressure letdown isolation valve can be automatically actuated to mitigate the effects from loss of RCS inventory. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.4.8.4

~~Verify~~Verification that unborated water sources are isolated from the RCS when operating with RHR loops in service and no RCPs running ensures that an inadvertent boron dilution cannot occur under plant conditions that do not provide adeguate boron mixing. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. CTS-01558

This SR is modified by a Note that state that the SR is not required to be performed if any RCP is in operation.

SR 3.4.8.5 CTS-01558

RHR System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required RHR loop(s) and may also prevent water hammer, pump cavitation, and pumping noncondensible gas into the reactor vessel.

Selection of RHR System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

BASES

SURVEILLANCE REQUIREMENTS (continued)

The RHR System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds an acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits. CTS-01558

RHR System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

SR 3.4.8.6

Verification that the RWSP contains a borated water volume (including water available in the refueling cavity) . 79,920 ft3 (597,800 gallons) ensures that the pump will have a sufficient inventory of water to mitigate the Mode 5 RCS drain-down event assumed in the probabilistic risk assessment (PRA). The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.8.7 CTS-01558

The boron concentration of the RWSP should be verified to be within the required limits. This SR ensures that the reactor will remain subcritical following a RCS drain down event. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.4.8.8

Verification that the breaker alignment is correct and indicated power is available to the required SI pump ensures that the pump motor will be available to drive the pump upon manual start. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.4.8.9

Periodic surveillance testing of an SI pump to detect gross degradation caused by impeller structural damage or other hydraulic component problems is required by the ASME Code. This type of testing may be accomplished by measuring the pump developed head at only one point of the pump characteristic curve. This verifies both that the measured performance is within an acceptable tolerance of the original pump baseline performance and that the performance at the test flow is greater than or equal to the performance assumed in the plant PRA for a drain-down event in Mode 5 with a partially filled RCS. SRs are specified in the Inservice Testing Program of the ASME Code. The ASME Code provides the activities and Frequencies necessary to satisfy the requirements.

REFERENCES None.

BASES

BACKGROUND (continued)

important for maintaining subcooled conditions in the RCS and ensuring the capability to remove core decay heat by either forced or natural circulation of reactor coolant. Unless adequate heater capacity is available, the hot, high pressure condition cannot be maintained indefinitely and still provide the required subcooling margin in the primary system. Inability to control the system pressure and maintain subcooling under conditions of natural circulation flow in the primary system could lead to a loss of single phase natural circulation and decreased capability to remove core decay heat.

APPLICABLE SAFETY ANALYSES

In MODES 1, 2, and 3, the LCO requirement for an adequate steam volume is reflected implicitly in the accident analyses. Safety analyses performed for lower MODES are not limiting. All analyses performed from a critical reactor condition assume the existence of a steam volume and saturated conditions in the pressurizer. In making this assumption, the analyses neglect the small fraction of noncondensible gases normally present.

Safety analyses do not take credit for pressurizer heater operation; however, an implicit initial condition assumption of the safety analyses is that the RCS is operating at normal pressure (Ref. 1).

The maximum pressurizer water level limit, which ensures that a steam volume exists in the pressurizer and prevents two-phase or water relief and pressurizer overfill, satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii). Although the heaters are not specifically used in accident analysis, the need to maintain subcooling in the long term during loss of offsite power, as indicated in NUREG-0737 (Ref. 2), is the reason for providing an LCO.

Some Chapter 15 AOOs result in an increase in RCS temperature and resultant increase in pressurizer level. For many of these events, the decrease in reactor power following reactor trip effectively terminates this increase in RCS temperature and leads to a stabilization or decrease in pressurizer level. Therefore, such events are protected from pressurizer overfill and water or two-phase relief by the high pressurizer water level reactor trip, specified in Table 3.3.1-1 of TS 3.3.1 and Table 7.2-3 of Section 7.2 of Chapter 7. This is also true for all Chapter 15 AOOs that begin from MODES 2 and 3 because the potential heatup of the core is limited by the low (~~<~~≤ 5%) or zero power in those MODES. CTS-01558

However, certain Chapter 15 AOOs beginning from MODE 1, such as the loss of non-emergency AC power to the station auxiliaries (Ref. 3) and the loss of normal feedwater flow (Ref. 4), result in a continued increase in pressurizer water level even after reactor trip, mainly due to the presence of decay heat and reduced secondary heat sink capability. In these events, the initial steam volume needs to be sufficient to accommodate the

APPLICABILITY

The need for pressure control is most pertinent when core heat can cause the greatest effect on RCS temperature, resulting in the greatest effect on pressurizer level and RCS pressure control. Thus, applicability has been designated for MODE 1. MODE 1 is the condition that provides minimum margin to pressurizer overfill and two-phase or water relief for AOOs that result in a net integrated pressurizer insurge. MODE 2 is applicable for the same reasons, although the LCO value is increased due to the lower initial power level of ~~-~~≤ 5%. The applicability is also provided for MODE 3. The purpose is to prevent solid water RCS operation during heatup and cooldown to avoid rapid pressure rises caused by normal operational perturbation, such as reactor coolant pump startup. CTS-01558

In MODES 1, 2, and 3, there is need to maintain the availability of pressurizer heaters, capable of being powered from an emergency power supply. In the event of a loss of offsite power, the initial conditions of these MODES give the greatest demand for maintaining the RCS in a hot pressurized condition with loop subcooling for an extended period. For MODE 4, 5, or 6, it is not necessary to control pressure (by heaters) to ensure loop subcooling for heat transfer when the Residual Heat Removal (RHR) System is in service, and therefore, the LCO is not applicable.

ACTIONS

A.1, A.2, A.3, and A.4

If the pressurizer water level is not within the limit, action must be taken to bring the plant to a MODE in which the LCO does not apply. To achieve this status, within 6 hours the unit must be brought to MODE 3 with all rods fully inserted and incapable of withdrawal. Additionally, the unit must be brought to MODE 4 within 12 hours. This takes the unit out of the applicable MODES.

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

B.1

If one required group of pressurizer heaters is inoperable, restoration is required within 72 hours. The Completion Time of 72 hours is reasonable considering the anticipation that a demand caused by loss of offsite power would be unlikely in this period. Pressure control may be maintained during this time using normal station powered heaters.

BACKGROUND (continued)

decay heat levels, the makeup system can provide adequate flow via the makeup control valve. If conditions require the use of more than two SI pumps or one charging pump for makeup in the event of loss of inventory, then pumps can be made available through manual actions.

The LTOP System for pressure relief consists of two residual heat removal (RHR) suction relief valves. Two RHR suction relief valves have adequate relieving capability to keep from overpressurization for the required coolant input capability.

RHR Suction Relief Valve Requirements

During LTOP MODES, the RHR System is operated for decay heat removal and low pressure letdown control. Therefore, the RHR suction isolation valves are open in the piping from the RCS hot legs to the inlets of the CS/RHR pumps. While these valves are open, the RHR suction relief valves are exposed to the RCS and are able to relieve pressure transients in the RCS. CTS-01558

The RHR suction relief valves are spring loaded, water relief valves with pressure tolerances and accumulation limits established by Section III of the American Society of Mechanical Engineers (ASME) Code (Ref. 3) for Class 2 relief valves.

RCS Vent Requirements

Once the RCS is depressurized, a vent exposed to the containment atmosphere will maintain the RCS at containment ambient pressure in an RCS overpressure transient, if the relieving requirements of the transient do not exceed the capabilities of the vent. Thus, the vent path must be capable of relieving the flow resulting from the limiting LTOP mass or heat input transient, and maintaining pressure below the P/T limits. The required vent capacity may be provided by one or more vent paths.

For an RCS vent to meet the flow capacity requirement, it may require removing a pressurizer safety valve, removing a SDV, or opening a SDV and disabling its block valve in the open position. The vent path(s) must be above the level of reactor coolant, so as not to drain the RCS when open.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.14.1

Performance of leakage testing on each RCS PIV or isolation valve used to satisfy Required Action A.1 and Required Action A.2 is required to verify that leakage is below the specified limit and to identify each leaking valve. The leakage limit of 0.5 gpm per inch of nominal valve diameter up to 5 gpm maximum applies to each valve. Leakage testing requires a stable pressure condition.

For the two PIVs in series, the leakage requirement applies to each valve individually and not to the combined leakage across both valves. If the PIVs are not individually leakage tested, one valve may have failed completely and not be detected if the other valve in series meets the leakage requirement. In this situation, the protection provided by redundant valves would be lost.

Testing is to be performed every ~~1~~2<u>4</u> months, but may be extended if the plant does not go into MODE 5 for at least 7 days. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. CTS-01558

Testing must also be performed once, to ensure tight reseating after an RCS PIV has been actuated. PIVs disturbed in the performance of this Surveillance should also be tested unless documentation shows that an infinite testing loop cannot practically be avoided. Testing must be performed within 24 hours after the valve has been reseated. Within 24 hours is a reasonable and practical time limit for performing this test after opening or reseating a valve.

The leakage limit is to be met at the RCS pressure associated with MODES 1 and 2. This permits leakage testing at high differential pressures with stable conditions not possible in the MODES with lower pressures.

Entry into MODES 3 and 4 is allowed to establish the necessary differential pressures and stable conditions to allow for performance of this Surveillance. The Note that allows this provision is complementary to the Frequency of prior to entry into MODE 2 whenever the unit has been in MODE 5 for 7 days or more, if leakage testing has not been performed in the previous 9 months. In addition, this Surveillance is not required to

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.2 Safety Injection System (SIS) - Operating

BASES

BACKGROUND

The function of the SIS is to provide core cooling and negative reactivity to ensure that the reactor core is protected after any of the following accidents:

a. Loss of coolant accident (LOCA), coolant leakage greater than the capability of the normal charging system,

b. Rod ejection accident,

c. Loss of secondary coolant accident, including uncontrolled steam release or loss of feedwater, and

d. Steam generator tube rupture (SGTR).

The addition of negative reactivity is designed primarily for the loss of secondary coolant accident where primary cooldown could add enough positive reactivity to achieve criticality and return to significant power.

There are two phases of SIS operation: direct vessel injection (DVI) and hot leg recirculation. In the DVI phase, water is taken from the refueling water storage Pit (RWSP) and injected directly into the reactor vessel downcomer. After approximately 4 hours of DVI, the SIS flow is shifted to the hot leg recirculation phase to provide a backflush, which would reduce the boiling in the top of the core and any resulting boron precipitation.

The SIS consists of four 50% capacity trains. The ECCS accumulators and the RWSP are also part of the ECCS, but are not considered part of an SIS flow path as described by this LCO.

The SIS flow paths consist of piping, valves, and pumps such that water from the RWSP can be injected into the RCS following the accidents described in this LCO. The major component of each train is the SI pump. Each pump is capable of supplying 50% of the flow required to mitigate the accident consequences. Four 50% capacity SIS trains ensure 100% of the required flow is delivered to the reactor with one train out of service, while still meeting the single failure criterion.

The Safeguards Component Area HVAC System is a support system that provides temperature control for the SI Pump Room, and includes electric heating coils, cooling coils, fans, ductwork, dampers, and instrumentation and controls necessary to perform the support function. The Essential Chilled Water System is a support system and provides chilled water to the CTS-01558

BASES

BACKGROUND (continued)

air handling unit cooling coil. The Essential Service Water System supports operation of the essential chiller. For each SIS train required to be OPERABLE, the associated train of Safeguards Component Area HVAC System, including its associated train of the Essential Chilled Water System and Essential Service Water System, must be in operation, or available to operate on demand, and capable of performing its related support function. CTS-01558

The four SIS trains are located in the four quadrants surrounding the Containment Vessel. A dedicated line from the RWSP penetrates through the Containment Vessel in each quadrant to the suction of the SI pump train located in the Reactor Building and associated with that quadrant. Each SI pump discharges through a direct injection throttle valve to a DVI nozzle on the reactor vessel. Each SIS train flow path is completely independent of the other three trains.

During low temperature conditions in the RCS, limitations are placed on the maximum number of SI pumps that may be OPERABLE. Refer to the Bases for LCO 3.4.12, "Low Temperature Overpressure Protection (LTOP) System," for the basis of these requirements.

The SI pumps are actuated upon receipt of an ECCS actuation signal. The actuation of safeguard loads is accomplished in a programmed time sequence. If offsite power is available, the safeguard loads start immediately in the programmed sequence. If offsite power is not available, the Engineered Safety Feature (ESF) buses shed normal operating loads and are connected to the Class 1E gas turbine generators (GTGs). Safeguard loads are then actuated in the programmed time sequence. The time delay associated with Class 1E GTG starting, sequenced loading, and pump starting determines the time required before pumped flow is available to the core following a LOCA.

The active SIS components, along with the passive accumulators and the RWSP covered in LCO 3.5.1, "Accumulators," and LCO 3.5.4, "Refueling Water Storage Pit (RWSP)," provide the cooling water necessary to meet GDC 35 (Ref. 1).

APPLICABLE SAFETY ANALYSES (continued)

During the blowdown stage of a LOCA, the RCS depressurizes as primary coolant is ejected through the break into the containment. The nuclear reaction is terminated either by moderator voiding during large breaks or control rod insertion for small breaks. Following depressurization, emergency cooling water is injected into the reactor vessel downcomer, fills the lower plenum, and refloods the core.

The effects on containment mass and energy releases are accounted for in appropriate analyses (Refs. 3 and 4). The LCO ensures that at least two SIS trains are available to deliver sufficient water to match boiloff rates soon enough to minimize the consequences of the core being uncovered following a large LOCA. It also ensures that the SI pumps will deliver sufficient water and boron during a small LOCA to maintain core subcriticality. For a small break LOCA, the steam generators continue to serve as the heat sink, providing part of the required core cooling.

Long term core cooling is achieved by using the SI pumps.

The SIS trains satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

In MODES 1, 2, and 3, three independent (and redundant) SIS trains are required to ensure that sufficient SIS flow is available, assuming a single failure affecting one of the three required trains. Additionally, individual components within the SIS trains may be called upon to mitigate the consequences of other transients and accidents.

In MODES 1, 2, and 3, an SIS train consists of the piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWSP upon an ECCS actuation signal.

During an event requiring ECCS actuation, a flow path is required to provide an abundant supply of water from the RWSP to the RCS via the SI pumps and their respective supply headers to each of the four direct vessel injection nozzles. In the long term, this flow path may be switched to supply its flow between the RCS hot and cold legs. Management of gas voids is important to ECCS OPERABILITY. CTS-01558

SURVEILLANCE REQUIREMENTS

SR 3.5.2.1

Verification of proper valve position ensures that the flow path from the SI pumps to the RCS is maintained. Misalignment of these valves could render two SIS trains inoperable. Securing these valves in position by removal of power ensures that they cannot change position as a result of an active failure or be inadvertently misaligned. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.5.2.2

Verifying the correct alignment for manual and power operated valves in the SIS flow paths provides assurance that the proper flow paths will exist for SIS operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these were verified to be in the correct position prior to locking, sealing, or securing. This Surveillance does not require any testing or valve manipulation. Rather, it involves verification that those valves capable of being mispositioned are in the correct position. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include stationing a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path and restore the system to a condition equivalent to the design condition if directed. CTS-01558

SR 3.5.2.3

Periodic surveillance testing of SI pumps to detect gross degradation caused by impeller structural damage or other hydraulic component problems is required by the ASME Code. This type of testing may be accomplished by measuring the pump developed head at only one point of the pump characteristic curve. This verifies both that the measured performance is within an acceptable tolerance of the original pump baseline performance and that the performance at the test flow is greater than or equal to the performance assumed in the plant safety analysis. SRs are specified in the Inservice Testing Program of the ASME Code. The ASME Code provides the activities and Frequencies necessary to satisfy the requirements.

SURVEILLANCE REQUIREMENTS (continued)

SR 3.5.2.4

This Surveillance demonstrates that each ECCS valve manually activated during a design basis accident event actuates to the required position. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in required position. SRs are specified in the Inservice activities and Frequencies necessary to satisfy the requirements.

SR 3.5.2.5

This Surveillance demonstrates that each SI pump starts on receipt of an actual or simulated ECCS actuation signal. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.5.2.6

Periodic inspections of the ECC/CS STRAINER ensure that it is unrestricted and stays in proper operating condition. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.5.2.7 CTS-01558

ECCS piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the ECCS and may also prevent water hammer, pump cavitation, and pumping of noncondensible gas into the reactor vessel.

Selection of ECCS locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

BASES

SURVEILLANCE REQUIREMENTS (continued)

The ECCS is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds an acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the ECCS is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits. CTS-01558

ECCS locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation

REFERENCES

1. 10 CFR 50, Appendix A, GDC 35.
2. 10 CFR 50.46.
3. FSAR Subsection 6.2.1.
4. FSAR Subsection 15.6.5.
5. FSAR Chapter 19.

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.3 Safety Injection System (SIS) - Shutdown

BASES

BACKGROUND	The Background section for Bases 3.5.2, "Safety Injection System (SIS) - Operating," is applicable to these Bases, with the following modifications. In MODE 4, the SIS train requirement is two trains. An SIS flow path consists of piping, valves, and an SI pump such that water from the refueling water storage pit (RWSP) can be injected into the Reactor Coolant System (RCS) following the accidents described in Bases 3.5.2.
APPLICABLE SAFETY ANALYSES	The Applicable Safety Analyses section of Bases 3.5.2 also applies to this Bases section. Due to the stable conditions associated with operation in MODE 4 and the reduced probability of occurrence of a Design Basis Accident (DBA), the SIS operational requirements are reduced. It is understood in these reductions that certain automatic ECCS actuation is not available. In this MODE, sufficient time exists for manual actuation of the required SIS to mitigate the consequences of a DBA. Only two trains of SIS are required for MODE 4. This requirement dictates that single failures are not considered during this MODE of operation. The SIS trains satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).
LCO	In MODE 4, two of the four independent (and redundant) SIS trains are required to be OPERABLE to ensure that sufficient SIS flow is available to the core following a DBA. In MODE 4, an ECCS train consists of the piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWSP. During an event requiring ECCS actuation, a flow path is required to provide an abundant supply of water from the RWSP to the RCS via the SI pumps to the reactor vessel direct injection nozzles associated with the SIS train. Management of gas voids is important to ECCS OPERABILITY. CTS-01558

BACKGROUND (continued)

isotopic concentration of B-10 of the refueling water in the RWSP can gradually decrease over a long period of time. The depleted B-10 of the boric acid solution in the RWSP can be recovered by increasing the overall boron concentration or the B-10 isotopic concentration itself. The requirement to verify the B-10 isotopic concentration is only required if the boron recycle subsystem is used.

APPLICABLE SAFETY ANALYSES

During accident conditions, the RWSP provides a source of borated water to the SI and CS System pumps. As such, it provides containment cooling and depressurization, core cooling, and replacement inventory and is a source of negative reactivity for reactor shutdown (Refs. 1 and 2). The design basis transients and applicable safety analyses concerning each of these systems are discussed in the Applicable Safety Analyses section of B 3.5.2, "Safety Injection System (SIS) - Operating," B 3.5.3, " Safety Injection System (SIS) - Shutdown," and B 3.6.6, "Containment Spray Systems." These analyses are used to assess changes to the RWSP in order to evaluate their effects in relation to the acceptance limits in the analyses.

The RWSP must also meet volume, boron concentration, and temperature requirements for non-LOCA events. The volume is not an explicit assumption in non-LOCA events since the required volume is a small fraction of the available volume. The deliverable volume limit is set by the LOCA and containment analyses. For the RWSP, the deliverable volume is different from the total volume contained since, due to the design of the tank, more water can be contained than can be delivered. The minimum boron concentration of 4000 ppm is an explicit assumption in the main steam line break (MSLB) analysis to ensure the required shutdown capability. The safety analysis assumes that the boron has the isotopic concentration of B-10 found in natural boron (19.9 atom percent).

The maximum temperatureis an assumption in the steam generator tube rupture analysis; the minimum is an assumption in the MSLB

For a large break LOCA analysis, the minimum recirculation water volume limit of 43,000 ft^3 (321~~9~~,~~15~~700 gallons) and the lower boron concentration limit of 4000 ppm (at the natural B-10 isotopic concentration) are used to compute the post LOCA boron concentration necessary to assure subcriticality. To secure this minimum water volume in the accident, RWSP needs to store boric acid water ≥ 79,920 ft^3 (5~~83~~97,~~34~~800 gallons) during normal operation. This water volume also bounds the ECCS and CSS pump NPSH Requirements. The large break LOCA is the limiting case since the safety analysis assumes that all control rods are out of the core. CTS-01558 CTS-01558

The upper limit on boron concentration of 4200 ppm is used to determine the maximum allowable time to switch to hot leg recirculation following a LOCA. The purpose of switching from direct vessel injection to hot leg injection is to avoid boron precipitation in the core following the accident. The upper limit of boron concentration is not related to reactivity and is not dependent on the B-10 isotopic concentration.

B 3.6 CONTAINMENT SYSTEMS

B 3.6.6 Containment Spray System

BASES

BACKGROUND

The Containment Spray system provides containment atmosphere cooling to limit post accident pressure and temperature in containment to less than the design values. Reduction of containment pressure reduces the release of fission product radioactivity from containment to the environment, in the event of a Design Basis Accident (DBA), to within limits. The Containment Spray System is designed to meet the requirements of 10 CFR 50, Appendix A, GDC 38, "Containment Heat Removal," GDC 39, "Inspection of Containment Heat Removal Systems," and GDC 40, "Testing of Containment Heat Removal Systems," (Ref. 1).

The Containment Spray System is an Engineered Safety Feature (ESF) system. It is designed to ensure that the heat removal capability required during the post accident period can be attained. The Containment Spray System limits and maintains post accident conditions to less than the containment design values.

The Containment Spray System consists of four separate trains of equal capacity, capable of meeting 50% of the design basis heat removal capacity. Each train includes a ~~containment spray~~CS/RHR pump, spray headers, nozzles, valves, and piping. Each train is powered from a separate ESF bus. The refueling water storage pit (RWSP) supplies borated water to the Containment Spray System. CTS-01558

The Containment Spray System provides a spray of cold borated water into the upper regions of containment to reduce the containment pressure and temperature during a DBA. The RWSP solution temperature is an important factor in determining the heat removal capability of the Containment Spray System.

Heat is removed from the RWSP water by the containment spray/residual heat removal heat exchangers. Two trains of the Containment Spray System provide adequate spray coverage to meet the system design requirements for containment heat removal.

BACKGROUND (continued)

The Containment Spray System is actuated either automatically by a High-3 containment pressure signal or manually. An automatic actuation opens the ~~containment spray~~CS/RHR pump discharge valves and starts the ~~containment spray~~CS/RHR pumps. A manual actuation of the Containment Spray System requires the operator to actuate two separate switches on the main control board to begin the same sequence. The Containment Spray System maintains an equilibrium temperature between the containment atmosphere and RWSP water. CTS-01558

The Safeguards Component Area HVAC System is a support system that provides temperature control for the CS/RHR Pump Room and CS/RHR Heat Exchanger Room, and includes electric heating coils, cooling coils, fans, ductwork, dampers, and instrumentation and controls necessary to perform the support function. The Essential Chilled Water System is a support system and provides chilled water to the air handling unit cooling coil. The Essential Service Water System supports operation of the essential chiller. For each CSS train required to be OPERABLE, the associated train of Safeguards Component Area HVAC System, including its associated train of the Essential Chilled Water System and Essential Service Water System, must be in operation, or available to operate on demand, and capable of performing its related support function. CTS01558

APPLICABLE SAFETY ANALYSES

The Containment Spray System limits the temperature and pressure that could be experienced following a DBA. The limiting DBAs considered relative to Containment integrity are the loss of coolant accident (LOCA) and the steam line break (SLB). The LOCA and SLB are analyzed using computer codes designed to predict the resultant containment pressure and temperature transients. No DBAs are assumed to occur simultaneously or consecutively. The postulated DBAs are analyzed with regard to containment ESF systems, assuming one Class 1E bus is out of service and the loss of another Class 1E bus, which is the worst case single active failure and results in two trains of Containment Spray System being inoperable.

The analysis and evaluation show that, under the worst case scenario, the highest peak containment pressure is 59.5 psig experienced during a LOCA. The analysis shows that the peak containment temperature is 355°F experienced during an SLB. Both results meet the intent of the design basis. See the Bases for LCO 3.6.4, "Containment Pressure," and LCO 3.6.5, “Containment Temperature” for a detailed discussion. The analyses and evaluations assume a unit specific power level of 100%, two containment spray trains operating, and initial (pre-accident) containment conditions of 120°F and 2 psig. The analyses also assume a response time delayed initiation in order to provide conservative peak calculated containment pressure and temperature responses.

BASES

APPLICABLE SAFETY ANALYSES (continued)

For certain aspects of transient accident analyses, maximizing the calculated containment pressure is not conservative. In particular, the effectiveness of the Emergency Core Cooling System during the core reflood phase of a LOCA analysis increases with increasing containment backpressure. For these calculations, the containment backpressure is calculated in a manner designed to conservatively minimize, rather than maximize, the calculated transient containment pressures in accordance with 10 CFR 50, Appendix K (Ref. 2).

The effect of an inadvertent containment spray actuation has been analyzed. An inadvertent spray actuation results in a -3.9 psig containment pressure and is associated with the sudden cooling effect in the interior of the leak tight containment. Additional discussion is provided in the Bases for LCO 3.6.4.

The modeled Containment Spray System actuation from the containment analysis is based upon a response time associated with exceeding the High-3 containment pressure setpoint to achieving full flow though the containment spray nozzles. The Containment Spray System total response time of 243 seconds includes Class 1E gas turbine generator (GTG) startup (for loss of offsite power), block loading of equipment, ~~containment spray~~CS/RHR pump startup, and spray line filling (Ref. 3). CTS-01558

The Containment Spray System satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

During a DBA, a minimum of two containment spray trains are required to maintain the containment peak pressure and temperature below the design limits (Ref. 4). To ensure that these requirements are met, three containment spray trains must be OPERABLE. Therefore, in the event of an accident, at least two trains operate, assuming the worst case single active failure occurs.

Each Containment Spray System typically includes a ~~spray~~CS/RHR pump, spray headers, nozzles, valves, piping, instruments, and controls to ensure an OPERABLE flow path capable of taking suction from the RWSP upon an ESF actuation signal. CTS-01558

This LCO is modified by a Note that allows an RHR train to be considered OPERABLE during alignment and operation for decay heat removal, if capable of being manually realigned (remote or local) to the CS mode of operation and not otherwise inoperable. This allows operation in the RHR mode during MODE 4.

SURVEILLANCE REQUIREMENTS

SR 3.6.6.1

Verifying the correct alignment for manual, power operated, and automatic valves, excluding check valves, in the Containment Spray System flow path provides assurance that the proper flow path exists for Containment Spray System operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these were verified to be in the correct positions prior to being secured. This SR does not require testing or valve manipulation. Rather, it involves verification that those valves outside containment (only check valves are inside containment) and capable of potentially being mispositioned are in the correct position. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.6.6.2

Verifying that each ~~containment spray~~CS/RHR pump's developed head at the flow test point is greater than or equal to the required developed head ensures that ~~spray~~CS/RHR pump performance has not degraded during the cycle. Flow and differential pressure are normal tests of centrifugal pump performance required by the ASME Code (Ref. 5). Since the ~~containment spray~~CS/RHR pumps cannot be tested with flow through the spray headers, they are tested on recirculation flow. This test confirms one point on the pump design curve and is indicative of overall performance. Such inservice inspections confirm component OPERABILITY, trend performance, and detect incipient failures by indicating abnormal performance. The Frequency of this SR is in accordance with the Inservice Testing Program.

CTS-01558
CTS-01558
CTS-01558

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.6.3 and SR 3.6.6.4

These SRs require verification that each automatic containment spray valve actuates to its correct position and that each ~~containment spray~~CS/RHR pump starts upon receipt of an actual or simulated High-3 containment pressure signal. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. CTS-01558

SR 3.6.6.5

With the containment spray inlet valves closed and the spray header drained of any solution, low pressure air or smoke can be blown through test connections. This SR ensures that each spray nozzle is unobstructed and that spray coverage of the containment during an accident is not degraded. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 38, GDC 39, GDC 40.
2. 10 CFR 50, Appendix K.
3. FSAR Subsection 15.6.5.5.
4. FSAR Subsection 6.2.1.
5. ASME Code for Operation and Maintenance of Nuclear Power Plants.

B 3.7 PLANT SYSTEMS

B 3.7.5 Emergency Feedwater System (EFWS)

BASES

BACKGROUND

The EFWS automatically supplies feedwater to the steam generators to remove decay heat from the Reactor Coolant System upon the loss of normal feedwater supply. The EFW pumps take suction through separate and independent suction lines from one of the two EFW pits (LCO 3.7.6) and pumps to the steam generator secondary side via separate and independent connections to the main feedwater (MFW) piping outside containment. The steam generators function as a heat sink for core decay heat. The heat load is dissipated by releasing steam to the atmosphere from the steam generators via the main steam safety valves (MSSVs) (LCO 3.7.1) or main steam depressurization valves (MSDVs) (LCO 3.7.4).

The EFWS consists of two motor driven EFW pumps and two turbine driven pumps configured into four trains. Each motor driven pump provides 50% of EFW flow capacity, and each turbine driven pump provides 50% of the required capacity to the steam generators, as assumed in the accident analysis. The pumps are equipped with independent recirculation lines to prevent pump operation against a closed system. Each motor driven EFW pump is powered from an independent Class 1E power supply. Each turbine driven EFW pump receives steam from two main steam lines upstream of the main steam isolation valves. Each of the steam feed lines will supply 100% of the requirements of the turbine driven EFW pump.

The Emergency Feedwater Pump Area HVAC System is a support system that provides temperature control for the EFW Pump Areas, and includes electric heating coils, cooling coils, fans, filters, ductwork, dampers, and instrumentation and controls necessary to perform the support function. The Essential Chilled Water System is a support system and provides chilled water to the air handling unit cooling coil. The Essential Service Water System supports operation of the essential chiller. For each EFW pump required to be OPERABLE, the associated train of Emergency Feedwater Pump Area HVAC System, including its associated train of the Essential Chilled Water System and Essential Service Water System, must be in operation, or available to operate on demand, and capable of performing its related support function. CTS-01558

B 3.7 PLANT SYSTEMS

B 3.7.7 Component Cooling Water (CCW) System

BASES

BACKGROUND

The CCW System provides a heat sink for the removal of process and operating heat from safety related components during a Design Basis Accident (DBA) or transient. During normal operation, the CCW System also provides this function for various nonessential components, as well as the spent fuel ~~storage pool~~pit. The CCW System serves as a barrier to the release of radioactive byproducts between potentially radioactive systems and the Essential Service Water System, and thus to the environment. CTS-01558

A typical CCW System is arranged as four independent, 50% capacity cooling loops, and has isolatable nonsafety related components. Each safety related train includes one 50% capacity pump, connection to one of the two surge tanks, a 50% capacity heat exchanger, piping, valves, and instrumentation. Each safety related train is powered from a separate bus. The surge tanks in the system provide pump trip protective functions to ensure that sufficient net positive suction head is available. The pump in each train is automatically started on receipt of a safety injection signal, and all nonessential components are isolated.

The Safety Related Component Area HVAC System is a support system that provides temperature control for the CCW Pump Areas, and includes electric heating coils, cooling coils, fans, and instrumentation and controls necessary to perform the support function. The Essential Chilled Water System is a support system and provides chilled water to the air handling unit cooling coil. The Essential Service Water System supports operation of the essential chiller. For each CCW train required to be OPERABLE, the associated train of Safety Related Component Area HVAC System, including its associated train of the Essential Chilled Water System and Essential Service Water System, must be in operation, or available to operate on demand, and capable of performing its related support function. CTS-01558

Additional information on the design and operation of the system, along with a list of the components served, is presented in FSAR Chapter 9 (Ref. 1). The principal safety related function of the CCW System is the removal of decay heat from the reactor via the ~~Containment Spray/R~~residual ~~H~~heat ~~R~~removal (~~CS/~~RHR) ~~S~~system. This may be during a normal or post accident cooldown and shutdown. CCWS cooling to the four RCP seal thermal barriers is used for all operating modes (including accident and safe shutdown) to preclude a RCP seal LOCA in the event that CVCS is unavailable to provide required flow to the RCP seal via seal injection. Manual alignment of RCP thermal barrier cooling is achieved via the CCWS RCP cross-tie valves from the MCR in the event two CCWS trains are unavailable to supply CCWS to a pair of RCP thermal barriers. CTS-01558

BASES

APPLICABLE SAFETY ANALYSES

The design basis of the CCW System is for two CCW trains to remove the post loss of coolant accident (LOCA) heat load from the refueling water storage pit and other components, such as Safety Injection Pumps and CS/RHR Pumps. The Emergency Core Cooling System (ECCS) LOCA and containment OPERABILITY LOCA each model the maximum and minimum performance of the CCW System, respectively. The normal temperature of the CCW is 100°F, and, during unit cooldown to MODE 5 (T_{cold} < 200°F), a maximum temperature of 110°F is assumed. This prevents the refueling water storage pit fluid from increasing in temperature following a LOCA, and provides a gradual reduction in the temperature of this fluid as it is supplied to the Reactor Coolant System (RCS).

The CCW System is designed to perform its function with a single failure of any active component, assuming a loss of offsite power.

The CCW System also functions to cool the unit from RHR entry conditions (T_{cold} < 350°F), to MODE 5 (T_{cold} < 200°F), during normal and post accident operations. The time required to cool from 350°F to 200°F is a function of the number of CCW and ~~CS/~~RHR trains operating. Two CCW trains are sufficient to remove decay heat during subsequent operations with T_{cold} < 200°F. This assumes a maximum service water temperature of 95°F occurring simultaneously with the maximum heat loads on the system. CTS-01558

The CCW System satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.7.3

This SR verifies isolation valves between safety and non-safety portions of the CCWS that cannot be tested during power operation. Such valves, notably NCS-AOV-057A/B and NCS-AOV-058A/B, cannot be tested during power operation because closure of these valves would isolate important components associated with normal operation. However, these valves are not normally cycled during power operation; thus, their leak rate is not likely to significantly change after the test is performed and the valves are restored to the position required for power operation. The valves are tested using a local leak rate test method. The total calculated leakage from isolation valves for each subsystem shall not exceed 25 gallons per 7 days. Successful completion of this test provides assurance that leakage from these valves isolating will not prevent CCWS function without surge tank makeup for at least 7 days. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. CTS-01558

B 3.7 PLANT SYSTEMS

B 3.7.8 Essential Service Water System (ESWS)

BASES

BACKGROUND

The ESWS provides a heat sink for the removal of process and operating heat from safety related components during a Design Basis Accident (DBA) or transient. During normal operation, and a normal shutdown, the ESWS also provides this function for various safety related and nonsafety related components. The safety related function is covered by this LCO.

The ESWS consists of four separate, safety related, cooling water trains. Each train consists of one 50% capacity pump, one component cooling water (CCW) heat exchanger, one essential chiller unit, piping, valves, instrumentation, and two types of strainers. The pumps and valves are remote and manually aligned, except in the unlikely event of a loss of coolant accident (LOCA). The pumps aligned to the critical loops are automatically started upon receipt of a safety injection signal, and all essential valves are aligned to their post accident positions.

Additional information about the design and operation of the ESWS, along with a list of the components served, is presented in FSAR Chapter 9 (Ref. 1). The principal safety related function of the ESWS is the removal of decay heat from the reactor via the CCW System.

The Safety Related Component Area HVAC System is a support system that provides temperature control for the ESW Pump Areas, and includes electric heating coils, cooling coils, fans, and instrumentation and controls necessary to perform the support function. The ESWS is a support system and provides cooling water to the essential chiller unit. The Essential Chilled Water System (ECWS) is a support system and provides chilled water to the air handling unit cooling coil. For each ESW train required to be OPERABLE, the associated train of Safety Related Component Area HVAC System, including its associated train of the ECWS and ESWS, must be in operation, or available to operate on demand, and capable of performing its related support function. CTS-01558

APPLICABLE SAFETY ANALYSES

The design basis of the ESWS is for two ESWS trains, in conjunction with the CCW System to remove core decay heat following a design basis LOCA. This prevents the refueling water storage pit fluid from increasing in temperature following a LOCA and provides for a gradual reduction in the temperature of this fluid as it is supplied to the Reactor Coolant System. The ESWS is designed to perform its function with a single failure of any active component, assuming the loss of offsite power.

BASES

APPLICABLE SAFETY ANALYSES (continued)

The ESWS, in conjunction with the CCW System, also cools the unit from ~~containment spray/~~residual heat removal (~~CS/~~RHR), as discussed in FSAR Chapter 5, (Ref. 2) entry conditions to MODE 5 during normal and post accident operations. The time required for this evolution is a function of the number of CCW and ~~CS/~~RHR System trains that are operating. CTS-01558

Two ESWS trains are sufficient to remove decay heat during subsequent operations in MODES 5 and 6. This assumes a maximum ESWS temperature of 95°F occurring simultaneously with maximum heat loads on the system.

The ESWS satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Three of the four ESWS trains are required to be OPERABLE to provide the required redundancy to ensure that the system functions to remove post accident heat loads, assuming that the worst case single active failure occurs coincident with the loss of offsite power.

An ESWS train is considered OPERABLE during MODES 1, 2, 3, and 4 when:

a. The pump is OPERABLE and

b. The associated piping, valves, heat exchanger, and instrumentation and controls required to perform the safety related function are OPERABLE.

APPLICABILITY

In MODES 1, 2, 3, and 4, the ESWS is a normally operating system that is required to support the OPERABILITY of the equipment serviced by the ESWS and required to be OPERABLE in these MODES.

In MODES 5 and 6, the OPERABILITY requirements of the ESWS are determined by the systems it supports.

ACTIONS

A.1 and A.2

If one of the required ESWS trains is inoperable, action must be taken to restore OPERABLE status within 72 hours. In this Condition, the remaining OPERABLE ESWS trains are adequate to perform the heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE ESWS trains could result in loss of ESWS function. Required Action A.1 is modified by two Notes.

B 3.7 PLANT SYSTEMS

B 3.7.9 Ultimate Heat Sink (UHS)

BASES

BACKGROUND

The UHS provides a heat sink for processing and operating heat from safety related components during a transient or accident, as well as during normal operation. This is done by utilizing the Essential Service Water System (ESWS) and the Component Cooling Water (CCW) System.

The UHS consists of four 50 percent capacity mechanical draft cooling towers, one for each ESWS train. Each cooling tower consists of two cells with one fan per cell. The combined inventory of three of the four UHS basins provides a 30-day storage capacity as discussed in FSAR Chapter 9 (Ref. 1). Each unit is provided with its own independent UHS with no cross connection between the two units. The two principal functions of the UHS are the dissipation of residual heat after reactor shutdown, and dissipation of residual heat after an accident.

The basic performance requirements are that an adequate inventory of cooling water be available for 30 days without makeup, and that the design basis temperatures of safety related equipment not be exceeded. Each UHS basin provides 33-1/3 percent of the combined inventory for the 30-day storage capacity to satisfy the short-term recommendation of Regulatory Guide 1.27 (Ref. 2). There is one safety-related UHS transfer pump per UHS basin which is used to transfer water between the UHS basins.

The stored water level provides adequate net positive suction head (NPSH) to the ESW pump during a 30-day period of operation following the design basis LOCA or safe shutdown with LOOP scenario without makeup.

The Safety Related Component Area HVAC System is a support system that provides temperature control for the UHS Transfer Pump Areas, and includes electric heating coils, cooling coils, fans, and instrumentation and controls necessary to perform the support function. The ESWS is a support system and provides cooling water to the essential chiller unit. The Essential Chilled Water System (ECWS) is a support system and provides chilled water to the air handling unit cooling coil. For each UHS Transfer Pump required to be OPERABLE, the associated train of Safety Related Component Area HVAC System, including its associated train of the ECWS and ESWS, must be in operation, or available to operate on demand, and capable of performing its related support function. CTS-01558

Additional information on the design and operation of the system, along with a list of components served, can be found in Reference 1.

BASES

APPLICABLE SAFETY ANALYSES

The UHS is the sink for heat removed from the reactor core following all accidents and anticipated operational occurrences in which the unit is cooled down and placed on residual heat removal (RHR) operation.

The operating limits are based on safe shutdown with LOOP. A conservative heat transfer analysis for the worst case LOCA was performed to ensure that the cooling tower capacity and the basin water inventory adequately remove the heat load for the worst case LOCA. Reference 1 provides the details of the assumptions used in the analysis, which include worst expected meteorological conditions, conservative uncertainties when calculating decay heat, and worst case single active failure. The UHS is designed in accordance with Regulatory Guide 1.27 (Ref. 2), which requires a 30 day supply of cooling water in the UHS.

The UHS satisfies Criterion 3 of 10 CFR 50.36(~~d~~c)(2)(ii). CTS-01558

LCO

The UHS is required to be OPERABLE and is considered OPERABLE if it contains a sufficient volume of water at or below the maximum temperature that would allow the ESWS to operate for at least 30 days following a design basis LOCA or safe shutdown with LOOP, without makeup water, and provide adequate net positive suction head (NPSH) to the ESWS pumps, and without exceeding the maximum design temperature of the equipment served by the ESWS. To meet this condition, three UHS cooling towers with the UHS temperature not exceeding 93°F during MODES 1, 2, 3 and 4 and the level in each of three basins being maintained above 2,8~~0~~50,000 gallons are required—a volume correspondent to the safe shutdown with LOOP conditions that bounds the LOCA condition. Additionally, three of the UHS transfer pumps shall be OPERABLE, with each pump capable of transferring flow from a UHS basin meeting water inventory and temperature limits, and powered from an independent Class 1E electrical division. CTS-01558

APPLICABILITY

In MODES 1, 2, 3, and 4, the UHS is required to support the OPERABILITY of the equipment serviced by the UHS and required to be OPERABLE in these MODES.

In MODE 5 or 6, the OPERABILITY requirements of the UHS are determined by the systems it supports.

ACTIONS

A.1 and A.2

If one of the required cooling towers and associated fans is inoperable (i.e., one or more fans per cooling tower inoperable), action must be taken to restore the inoperable cooling tower and associated fan(s) to OPERABLE status within 72 hours. In this Condition, the remaining OPERABLE cooling towers with associated fans are adequate to perform the heat

ACTIONS (continued)

D.1, D.2.1, and D.2.2

If one or more required UHS transfer pump(s) are inoperable, action must be taken to restore the pump(s) to OPERABLE status or implement an alternate method of transferring the affected basin within 7 days. If an alternate method is utilized, action still must be taken to restore the transfer pump(s) to OPERABLE status within 31 days.

The Completion Times are reasonable based on the low probability of an accident occurring during the time allowed to restore the pump(s) or implement an alternate method, the availability of alternate methods, and the amount of time available to transfer the water from one basin to the other under the worst case accident assumptions. Furthermore, the inoperability of all required transfer pumps leaves only two cooling tower basins with a combined design heat removal capacity of approximately 20 days. This cooling period bounds and justifies the 7-day completion time to restore the transfer pumps to operable status.

E.1 and E.2

If the Required Actions and Completion Times of Condition A, B, or C are not met, or the UHS is inoperable for reasons other than Condition A, B, or C, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours and in MODE 5 within 36 hours.

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

SURVEILLANCE REQUIREMENTS

SR 3.7.9.1

This SR verifies that adequate long term (30 day) cooling can be maintained. The specified level also ensures that sufficient NPSH is available to operate the ESWS pumps. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. This SR verifies that each required UHS basin water level is ≥ 2,8~~0~~50,000 gallons. Plant procedures provide the corresponding water level to be verified to assure a usable volume of 2,8~~0~~50,000 gallons, accounting for unusable volume and measurement uncertainty. CTS-01558 CTS-01558

BACKGROUND (continued)

The air entering the CRE is continuously monitored by radiation detectors. One detector output above the setpoint will cause actuation of the pressurization mode or isolation mode as required. The actions of the isolation mode are more restrictive, and will override the actions of the pressurization mode.

A single train of MCREFS operating at a flow ≤~~12~~600 cfm will pressurize the CRE to about 0.125 inches water gauge relative to external areas adjacent to the CRE boundary. The MCRVS operation in maintaining the CRE habitable is discussed in FSAR Chapter 9, Subsection 9.4.1 (Ref. 2). CTS-01558

Redundant supply and recirculation trains provide the required filtration should an excessive pressure drop develop across the other filter train. Normally open isolation dampers are arranged in series pairs so that the failure of one damper to shut will not result in a breach of isolation. The MCREFS is designed in accordance with Seismic Category I requirements.

Two trains of MCRATCS will provide the required temperature control to maintain the control room between 73°F and 78°F. The MCRVS operation in maintaining the control room temperature is discussed in FSAR Chapter 9, Section 9.4.1 (Ref. 2).

In order for the MCRATCS train to be considered OPERABLE, the associated train of Essential Chilled Water System must be in operation and capable of performing its related support function to provide chilled water flow to the air handling unit cooling coil upon demand. The Essential Service Water System supports operation of the essential chiller, and the associated train of the Essential Service Water System must also be in operation. CTS-01558

The CRE habitability is maintained by limiting the inleakage of potentially contaminated air into the CRE. The potential leakage paths for the CRE include the control room enclosure (e.g., walls, penetrations, floor, ceilings, joints, etc.) and other potential paths such as pressurized ductwork from other HVAC systems, pressurized air systems (e.g., instrument air) or isolated HVAC intakes.

~~The periodic surveillance pressurization tests verify the integrity of the CRE with respect to potentially contaminated adjacent areas. It does not verify filtered inleakage internal to the filtration units and ductwork nor does it verify unfiltered inleakage from internal pressurized sources (e.g., instrument air). These sources of inleakage are addressed separately from TS surveillances.~~ CTS-01558

The MCRVS is designed to maintain a habitable environment in the CRE for 30 days of continuous occupancy after a Design Basis Accident (DBA) without exceeding a 5 rem total effective dose equivalent (TEDE).

BASES

BACKGROUND (continued)

The Safety Related Component Area HVAC System is a support system that provides temperature control for the Annulus Emergency Exhaust Filtration Unit Area, and includes electric heating coils, cooling coils, fans, and instrumentation and controls necessary to perform the support function. The Essential Chilled Water System is a support system and provides chilled water to the air handling unit cooling coil. The Essential Service Water System supports operation of the essential chiller. For each annulus emergency exhaust system train required to be OPERABLE, the associated train of Safety Related Component Area HVAC System, including one of its two associated trains of the Essential Chilled Water System and Essential Service Water System, must be in operation, or available to operate on demand, and capable of performing its related support function. CTS-01558

The annulus emergency exhaust system is discussed in FSAR Subsection 6.5.1 and Subsection 9.4.5 (Refs. 1 and 2 respectively).

APPLICABLE SAFETY ANALYSES

The annulus emergency exhaust system design basis is SAFETY established by the large break loss of coolant accident (LOCA). The system evaluation assumes a passive failure outside containment, such as valve packing leakage during a Design Basis Accident (DBA). The system evaluation also assumes a passive failure of the ECCS outside containment, such as an SI pump seal leakage. In such a case, the system restricts the radioactive release to within the 10 CFR 50.34 (Ref. 4) limits, or the NRC staff approved licensing basis (e.g., a specified fraction of 10 CFR 50.34 limits). The analysis of the effects and consequences of a large break LOCA are presented in FSAR Chapter 15, Subsection 15.6.5.5 (Ref. 3). The annulus emergency exhaust system also actuates following a small break LOCA to clean up releases of smaller leaks, such as from valve stem packing.

Either a complete loss of function or excessive LEAKAGE may result in less efficient removal of any gaseous or particulate material released to the penetration areas and the ECCS pump rooms following a LOCA.

The annulus emergency exhaust system satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

B 3.7 PLANT SYSTEMS

B 3.7.12 Spent Fuel ~~Storage~~ Pit Water Level CTS-01558

BASES

BACKGROUND

The minimum water level in the spent fuel ~~storage~~ pit meets the assumptions of iodine decontamination factors following a fuel handling accident. The specified water level shields and minimizes the general area dose when the storage racks are filled to their maximum capacity. The water also provides shielding during the movement of spent fuel. CTS-01558

A general description of the spent fuel ~~storage~~ pit design is given in FSAR Chapter 9 (Ref. 1). A description of the Spent Fuel Pit Purification and Cooling System is given in FSAR Chapter 9 (Ref. 1). The assumptions of the fuel handling accident are given in FSAR Chapter 15 (Ref. 2). CTS-01558

APPLICABLE SAFETY ANALYSES

The minimum water level in the spent fuel ~~storage~~ pit meets the assumptions of the fuel handling accident described in Regulatory Guide 1.183 (Ref. 3). The resultant 2 hour total effective dose equivalent per person at the exclusion area boundary is a small fraction of the 10 CFR 50.34 (Ref. 4) limits. CTS-01558

According to Reference 3, there is 23 ft of water between the top of the damaged fuel bundle and the fuel pit surface during a fuel handling accident. With 23 ft of water, the assumptions of Reference 3 can be used directly. In practice, this LCO preserves this assumption for the bulk of the fuel in the storage racks. In the case of a single bundle dropped and lying horizontally on top of the spent fuel racks, however, there may be < 23 ft of water above the top of the fuel bundle and the surface, indicated by the width of the bundle. To offset this small nonconservatism, the analysis conservatively assumes that all fuel rods fail.

The spent fuel ~~storage~~ pit water level satisfies Criteria 2 and 3 of 10 CFR 50.36(c)(2)(ii). CTS-01558

LCO

The spent fuel ~~storage~~ pit water level is required to be ≥ 23 ft over the top of irradiated fuel assemblies seated in the storage racks. The specified water level preserves the assumptions of the fuel handling accident analysis (Ref. 2). As such, it is the minimum required for fuel storage and movement within the spent fuel ~~storage~~ pit. CTS-01558 CTS-01558

BASES

APPLICABILITY

This LCO applies during movement of irradiated fuel assemblies in the spent fuel ~~storage~~ pit since the potential for a release of fission products exists. CTS-01558

ACTIONS

A.1

Required Action A.1 is modified by a Note indicating that LCO 3.0.3 does not apply.

When the initial conditions for prevention of an accident cannot be met, steps should be taken to preclude the accident from occurring. When the spent fuel ~~storage~~ pit water level is lower than the required level, the movement of irradiated fuel assemblies in the spent fuel ~~storage~~ pit is immediately suspended to a safe position. This action effectively precludes the occurrence of a fuel handling accident. This does not preclude movement of a fuel assembly to a safe position. CTS-01558

If moving irradiated fuel assemblies while in MODE 5 or 6, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODES 1, 2, 3, and 4, the fuel movement is independent of reactor operations. Therefore, inability to suspend movement of irradiated fuel assemblies is not sufficient reason to require a reactor shutdown.

SURVEILLANCE REQUIREMENTS

SR 3.7.12.1

This SR verifies sufficient spent fuel ~~storage~~ pit water is available in the event of a fuel handling accident. The water level in the spent fuel ~~storage~~ pit must be checked at the start of spent fuel movement campaign and periodically. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. CTS-01558

During refueling operations, the level in the spent fuel ~~storage~~ pit is in equilibrium with the refueling canal, and the level in the refueling canal is checked daily in accordance with SR 3.9.7.1. CTS-01558

REFERENCES

1. FSAR Section 9.1.
2. FSAR Subsection 15.7.4.
3. Regulatory Guide 1.183, July 2000.
4. 10 CFR 50.34.

B 3.7 PLANT SYSTEMS

B 3.7.13 Spent Fuel ~~Storage~~ Pit Boron Concentration CTS-01558

BASES

BACKGROUND	The spent fuel pit is a single region spent fuel rack design with 11.1 in center-to-center rack spacing. The spent fuel pit stores 900 spent fuel assemblies in borated water without credit for fuel burnup. The water in the spent fuel storage pit normally contains soluble boron which results in large subcriticality margins under actual operating conditions. The maximum Keff without taking credit for soluble boron is well below 0.95, which is the criticality safety design criteria in 10 CFR 50.68(b)(4) being adopted in designing the spent fuel racks. The double contingency principle discussed in ANSI/ANS-8.1-1998 (R2007), however, allows credit for soluble boron under abnormal or accident conditions since only a single accident scenario need be considered at a time.
APPLICABLE SAFETY ANALYSES	Most accident conditions do not result in an increase in the reactivity of the spent fuel ~~storage~~ pit. (CTS-01558) Examples of these accident conditions, as determined from criticality analysis, are the dropping of a fuel assembly onto the top of the rack and misloading of a fresh fuel assembly of the highest anticipated reactivity into a spent fuel rack cell. However, accidents that could increase reactivity can be postulated. This increase in reactivity is unacceptable with unborated water in the spent fuel~~storage~~ pit. (CTS-01558) Accidents that can be postulated are associated with the mislocation of a fresh fuel assembly and rack movements in the event of seismic activity. The minimum soluble boron concentration to maintain subcriticality in the SFP during these accident conditions is 800 ppm, as determined from criticality analysis. The negative reactivity effect of the soluble boron compensates for the increased reactivity caused by these postulated accident scenarios. Subcriticality conditions, therefore, are maintained through compliance with the LCO minimum limit of ≥ 4000 ppm soluble boron. The concentration of dissolved boron in the spent fuel ~~storage~~ pit satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii). (CTS-01558)
LCO	The spent fuel ~~storage~~ pit boron concentration is required to be ≥ 4000 ppm according to the RWSP and refueling requirements. (CTS-01558) The specified concentration of dissolved boron in the spent fuel ~~storage~~ pit preserves the assumptions used in the analyses of the soluble boron credit including the potential critical accident scenarios as described in Reference 1. (CTS-01558) This concentration of dissolved boron is necessary to control reactivity during fuel assembly storage and movement within the spent fuel ~~storage~~ pit. (CTS-01558)

BASES

APPLICABILITY	This LCO applies whenever fuel assemblies are stored in the spent fuel storage pit until a complete spent fuel storage pit verification has been performed following the last movement of fuel assemblies in the spent fuel storage pit. This LCO does not apply following the verification since the verification would confirm that there are no misloaded fuel assemblies. With no further fuel assembly movements in progress, there is no potential for a misloaded fuel assembly or a dropped fuel assembly.
ACTIONS	<u>A.1, A.2.1, and A.2.2</u> The Required Actions are modified by a Note indicating that LCO 3.0.3 does not apply. When the concentration of boron in the spent fuel ~~storage~~ pit is less than which is required, immediate action must be taken to preclude the occurrence of an accident or to mitigate the consequences of an accident in progress. This is most efficiently achieved by immediately suspending the movement of fuel assemblies. The concentration of boron is restored simultaneously with suspending movement of fuel assemblies. Alternatively, beginning a verification of the spent fuel ~~storage~~ pit fuel locations to ensure proper locations of the fuel can be performed. However, prior to resuming movement of fuel assemblies, the concentration of boron must be restored. This does not preclude movement of a fuel assembly to a safe position. (CTS-01558) If the LCO is not met while moving irradiated fuel assemblies in MODE 5 or 6, LCO 3.0.3 would not be applicable. If moving irradiated fuel assemblies while in MODE 1, 2, 3, or 4, the fuel movement is independent of reactor operation. Therefore, the inability to suspend movement of fuel assemblies is not sufficient reason to require a reactor shutdown.
SURVEILLANCE REQUIREMENTS	<u>SR 3.7.13.1</u> This SR verifies that the concentration of boron in the spent fuel ~~storage~~ pit is within the required limit. As long as this SR is met, the accidents mentioned are fully addressed. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program. (CTS-01558)
REFERENCES	1. FSAR Section 9.1.

BASES

SURVEILLANCE REQUIREMENTS (continued)

Risk insights or deterministic methods may be used for this assessment. Credit may be taken for unplanned events that satisfy this SR. Note 3 ensures that the Class 1E GTG is tested under load conditions that are as close to design basis conditions as possible. When synchronized with offsite power, testing should be performed at a power factor of ≤ 0.9. ~~This power factor is representative of the actual inductive loading a Class 1E GTG would see under design basis accident conditions.~~This power factor should be maintained as close as practicable to actual power factor which a Class 1E GTG would see under design basis accident conditions, such as 0.85. Under certain conditions, however, Note 3 allows the Surveillance to be conducted as a power factor other than ≤ 0.9. These conditions occur when grid voltage is high, and the additional field excitation needed to get the power factor to ≤ 0.9 results in voltages on the emergency busses that are too high. Under these conditions, the power factor should be maintained as close as practicable to 0.9 while still maintaining acceptable voltage limits on the emergency busses. In other circumstances, the grid voltage may be such that the Class 1E GTG excitation levels needed to obtain a power factor of 0.9 may not cause unacceptable voltages on the emergency busses, but the excitation levels are in excess of those recommended for the Class 1E GTG. In such cases, the power factor shall be maintained close as practicable to 0.9 without exceeding the Class 1E GTG excitation limits. CTS-01558

SR 3.8.1.14

This Surveillance demonstrates that the Class 1E GTG can restart from a hot condition, such as subsequent to shutdown from normal Surveillances, and achieve the required voltage and frequency within 100 seconds. The 100 second time is derived from the requirements of the accident analysis to respond to a design basis large break LOCA.

The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note. The Note ensures that the test is performed with the Class 1E GTG sufficiently hot. The load band is provided to avoid routine overloading of the Class 1E GTG. Routine overloads may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain Class 1E GTG OPERABILITY. The requirement that the Class 1E GTG has operated for at least 2 hours at full load conditions prior to performance of this Surveillance is based on manufacturer recommendations for achieving hot conditions. Momentary transients due to changing bus loads do not invalidate this test.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.20 CTS-01558

This Surveillance performs cleaning of the two fuel nozzles on each Class 1E gas turbine generator. Each Class 1E gas turbine generator has two engines. Each engine has an attached combustion chamber. The fuel nozzle supplies fuel oil to the combustion chamber. There is a nozzle tip in the end of the fuel nozzle which atomizes and sprays the liquid fuel. The nozzle tip gets clogged as the number of gas turbine generator starts and stops increases. This is because the liquid fuel that remains in the nozzle tip is carbonized by heat from hot parts such as the combustion chamber, which remains hot for a while after the engine stops. Clogging of the nozzle tip causes abnormal fuel atomization and could cause failure of the gas turbine generator to start. This cleaning was performed during the Class 1E gas turbine generator qualification testing.

The Frequency of this Surveillance is once per 50 gas turbine generator starts as this Frequency of nozzle cleaning was used during the Class 1E gas turbine generator qualification per the manufacturer's recommendation. This manufacturer's recommendation was based on typical industrial experience including the use of lower quality fuel (e.g., A-type heavy oil) than is used for the Class 1E gas turbine generators.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 17.
2. FSAR Section 8.2.
3. Regulatory Guide 1.9, Rev. 4, March 2007.
4. FSAR Chapter 6.
5. FSAR Chapter 15.
6. Regulatory Guide 1.93, Rev. 0, December 1974.
7. Generic Letter 84-15, "Proposed Staff Actions to Improve and Maintain Diesel Generator Reliability," July 2, 1984.
8. 10 CFR 50, Appendix A, GDC 18.
9. Regulatory Guide 1.137, Rev.1, October 1979.
10. ASME Code for Operation and Maintenance of Nuclear Power Plants.
11. IEEE Standard 308-2001.

BACKGROUND (continued)

The Class 1E Electrical Room HVAC System is a support system and provides temperature control and battery room exhaust for the Class 1E Battery and Battery Charger Rooms where the dc electrical power subsystems are located. The system includes electric heating coils, chilled water cooling coils, fans, filters, ductwork, dampers, and instrumentation and controls necessary to perform the support function. The Essential Chilled Water System is a support system and provides chilled water to the air handling unit cooling coil. The Essential Service Water System supports operation of the essential chiller. CTS-01558

The Class 1E Electrical Room HVAC System consists of four redundant trains, each sized to satisfy 100% of the cooling and heating demand of two Class 1E Battery and Battery Charger Rooms. Class 1E Electrical Room HVAC train A or B can provide cooling and heating for both A and B Class 1E Battery and Battery Charger Rooms, and train C or D can provide cooling and heating for both C and D Class 1E Battery and Battery Charger Rooms. For each dc electrical power subsystem train required to be OPERABLE, one of the associated Class 1E Electrical Room HVAC System trains, including its associated train of the Essential Chilled Water System and Essential Service Water System, must be in operation, and capable of performing its related support function.

When desired, the charger can be placed in the equalize mode. The equalize mode is at a higher voltage than the float mode and charging current is correspondingly higher. The battery charger is operated in the equalize mode after a battery discharge or for routine maintenance. Following a battery discharge, the battery recharge characteristic accepts current at the current limit of the battery charger (if the discharge was significant, e.g., following a battery service test) until the battery terminal voltage approaches the charger voltage setpoint. Charging current then reduces exponentially during the remainder of the recharge cycle. Lead-calcium batteries have recharge efficiencies of greater than 95%, so once at least 105% of the ampere-hours discharged have been returned, the battery capacity would be restored to the same condition as it was prior to the discharge. This can be monitored by direct observation of the exponentially decaying charging current or by evaluating the amp-hours discharged from the battery and amp-hours returned to the battery.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.7 Inverters - Operating

BASES

BACKGROUND

The inverters are the preferred source of power for the ac vital buses because of the stability and reliability they achieve. The function of the inverter is to provide ac electrical power to the vital buses. The inverters can be powered from an internal ac source/rectifier or from the station battery. The station battery provides an uninterruptible power source for the instrumentation and controls for the Reactor Protective System (RPS) and the Engineered Safety Feature Actuation System (ESFAS). Specific details on inverters and their operating characteristics are found in FSAR Subsection 8.3.1 (Ref. 1).

The Class 1E Electrical Room HVAC System is a support system and provides temperature control for the Class 1E UPS Rooms where the inverters are located. The system includes electric heating coils, chilled water cooling coils, fans, filters, ductwork, dampers, and instrumentation and controls necessary to perform the support function. The Essential Chilled Water System is a support system and provides chilled water to the air handling unit cooling coil. The Essential Service Water System supports operation of the essential chiller. CTS-01558

The Class 1E Electrical Room HVAC System consists of four redundant trains, each sized to satisfy 100% of the cooling and heating demand of two Class 1E UPS Rooms. Class 1E Electrical Room HVAC train A or B can provide cooling and heating for both A and B Class 1E UPS Rooms, and train C or D can provide cooling and heating for both C and D Class 1E UPS Rooms. For each inverter required to be OPERABLE, one of the associated Class 1E Electrical Room HVAC System trains, including its associated train of the Essential Chilled Water System and Essential Service Water System, must be in operation, and capable of performing its related support function.

APPLICABLE SAFETY ANALYSES

The initial conditions of Anticipated Operational Occurrence (AOO) and Postulated Accident (PA) analyses in FSAR Chapter 6 (Ref. 2) and FSAR Chapter 15 (Ref. 3), assume Engineered Safety Feature systems are OPERABLE. The inverters are designed to provide the required capacity, capability, redundancy, and reliability to ensure the availability of necessary power to the RPS and ESFAS instrumentation and controls so that the fuel, Reactor Coolant System, and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for FSAR Section 3.2, Power Distribution Limits; FSAR Section 3.4, Reactor Coolant System (RCS); and FSAR Section 3.6, Containment Systems.

BASES

BACKGROUND (continued)

The list of all required dc and vital ac distribution buses are presented in Table B 3.8.9-1. Specific details on inverters and their operating characteristics are found in FSAR Chapter 8 (Ref. 4).

The Class 1E Electrical Room HVAC System is a support system and provides temperature control for the Class 1E Electrical Rooms where the ac, dc, and ac vital bus electrical power distribution subsystems are located. The system includes electric heating coils, chilled water cooling coils, fans, filters, ductwork, dampers, and instrumentation and controls necessary to perform the support function. The Essential Chilled Water System is a support system and provides chilled water to the air handling unit cooling coil. The Essential Service Water System supports operation of the essential chiller. CTS-01558

The Class 1E Electrical Room HVAC System consists of four redundant trains, each sized to satisfy 100% of the cooling and heating demand of two Class 1E Electrical Rooms. Class 1E Electrical Room HVAC train A or B can provide cooling and heating for both A and B Class 1E Electrical Rooms, and train C or D can provide cooling and heating for both C and D Class 1E Electrical Rooms. For each ac, dc, and ac vital bus electrical power distribution subsystem train required to be OPERABLE, one of the associated Class 1E Electrical Room HVAC System trains, including its associated train of the Essential Chilled Water System and Essential Service Water System, must be in operation, and capable of performing its related support function.

APPLICABLE SAFETY ANALYSES

The initial conditions of Anticipated Operational Occurrence (AOO) and Postulated Accident (PA) analyses in FSAR Chapter 6 (Ref. 1), and in FSAR Chapter 15 (Ref. 2), assume Engineered Safety Features (ESF) systems are OPERABLE. The ac, dc, and ac vital bus electrical power distribution systems are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System, and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for FSAR Section 3.2, Power Distribution Limits; FSAR Section 3.4, Reactor Coolant System (RCS); and FSAR Section 3.6, Containment Systems.

B 3.9 REFUELING OPERATIONS

B 3.9.5 Residual Heat Removal (RHR) and Coolant Circulation - High Water Level

BASES

BACKGROUND

The purpose of the RHR System in MODE 6 is to remove decay heat and sensible heat from the Reactor Coolant System (RCS), as required by GDC 34, to provide mixing of borated coolant and to prevent boron stratification (Ref. 1). Heat is removed from the RCS by circulating reactor coolant through the Containment Spray (CS)/RHR heat exchanger(s), where the heat is transferred to the Component Cooling Water System. The coolant is then returned to the RCS via the RCS cold leg(s). Operation of the RHR System for normal cooldown or decay heat removal is manually accomplished from the control room. The heat removal rate is adjusted by controlling the flow of reactor coolant through the CS/RHR heat exchanger(s) and the bypass line(s). Mixing of the reactor coolant is maintained by this continuous circulation of reactor coolant through the RHR System.

The Safeguards Component Area HVAC System is a support system that provides temperature control for the CS/RHR Pump Room and CS/RHR Heat Exchanger Room, and includes electric heating coils, cooling coils, fans, ductwork, dampers, and instrumentation and controls necessary to perform the support function. The Essential Chilled Water System is a support system and provides chilled water to the air handling unit cooling coil. The Essential Service Water System supports operation of the essential chiller. For each RHR loop required to be OPERABLE, the associated train of Safeguards Component Area HVAC System, including its associated train of the Essential Chilled Water System and Essential Service Water System, must be in operation, or available to operate on demand, and capable of performing its related support function. CTS-01558

BASES

LCO

Only two RHR loops are required for decay heat removal in MODE 6, with the water level ≥ 23 ft above the top of the reactor vessel flange. Only two RHR loops are required to be OPERABLE, because the volume of water above the reactor vessel flange provides backup decay heat removal capability. At least two RHR loops must be OPERABLE and in operation to provide:

a. Removal of decay heat,

b. Mixing of borated coolant to minimize the possibility of criticality, and

c. Indication of reactor coolant temperature.

An OPERABLE RHR loop includes a CS/RHR pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the low end temperature. The flow path starts in one of the RHR hot legs and is returned to the RCS cold legs. Management of gas voids is important to RHR System OPERABILITY. CTS-01558

The LCO is modified by a Note that allows the required operating RHR loops to be removed from operation for up to 1 hour per 8 hour period, provided no operations are permitted that would dilute the RCS boron concentration by introduction of coolant into the RCS with boron concentration less than required to meet the minimum boron concentration of LCO 3.9.1. Boron concentration reduction with coolant at boron concentrations less than required to assure the RCS boron concentration is maintained is prohibited because uniform concentration distribution cannot be ensured without forced circulation. This permits operations such as core mapping or alterations in the vicinity of the reactor vessel hot leg nozzles and RCS to ~~CS/~~RHR isolation valve testing. During this 1 hour period, decay heat is removed by natural convection to the large mass of water in the refueling cavity. CTS-01558

APPLICABILITY

Two RHR loops must be OPERABLE and in operation in MODE 6, with the water level ≥ 23 ft above the top of the reactor vessel flange, to provide decay heat removal and mixing of the borated coolant. The 23 ft water level was selected because it corresponds to the 23 ft requirement established for fuel movement in LCO 3.9.7, "Refueling Cavity Water Level." Requirements for the RHR System in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS), and Section 3.5, Emergency Core Cooling Systems (ECCS). RHR loop requirements in MODE 6 with the water level < 23 ft are located in LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation - Low Water Level."

BASES

ACTIONS (continued)

b. One door in each air lock must be closed, and

c. Each penetration providing direct access from the containment atmosphere to the outside atmosphere must be either closed by a manual or automatic isolation valve, blind flange, or equivalent, or verified to be capable of being closed by an OPERABLE Containment Purge and Exhaust Isolation System.

With RHR loop requirements not met, the potential exists for the coolant to boil and release radioactive gas to the containment atmosphere. Performing the actions described above ensures that all containment penetrations are either closed or can be closed so that the dose limits are not exceeded.

The Completion Time of 4 hours allows fixing of most RHR problems and is reasonable, based on the low probability of the coolant boiling in that time.

SURVEILLANCE REQUIREMENTS

SR 3.9.5.1

This Surveillance demonstrates that the RHR loops are in operation and circulating reactor coolant. The flow rate is determined by the flow rate necessary to provide sufficient decay heat removal capability and to prevent thermal and boron stratification in the core. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.9.5.2 CTS-01558

RHR System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required RHR loop(s) and may also prevent water hammer, pump cavitation, and pumping noncondensible gas into the reactor vessel.

Selection of RHR System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

BASES

SURVEILLANCE REQUIREMENTS (continued)

CTS-01558

The RHR System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds an acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits.

RHR System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

REFERENCES

1. FSAR Subsection 5.4.7.

B 3.9 REFUELING OPERATIONS

B 3.9.6 Residual Heat Removal (RHR) and Coolant Circulation - Low Water Level

BASES

BACKGROUND

The purpose of the RHR System in MODE 6 is to remove decay heat and sensible heat from the Reactor Coolant System (RCS), as required by GDC 34, to provide mixing of borated coolant, and to prevent boron stratification (Ref. 1). Heat is removed from the RCS by circulating reactor coolant through the Containment Spray (CS)/RHR heat exchangers where the heat is transferred to the Component Cooling Water System. The coolant is then returned to the RCS via the RCS cold leg(s). Operation of the RHR System for normal cooldown decay heat removal is manually accomplished from the control room. The heat removal rate is adjusted by controlling the flow of reactor coolant through the CS/RHR heat exchanger(s) and the bypass lines. Mixing of the reactor coolant is maintained by this continuous circulation of reactor coolant through the RHR System.

In MODE 6 Low Water Level, low-pressure letdown line isolation valves are automatically closed upon detection of RCS loop low-level signal to prevent loss of RCS inventory.

The function is effective to prevent core damage during plant shutdown, based on probabilistic risk assessment.

In Mode 6 with low water level (<23 feet above the vessel flange), one additional source of injection water (beyond a CS/RHR pump) will reduce the calculated core damage frequency. One safety injection (SI) pump can provide this injection source. A water source is also required. CTS-01558

The Safeguards Component Area HVAC System is a support system that provides temperature control for the CS/RHR Pump Room and CS/RHR Heat Exchanger Room, and includes electric heating coils, cooling coils, fans, ductwork, dampers, and instrumentation and controls necessary to perform the support function. The Essential Chilled Water System is a support system and provides chilled water to the air handling unit cooling coil. The Essential Service Water System supports operation of the essential chiller. For each RHR loop required to be OPERABLE, the associated train of Safeguards Component Area HVAC System, including its associated train of the Essential Chilled Water System and Essential Service Water System, must be in operation, or available to operate on demand, and capable of performing its related support function.

BASES

APPLICABLE SAFETY ANALYSES

While there is no explicit analysis assumptions for the decay heat removal function of the RHR System in MODE 6, if the reactor coolant temperature is not maintained below 200°F, boiling of the reactor coolant could result. This could lead to a loss of refueling cavity water level. Additionally, boiling of the reactor coolant could lead to a reduction in boron concentration in the coolant due to the boron plating out on components near the areas of the boiling activity. The loss of reactor coolant and the reduction of boron concentration in the reactor coolant will eventually challenge the integrity of the fuel cladding, which is a fission product barrier. Three trains of the RHR System are required to be OPERABLE, and two trains in operation, in order to prevent this challenge.

RHR and Coolant Circulation – Low Water Level satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).

The need for one SI pump is based on the PRA insight that maintaining at least one RCS injection function operable results in a reduction in core damage risk during shutdown conditions (Mode 6) with water level <23 feet above the top of the reactor vessel flange. CTS-01558

LCO

In MODE 6, with the water level < 23 ft above the top of the reactor vessel flange, three RHR loops must be OPERABLE. Additionally, two loops of RHR must be in operation in order to provide:

a. Removal of decay heat,

b. Mixing of borated coolant to minimize the possibility of criticality, and

c. Indication of reactor coolant temperature.

This LCO requires the low-pressure letdown line isolation valves to be OPERABLE to mitigate the effects associated with loss of RCS inventory.

The LCO also requires that one SI pump be OPERABLE such that in response to a manual operator start the pump can provide sufficient water to mitigate a drain-down event while in Mode 6 with water level <23 feet above the top of the reactor vessel flange. The LCO requires that a source of water (i.e., reactor water storage pit (RWSP) and water available from the refueling cavity) be available and contain the necessary volume of water. The capability to provide injection water is important to achieve defense-in-depth during Mode 6 with water level <23 feet above the top of the reactor vessel flange. The ability of the pump to provide flow to the RCS while partially filled (and at near atmospheric pressure) and have electrical power are the criteria necessary to be OPERABLE in Mode 6. No pump automatic start features are required to be OPERABLE in Mode 6 as these capabilities were not credited in the PRA. CTS-01558

BASES

LCO (continued)

This LCO is modified by two Notes. Note 1 permits the CS/RHR pumps to be removed from operation for ≤ 15 minutes when switching from one train to another. The circumstances for stopping all CS/RHR pumps are to be limited to situations when the outage time is short and the core outlet temperature is maintained > 10 degrees F below saturation temperature. The Note prohibits boron dilution or draining operations when RHR forced flow is stopped. CTS-01558 CTS-01558

Note 2 allows one RHR loop to be inoperable for a period of 2 hours provided the other loops are OPERABLE and in operation. Prior to declaring the loop inoperable, consideration should be given to the existing plant configuration. This consideration should include that the core time to boil is short, there is no draining operation to further reduce RCS water level and that the capability exists to inject borated water into the reactor vessel. This permits surveillance tests to be performed on the inoperable loop during a time when these tests are safe and possible.

An OPERABLE RHR loop consists of a~~n~~ CS/RHR pump, a heat exchanger, valves, piping, instruments and controls to ensure an OPERABLE flow path and to determine the low end temperature. The flow path starts in one of the RCS hot legs and is returned to the RCS cold legs. Management of gas voids is important to RHR System OPERABILITY. CTS-01558 CTS-01558

All RHR pumps may be aligned to the Refueling Water Storage Pit to support filling or draining the refueling cavity or for performance of required testing.

APPLICABILITY

Three RHR loops are required to be OPERABLE, and two RHR loops must be in operation in MODE 6, with the water level < 23 ft above the top of the reactor vessel flange, to provide decay heat removal and mixing of the borated coolant. Requirements for the RHR System in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS), and Section 3.5, Emergency Core Cooling Systems (ECCS). RHR loop requirements in MODE 6 with the water level ≥ 23 ft are located in LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation - High Water Level."

In MODE 6 Low Water Level, low-pressure letdown line isolation valves are automatically closed upon detection of RCS loop low-level signal to prevent loss of RCS inventory.

The function is effective to prevent core damage during plant shutdown, based on probabilistic risk assessment.

BASES

ACTIONS (continued)

c. Each penetration providing direct access from the containment atmosphere to the outside atmosphere must be either closed by a manual or automatic isolation valve, blind flange, or equivalent, or verified to be capable of being closed by an OPERABLE Containment Purge and Exhaust Isolation System.

With RHR loop requirements not met, the potential exists for the coolant to boil and release radioactive gas to the containment atmosphere. Performing the actions stated above ensures that all containment penetrations are either closed or can be closed so that the dose limits are not exceeded.

The Completion Time of 4 hours allows fixing of most RHR problems and is reasonable, based on the availability of the standby RHR loop and one SI train for injection water, and on the low probability of the coolant boiling in that time. CTS-01558

D.1, D.2, D.3, and D.4 CTS-01558

In the event that no SI pump is available to inject water into the RCS, the RWSP does not contain sufficient water volume (SR 3.9.6.5), or boron concentration is not within limits (SR 3.9.6.6) to mitigate a RCS drain-down event in Mode 6 with <23 feet above the top of the reactor vessel flange, then actions must be initiated immediately to restore this capability. The PRA indicates that the availability of an injection water source reduces the core damage frequency. Additionally, until such capability is restored, any activity that could result in lowering RCS water volume must be suspended. The immediate COMPLETION TIME reflects the importance of maintaining water injection capability while the RCS is in a low water level condition.

SURVEILLANCE REQUIREMENTS

SR 3.9.6.1

This Surveillance demonstrates that two RHR loops are in operation and circulating reactor coolant. The flow rate is determined by the flow rate necessary to provide sufficient decay heat removal capability and to prevent thermal and boron stratification in the core. In addition, during operation of the RHR loops with the water level in the vicinity of the reactor vessel nozzles, the CS/RHR pump suction requirements must be met. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.9.6.2

Verification that the required pump is OPERABLE ensures that an additional RCS or RHR pump can be placed in operation, if needed, to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available to the required pump. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.9.6.3

SR 3.9.6.3 requires a complete cycle of each low-pressure letdown isolation valve. This requirements mean confirmation of OPERABILITY of Instrumentation and its control (Setpoints, Channel Checks, Channel Calibrations) and valve. Operating a low-pressure letdown isolation valve through one complete cycle ensures that the low-pressure letdown isolation valve can be automatically actuated to mitigate the effects from loss of RCS inventory. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.9.6.4 CTS-01558

RHR System piping and components have the potential to develop voids and pockets of entrained gases. Preventing and managing gas intrusion and accumulation is necessary for proper operation of the required RHR loop(s) and may also prevent water hammer, pump cavitation, and pumping noncondensible gas into the reactor vessel.

Selection of RHR System locations susceptible to gas accumulation is based on a review of system design information, including piping and instrumentation drawings, isometric drawings, plan and elevation drawings, and calculations. The design review is supplemented by system walk downs to validate the system high points and to confirm the location and orientation of important components that can become sources of gas or could otherwise cause gas to be trapped or difficult to remove during system maintenance or restoration. Susceptible locations depend on plant and system configuration, such as stand-by versus operating conditions.

SURVEILLANCE REQUIREMENTS (continued)

The RHR System is OPERABLE when it is sufficiently filled with water. Acceptance criteria are established for the volume of accumulated gas at susceptible locations. If accumulated gas is discovered that exceeds an acceptance criteria for the susceptible location (or the volume of accumulated gas at one or more susceptible locations exceeds an acceptance criteria for gas volume at the suction or discharge of a pump), the Surveillance is not met. If it is determined by subsequent evaluation that the RHR System is not rendered inoperable by the accumulated gas (i.e., the system is sufficiently filled with water), the Surveillance may be declared met. Accumulated gas should be eliminated or brought within the acceptance criteria limits. CTS-01558

RHR System locations susceptible to gas accumulation are monitored and, if gas is found, the gas volume is compared to the acceptance criteria for the location. Susceptible locations in the same system flow path which are subject to the same gas intrusion mechanisms may be verified by monitoring a representative sub-set of susceptible locations. Monitoring may not be practical for locations that are inaccessible due to radiological or environmental conditions, the plant configuration, or personnel safety. For these locations alternative methods (e.g., operating parameters, remote monitoring) may be used to monitor the susceptible location. Monitoring is not required for susceptible locations where the maximum potential accumulated gas void volume has been evaluated and determined to not challenge system OPERABILITY. The accuracy of the method used for monitoring the susceptible locations and trending of the results should be sufficient to assure system OPERABILITY during the Surveillance interval.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Surveillance Frequency may vary by location susceptible to gas accumulation.

SR 3.9.6.5

Verification that the RWSP contains a borated water volume (including water available in the refueling cavity) ≥ 79,920 ft^3 (597,800 gallons) ensures that the pump will have a sufficient inventory of water to mitigate the Mode 6 RCS drain-down event assumed in the probabilistic risk assessment (PRA). The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

BASES

SURVEILLANCE REQUIREMENTS (continued)

CTS-01558

SR 3.9.6.6

The boron concentration of the RWSP should be verified to be within the required limits. This SR ensures that the reactor will remain subcritical following a RCS drain down event. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.9.6.7

Verification that the breaker alignment is correct and indicated power is available to the required SI pump ensures that the pump motor will be available to drive the pump upon manual start. The Surveillance Frequency is based on operating experience, equipment reliability, and plant risk and is controlled under the Surveillance Frequency Control Program.

SR 3.9.6.8

Periodic surveillance testing of an SI pump to detect gross degradation caused by impeller structural damage or other hydraulic component problems is required by the ASME Code. This type of testing may be accomplished by measuring the pump developed head at only one point of the pump characteristic curve. This verifies both that the measured performance is within an acceptable tolerance of the original pump baseline performance and that the performance at the test flow is greater than or equal to the performance assumed in the plant PRA for a drain-down event in Mode 6 with <23 ft. SRs are specified in the Inservice Testing Program of the ASME Code. The ASME Code provides the activities and Frequencies necessary to satisfy the requirements.

REFERENCES

1. FSAR Subsection 5.4.7.