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TSB2 - TECHNICAL SPECIFICATIONS BASES UNIT 2 MANUAL

REMOVE MANUAL TABLE OF CONTENTS DATE: 05/20/2010

ADD MANUAL TABLE OF CONTENTS DATE: 07/09/2010

CATEGORY: DOCUMENTS TYPE: TSB2

KIRR

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Page 2 of 2

ID: TEXT 3.5.3 ADD: REV: 2

REMOVE: REV:1

CATEGORY: DOCUMENTS TYPE: TSB2 ID: TEXT LOES ADD: REV: 100

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Manual Name: TSB2

Manual Title: TECHNICAL SPECIFICATIONS BASES UNIT 2 MANUAL

Table Of Contents

Issue Date: 07/09/2010

Procedure NameRevIssue DateChange IDChange NumberTEXT LOES10007/09/2010Title: LIST OF EFFECTIVE SECTIONS

TEXT TOC 16 03/10/2010 Title: TABLE OF CONTENTS

TEXT 2.1.1 4 05/06/2009 Title: SAFETY LIMITS (SLS) REACTOR CORE SLS

TEXT 2.1.2 1 10/04/2007 Title: SAFETY LIMITS (SLS) REACTOR COOLANT SYSTEM (RCS) PRESSURE SL

TEXT 3.0 3 08/20/2009 Title: LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY

TEXT 3.1.1 1 03/24/2005 Title: REACTIVITY CONTROL SYSTEMS SHUTDOWN MARGIN (SDM)

TEXT 3.1.2 0 11/18/2002 Title: REACTIVITY CONTROL SYSTEMS REACTIVITY ANOMALIES

TEXT 3.1.3 2 01/19/2009 Title: REACTIVITY CONTROL SYSTEMS CONTROL ROD OPERABILITY

TEXT 3.1.4 4 01/30/2009 Title: REACTIVITY CONTROL SYSTEMS CONTROL ROD SCRAM TIMES

TEXT 3.1.5 1 07/06/2005 Title: REACTIVITY CONTROL SYSTEMS CONTROL ROD SCRAM ACCUMULATORS

TEXT 3.1.6 2 03/24/2005 Title: REACTIVITY CONTROL SYSTEMS ROD PATTERN CONTROL

Manual Name: TSB2 Manual Title: TECHNICAL SPECIFICATIONS BASES UNIT 2 MANUAL 10/04/2007 3 TEXT 3.1.7 Title: REACTIVITY CONTROL SYSTEMS STANDBY LIQUID CONTROL (SLC) SYSTEM ٦ 05/06/2009 TEXT 3.1.8 Title: REACTIVITY CONTROL SYSTEMS SCRAM DISCHARGE VOLUME (SDV) VENT AND DRAIN VALVES 05/06/2009 TEXT 3.2.1 4 Title: POWER DISTRIBUTION LIMITS AVERAGE PLANAR LINEAR HEAT GENERATION RATE (APLHGR) 05/06/2009 TEXT 3.2.2 3 Title: POWER DISTRIBUTION LIMITS MINIMUM CRITICAL POWER RATIO (MCPR) 05/06/2009 2 TEXT 3.2.3 Title: POWER DISTRIBUTION LIMITS LINEAR HEAT GENERATION RATE LHGR 05/06/2009 4 TEXT 3.3.1.1 Title: INSTRUMENTATION REACTOR PROTECTION SYSTEM (RPS) INSTRUMENTATION 01/19/2009 2 TEXT 3.3.1.2 Title: INSTRUMENTATION SOURCE RANGE MONITOR (SRM) INSTRUMENTATION 2 04/09/2007 TEXT 3.3.2.1 Title: INSTRUMENTATION CONTROL ROD BLOCK INSTRUMENTATION TEXT 3.3.2.2 1 05/06/2009 Title: INSTRUMENTATION FEEDWATER - MAIN TURBINE HIGH WATER LEVEL TRIP INSTRUMENTATION 7 10/27/2008 TEXT 3.3.3.1 Title: INSTRUMENTATION POST ACCIDENT MONITORING (PAM) INSTRUMENTATION 04/18/2005 TEXT 3.3.3.2 1 Title: INSTRUMENTATION REMOTE SHUTDOWN SYSTEM 05/06/2009 TEXT 3.3.4.1 1



Manual Name: TSB2

Manual Title: TECHNICAL SPECIFICATIONS BASES UNIT 2 MANUAL

3 03/10/2010 TEXT 3.4.5 Title: REACTOR COOLANT SYSTEM (RCS) RCS PRESSURE ISOLATION VALVE (PIV) LEAKAGE 2 08/20/2009 TEXT 3.4.6 Title: REACTOR COOLANT SYSTEM (RCS) RCS LEAKAGE DETECTION INSTRUMENTATION 10/04/2007 TEXT 3.4.7 2 Title: REACTOR COOLANT SYSTEM (RCS) RCS SPECIFIC ACTIVITY 04/18/2005 TEXT 3.4.8 1 Title: REACTOR COOLANT SYSTEM (RCS) RESIDUAL HEAT REMOVAL (RHR) SHUTDOWN COOLING SYSTEM - HOT SHUTDOWN TEXT 3.4.9 11/18/2002 0 Title: REACTOR COOLANT SYSTEM (RCS) RESIDUAL HEAT REMOVAL (RHR) SHUTDOWN COOLING SYSTEM - COLD SHUTDOWN 05/06/2009 3 TEXT 3.4.10 Title: REACTOR COOLANT SYSTEM (RCS) RCS PRESSURE AND TEMPERATURE (P/T) LIMITS 11/18/2002 0 TEXT 3.4.11 Title: REACTOR COOLANT SYSTEM (RCS) REACTOR STEAM DOME PRESSURE 3 01/16/2006 TEXT 3.5.1 Title: EMERGENCY CORE COOLING SYSTEMS (ECCS) AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM ECCS - OPERATING TEXT 3.5.2 0 11/18/2002 Title: EMERGENCY CORE COOLING SYSTEMS (ECCS) AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM ECCS - SHUTDOWN 07/09/2010 2 TEXT 3.5.3 Title: EMERGENCY CORE COOLING SYSTEMS (ECCS) AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM RCIC SYSTEM 05/06/2009 TEXT 3.6.1.1 3 Title: CONTAINMENT SYSTEMS PRIMARY CONTAINMENT 05/06/2009 TEXT 3.6.1.2 1 Title: CONTAINMENT SYSTEMS PRIMARY CONTAINMENT AIR LOCK

Manual Name: TSB2 Manual Title: TECHNICAL SPECIFICATIONS BASES UNIT 2 MANUAL 11 04/14/2010 TEXT 3.6.1.3 Title: CONTAINMENT SYSTEMS PRIMARY CONTAINMENT ISOLATION VALVES (PCIVS) 1 05/06/2009 TEXT 3.6.1.4 Title: CONTAINMENT SYSTEMS CONTAINMENT PRESSURE 10/05/2005 TEXT 3.6.1.5 1 Title: CONTAINMENT SYSTEMS DRYWELL AIR TEMPERATURE 11/18/2002 TEXT 3.6.1.6 0 Title: CONTAINMENT SYSTEMS SUPPRESSION CHAMBER-TO-DRYWELL VACUUM BREAKERS 12/17/2007 2 TEXT 3.6.2.1 Title: CONTAINMENT SYSTEMS SUPPRESSION POOL AVERAGE TEMPERATURE 11/18/2002 0 TEXT 3.6.2.2 Title: CONTAINMENT SYSTEMS SUPPRESSION POOL WATER LEVEL 1 01/16/2006 TEXT 3.6.2.3 Title: CONTAINMENT SYSTEMS RESIDUAL HEAT REMOVAL (RHR) SUPPRESSION POOL COOLING 11/18/2002 TEXT 3.6.2.4 0 Title: CONTAINMENT SYSTEMS RESIDUAL HEAT REMOVAL (RHR) SUPPRESSION POOL SPRAY 06/13/2006 TEXT 3.6.3.1 2 Title: CONTAINMENT SYSTEMS PRIMARY CONTAINMENT HYDROGEN RECOMBINERS 1 04/18/2005 TEXT 3.6.3.2 Title: CONTAINMENT SYSTEMS DRYWELL AIR FLOW SYSTEM 11/18/2002 0 TEXT 3.6.3.3 Title: CONTAINMENT SYSTEMS PRIMARY CONTAINMENT OXYGEN CONCENTRATION 10/04/2007 7 TEXT 3.6.4.1 Title: CONTAINMENT SYSTEMS SECONDARY CONTAINMENT

Manual Name: TSB2 Manual Title: TECHNICAL SPECIFICATIONS BASES UNIT 2 MANUAL 03/10/2010 3 TEXT 3.6.4.2 Title: CONTAINMENT SYSTEMS SECONDARY CONTAINMENT ISOLATION VALVES (SCIVS) 09/21/2006 TEXT 3.6.4.3 4 Title: CONTAINMENT SYSTEMS STANDBY GAS TREATMENT (SGT) SYSTEM 04/05/2010 4 TEXT 3.7.1 Title: PLANT SYSTEMS RESIDUAL HEAT REMOVAL SERVICE WATER (RHRSW) SYSTEM AND THE ULTIMATE HEAT SINK (UHS) 05/02/2008 2 TEXT 3.7.2 Title: PLANT SYSTEMS EMERGENCY SERVICE WATER (ESW) SYSTEM 01/08/2010 1 TEXT 3.7.3 Title: PLANT SYSTEMS CONTROL ROOM EMERGENCY OUTSIDE AIR SUPPLY (CREOAS) SYSTEM 0 11/18/2002 TEXT 3.7.4 Title: PLANT SYSTEMS CONTROL ROOM FLOOR COOLING SYSTEM 10/04/2007 1 TEXT 3.7.5 Title: PLANT SYSTEMS MAIN CONDENSER OFFGAS 05/06/2009 2 TEXT 3.7.6 Title: PLANT SYSTEMS MAIN TURBINE BYPASS SYSTEM 10/04/2007 1 TEXT 3.7.7 Title: PLANT SYSTEMS SPENT FUEL STORAGE POOL WATER LEVEL 05/06/2009 8 TEXT 3.8.1 Title: ELECTRICAL POWER SYSTEMS AC SOURCES - OPERATING 0 05/06/2009 TEXT 3.7.8 Title: MAINE TURBINE PRESSURE REGULATION SYSTEM 11/18/2002 0 TEXT 3.8.2 Title: ELECTRICAL POWER SYSTEMS AC SOURCES - SHUTDOWN

Manual Name: TSB2 Manual Title: TECHNICAL SPECIFICATIONS BASES UNIT 2 MANUAL 04/14/2010 TEXT 3.8.3 2 Title: ELECTRICAL POWER SYSTEMS DIESEL FUEL OIL LUBE OIL AND STARTING AIR 01/19/2009 TEXT 3.8.4 3 Title: ELECTRICAL POWER SYSTEMS DC SOURCES - OPERATING 1 12/14/2006 TEXT 3.8.5 Title: ELECTRICAL POWER SYSTEMS DC SOURCES - SHUTDOWN 12/14/2006 1 TEXT 3.8.6 Title: ELECTRICAL POWER SYSTEMS BATTERY CELL PARAMETERS 03/31/2006 3 TEXT 3.8.7 Title: ELECTRICAL POWER SYSTEMS DISTRIBUTION SYSTEMS - OPERATING TEXT 3.8.8 0 11/18/2002 Title: ELECTRICAL POWER SYSTEMS DISTRIBUTION SYSTEMS - SHUTDOWN 11/18/2002 TEXT 3.9.1 0 Title: REFUELING OPERATIONS REFUELING EQUIPMENT INTERLOCKS 11/18/2002 0 TEXT 3.9.2 Title: REFUELING OPERATIONS REFUEL POSITION ONE-ROD-OUT INTERLOCK 11/18/2002 0 TEXT 3.9.3 Title: REFUELING OPERATIONS CONTROL ROD POSITION 0 11/18/2002 TEXT 3.9.4 Title: REFUELING OPERATIONS CONTROL ROD POSITION INDICATION 0 11/18/2002 TEXT 3.9.5 Title: REFUELING OPERATIONS CONTROL ROD OPERABILITY - REFUELING TEXT 3.9.6 1 10/04/2007

Title: REFUELING OPERATIONS REACTOR PRESSURE VESSEL (RPV) WATER LEVEL

Manual Name: TSB2 Manual Title: TECHNICAL SPECIFICATIONS BASES UNIT 2 MANUAL 11/18/2002 0 TEXT 3.9.7 Title: REFUELING OPERATIONS RESIDUAL HEAT REMOVAL (RHR) - HIGH WATER LEVEL 11/18/2002 TEXT 3.9.8 0 Title: REFUELING OPERATIONS RESIDUAL HEAT REMOVAL (RHR) - LOW WATER LEVEL 01/23/2008 1 TEXT 3.10.1 Title: SPECIAL OPERATIONS INSERVICE LEAK AND HYDROSTATIC TESTING OPERATION 11/18/2002 0 TEXT 3.10.2 Title: SPECIAL OPERATIONS REACTOR MODE SWITCH INTERLOCK TESTING 11/18/2002 0 TEXT 3.10.3 Title: SPECIAL OPERATIONS SINGLE CONTROL ROD WITHDRAWAL - HOT SHUTDOWN TEXT 3.10.4 0 11/18/2002 Title: SPECIAL OPERATIONS SINGLE CONTROL ROD WITHDRAWAL - COLD SHUTDOWN TEXT 3.10.5 0 11/18/2002 Title: SPECIAL OPERATIONS SINGLE CONTROL ROD DRIVE (CRD) REMOVAL - REFUELING 11/18/2002 TEXT 3.10.6 0 Title: SPECIAL OPERATIONS MULTIPLE CONTROL ROD WITHDRAWAL - REFUELING 03/24/2005 1 TEXT 3.10.7 Title: SPECIAL OPERATIONS CONTROL ROD TESTING - OPERATING 04/09/2007 2 TEXT 3.10.8 Title: SPECIAL OPERATIONS SHUTDOWN MARGIN (SDM) TEST - REFUELING

<u>Section</u>	<u>Title</u>	Revision
TOC	Table of Contents	16
В 2.0	SAFETY LIMITS BASES Page TS / B 2.0-1 Pages TS / B 2.0-2 and TS / B 2.0-3 Page TS / B 2.0-4 Pages TS / B 2.0-5 through TS / B 2.0-8	1 4 6 1
В 3.0	LCO AND SR APPLICABILITY BASES Page TS / B 3.0-1 Pages TS / B 3.0-2 through TS / B 3.0-4 Pages TS / B 3.0-5 through TS / B 3.0-7 Page TS / B 3.0-8 Pages TS / B 3.0-9 through Page TS / B 3.0-11 Page TS / B 3.0-11a Page TS / B 3.0-12 Pages TS / B 3.0-13 through TS / B 3.0-15 Pages TS / B 3.0-16 and TS / B 3.0-17	1 0 1 3 2 0 1 2 0
B 3.1	REACTIVITY CONTROL BASES Pages B 3.1-1 through B 3.1-4 Page TS / B 3.1-5 Pages TS / B 3.1-6 and TS / B 3.1-7 Pages B 3.1-8 through B 3.1-13 Page TS / B 3.1-14 Page TS / B 3.1-15 Page TS / B 3.1-16 Pages TS / B 3.1-20 and TS / B 3.1-19 Pages TS / B 3.1-20 and TS / B 3.1-21 Page TS / B 3.1-22 Page TS / B 3.1-22 Page TS / B 3.1-25 through TS / B 3.1-27 Page TS / B 3.1-26 Pages TS / B 3.1-28 Pages TS / B 3.1-28 Pages TS / B 3.1-30 through B 3.1-33 Pages TS / B 3.1-37 and TS / B 3.1-36 Pages TS / B 3.1-37 and TS / B 3.1-40 Page TS / B 3.1-40a Page TS / B 3.1-41 Page TS / B 3.1-42	0 1 2 0 1 0 1 0 1 0 1 2 0 1 2 0 1 2

, ·

۰,

<u>Section</u>	Title	Revision
	Pages TS / B 3.1-43 Page TS / B 3.1-44 Page TS / B 3.1-45 Page TS / B 3.1-46 Page TS / B 3.1-47 Pages TS / B 3.1-48 and TS / B 3.1-49 Page B 3.1-50 Page TS / B 3.1-51	1 0 3 0 1 1 0 3
B 3.2	POWER DISTRIBUTION LIMITS BASES Pages TS / B 3.2-1 and TS / B 3.2-2 Page TS / B 3.2-3 Page TS / B 3.2-4 Page TS / B 3.2-5 Page TS / B 3.2-6 Page TS / B 3.2-7 Pages TS / B 3.2-7 Pages TS / B 3.2-10 through TS / B 3.2-12 Page TS / B 3.2-13	2 4 1 3 4 3 4 2 1
B 3.3	INSTRUMENTATION Pages TS / B 3.3-1 through TS / B 3.3-4 Page TS / B 3.3-5 Page TS / B 3.3-6 Page TS / B 3.3-7 Page TS / B 3.3-7 Page TS / B 3.3-9 through TS / B 3.3-13 Pages TS / B 3.3-9 through TS / B 3.3-16 Pages TS / B 3.3-15 and TS / B 3.3-16 Pages TS / B 3.3-17 through TS / B 3.3-21 Pages TS / B 3.3-22 through TS / B 3.3-21 Pages TS / B 3.3-28 Page TS / B 3.3-29 Pages TS / B 3.3-30 and TS / B 3.3-31 Pages TS / B 3.3-32 and TS / B 3.3-31 Pages TS / B 3.3-34 Pages TS / B 3.3-34 Pages TS / B 3.3-34b through TS / B 3.3-34d Pages TS / B 3.3-34f through TS / B 3.3-34i Pages TS / B 3.3-35 and TS / B 3.3-36 Pages TS / B 3.3-37 and TS / B 3.3-38	1 2 1 3 4 3 4 2 3 2 3 4 3 4 2 1 0 1 0 2 1

Section	Title	<u>Revision</u>
	Page TS / B 3.3-39	2
	Pages TS / B 3.3-40 through TS / B 3.3-43	2
	Pages TS / B 3.3-44 through TS / B 3.3-54	3
	Pages TS / B 3.3-54a through TS / B 3.3-54e	0
	Page TS / B 3.3-55	1
	Page B 3.3-56	0
	Page TS / B 3.3-57	1
	Page B 3.3-58	0
	Page TS / B 3.3-59	1
	Pages B 3.3-60 through B 3.3-63	0
	Pages 1S / B 3.3-64 and 1S / B 3.3-65	2
	Page 15 / B 3.3-66	4
		3
		4
	Page 157 B 3.3.09 Dago TS / B 3.3.09	D A
	Page 107 D 3.3-70 Dogo TS / D 3.3-71	4
	$Faye TO / D 3.5^{-7}$ $Pager TS / B 3.2 72 and TS / B 3.2 72$	3 2
	Page TS / B 3 3.7/	2
	Page TS / B 3 $3-75$	5 2
	Pages TS / B 3 3 -75a and TS / B 3 3 -75 h	6
	Page TS / B 3 3-75c	5
	Pages B 3 3-76 and TS / B 3 3-77	Õ
	Page TS / B 3.3-78	1
	Pages B 3.3-79 through B 3.3-81	Ó
	Page TS / B 3.3-82	1
	Page B 3.3-83	Û
	Pages TS / B 3.3-84 and TS / B 3.3-85	1
	Page 3.3-86	0
	Page TS / B 3.3-87	1
	Page B 3.3-88	0
	Page TS / B 3.3-89	1
	Pages B 3.3-90 and B 3.3-91	0
	Pages TS / B 3.3-92 through TS / B 3.3-103	1
	Page TS / B 3.3-104	3
	Pages TS / B 3.3-105 and TS / B 3.3-106	1
	Page TS / B 3.3-107	2
	Page TS / B 3.3-108	1
	Page TS / B 3.3-109	2
	Pages TS / B 3.3-110 through TS / B 3.3-112	1
	Page 15 / B 3.3-713	2
	Page 15 / B 3.3-114]
	Faye 10 / D 0.0-110 Dago TS / D 2 2 116	2
	Faye IO / D O O O O O O O O O O O O O O O O O	ა ე
	Fayes 10/ D 3.3-11/ and 10/ B 3.3-110	۷ ک

<u>Section</u>	<u>Title</u>	Revision
	Pages TS / B 3.3-119 through TS / B 3.3-120 Pages TS / B 3.3-121 and TS / B 3.3-122	1 2
	Page TS / B 3.3-123	1
	Page TS / B 3.3-124	2
	Page TS / B 3.3-124a	0
	Page TS / B 3.3-125	1
	Page TS / B 3.3-126	2
	Page TS / B 3.3-127	3
2	Page TS / B 3.3-128	2
	Pages TS / B 3.3-129 through TS / B 3.3-131	1
	Page TS / B 3.3-132	2
	Pages TS / B 3.3-133 and TS / B 3.3-134	1
	Pages B 3.3-135 through B 3.3-137	0
	Page 157 B 3.3-138	1
	Pages B 3.3-139 through B 3.3-149	U d
	Pages TS/ B 3.3-150 and TS / B 3.3-151	1
	Pages 15 / D 3.3-152 [nilougi] 15 / D 3.3-154	2
	Pages TS / B 3.3-156 through TS / B 3.3-158	2
	Pages TS / B 3 3-150 through TS / B 3 3-161 Pages TS / B 3 3-150 through TS / B 3 3-161	2 1
	Page TS / B 3 3-162	1
	Page TS / B 3 3-163	2
	Page TS / B 3 3-164	1
	Pages TS / B 3 3-165 and TS / B 3 3-166	2
	Pages TS / B 3.3-167 and TS / B 3.3-168	1
	Pages TS / B 3.3-169 and TS / B 3.3-170	2
	Pages TS / B 3.3-171 through TS / B 3.3-177	- 1
	Page TS / B 3.3-178	2
	Page TS / B 3.3-179	3
	Page TS / B 3.3-179a	2
	Page TS / B 3.3-180	1
	Page TS / B 3.3-181	3
	Page TS / B 3.3-182	1
	Page TS / B 3.3-183	2
	Page TS / B 3.3-184	1
	Page TS / B 3.3-185	3
	Page TS / B 3.3-186	1
	Pages TS / B 3.3-187 and TS / B 3.3-188	2
	Pages IS / B 3.3-189 through TS / B 3.3-191	1
	Page 15 / B 3.3-192	0
	Page 15 / B 3.3-193	1 .
	Pages 15 / B 3.3-194 and 15 / B 3.3-195	U
	Page 157 B 3.3-196	2

Section	<u>Title</u>	Revision
	Pages TS / B 3.3-197 through TS / B 3.3-205 Page TS / B 3.3-206 Pages B 3.3-207 through B 3.3-209 Page TS / B 3.3-210 Page TS / B 3.3-211 Pages TS / B 3.3-212 and TS / B 3.3-213 Pages B 3.3-214 through B 3.3-220	0 1 0 1 2 1 0
B 3.4	REACTOR COOLANT SYSTEM BASES Pages TS / B 3.4-1 and TS / B 3.4-2 Pages TS / B 3.4-3 and TS / B 3.4-4 Pages TS / B 3.4-3 and TS / B 3.4-9 Pages B 3.4-10 through B 3.4-12 Page TS / B 3.4-13 Page B 3.4-14 Page TS / B 3.4-15 Pages TS / B 3.4-16 and TS / B 3.4-17 Page TS / B 3.4-18 Pages TS / B 3.4-18 Pages TS / B 3.4-24 through TS / B 3.4-27 Page TS / B 3.4-24 through TS / B 3.4-27 Page TS / B 3.4-29 Pages TS / B 3.4-29 Pages TS / B 3.4-30 and TS / B 3.3-31 Pages TS / B 3.4-32 and TS / B 3.4-33 Page TS / B 3.4-35 and TS / B 3.4-36 Page TS / B 3.4-37 Page B 3.4-38 Pages B 3.4-39 and B 3.4-40 Page TS / B 3.4-41 Pages TS / B 3.4-42 through B 3.4-48 Page TS / B 3.4-42 through B 3.4-48 Page TS / B 3.4-49 Pages TS / B 3.4-50 through TS / B 3.4-52 Page TS / B 3.4-54 through TS / B 3.4-57 Pages TS / B 3.4-58 through TS / B 3.4-60	1 4 3 0 1 0 2 3 2 0 0 1 3 0 1 0 1 2 1 0 1 0 3 2 1 2 1 2 1
B 3.5	ECCS AND RCIC BASES Pages TS / B 3.5-1 and TS / B 3.5-2 Pages TS / B 3.5-3 through TS / B 3.5-6 Pages TS / B 3.5-7 through TS / B 3.5-10 Pages TS / B 3.5-11 and TS / B 3.5-12 Pages TS / B 3.6-13 and TS / B 3.5-14	1 2 1 2 1

<u>Section</u>	<u>Title</u>	Revision
	Pages TS / B 3.5-15 and TS / B.3.5-16 Page TS / B 3.5-17 Page TS / B 3.5-18 Pages B 3.5-19 through B 3.5-24 Pages TS / B 3.5-25 through TS / B 3.5-27 Page TS / B 3.5-28 Page TS / B 3.5-29 Pages TS / B 3.5-30 and TS / B 3.5-31	2 3 1 0 1 0 1 0
B 3.6	CONTAINMENT SYSTEMS BASES Page TS / B 3.6-1 Page TS / B 3.6-1 Page TS / B 3.6-2 Page TS / B 3.6-3 Page TS / B 3.6-4 Page TS / B 3.6-6 Pages TS / B 3.6-6a and TS / B 3.6-6b Page TS / B 3.6-6c Page B 3.6-7 Page TS / B 3.6-15 Page TS / B 3.6-15 Page TS / B 3.6-15a Page TS / B 3.6-15b Page TS / B 3.6-16 and TS / B 3.6-17 Page TS / B 3.6-16and TS / B 3.6-17 Page TS / B 3.6-16and TS / B 3.6-17 Page TS / B 3.6-20 Page TS / B 3.6-21 Page TS / B 3.6-21a and TS / B 3.6-21b Pages TS / B 3.6-24 and TS / B 3.6-25 Pages TS / B 3.6-28 Page TS / B 3.6-28 Page TS / B 3.6-29 Page TS / B 3.6-31 Pages TS / B 3.6-31 Pages TS / B 3.6-31 Pages TS / B 3.6-32 and TS / B 3.6-33	2 3 4 3 4 3 4 2 0 0 1 0 3 0 3 2 0 1 2 3 0 2 1 3 7 5 0 2 3 2

TS / B LOES-6

<u>Section</u>	Title	<u>Revision</u>
	Page TS / B 3.6-34	1
	Page TS / B 3.6-35	3
	Pages TS / B 3.6-36 and TS / B 3.6-37	2
	Page TS / B 3.6-38	3
	Page TS / B 3.6-39	7
	Page TS / B 3.6-40	1
	Pages B 3.6-41 and B 3.6-42	0
	Pages TS / B 3.6-43 and TS / B 3.6-44	1
	Page TS / B 3.6-45	2
	Pages TS / B 3.6-46 through TS / B 3.6-50	1
	Page TS / B 3.6-51	2
	Pages B 3.6-52 through B 3.6-55	0
	Pages TS / B 3.6-56 and TS / B 3.6-57	2
	Pages B 3.6-58 through B 3.6-62	0
	Pages TS / B 3.6-63 and TS / B 3.6-64	1
	Pages B 3.6-65 through B 3.6-68	0
	Pages B 3.6-69 through B 3.6-71	1
	Page 15 / B 3.6-72	2
	Pages 15 / B 3.6-/3 and 15 / B 3.6-/4	1
		U
	Page 15 / B 3.6-77	1
	Pages B 3.0-78 Infough B 3.0-82	0
	Page TS / B 3.0-83	3
	Page TS / B 3.0-04 Baga TS / B 3.6 95	2
	$\begin{array}{c} Fage IS / D 3.0^{\circ00} \\ Dage TS / D 2.6 96 through TS / D 2.6 97a \\ \end{array}$	4
		2
	Page TS / B 3.6.90	4
	Page TS / B 3 6.00	- 2
	Page TS / B 3,0-50 Dages TS / B 3,6,01 through TS / B 3,6,05	ن ۲
	Pages 157 B 3.0-91 (filough 157 B 3.0-93) Page TS / B 3.6-96	
	Pages TS / B 3 6-97 and TS / B 3 6-98	2 1
	Page TS / B 3 6-99	1 3
	Page TS / B 3 6-99a	ő
	Pages TS / B 3.6-100 and TS / B 3.6-101	1
	Pages TS / B 3.6-102 and TS / B 3.6-103	2
	Page TS / B 3.6-104	3
	Page TS / B 3.6-105	2
	Page TS / B 3.6-106	3
	· ••••	~

B 3.7 PLANT SYSTEMS BASES Page TS / B 3.7-1 3 Page TS / B 3.7-2 4 Pages TS / B 3.7-3 1 Page TS / B 3.7-5a 1 Page TS / B 3.7-6a 2 Page TS / B 3.7-6a 2 Page TS / B 3.7-6a 2 Page TS / B 3.7-6c 2 Page TS / B 3.7-6c 2 Page TS / B 3.7-7 3 Page TS / B 3.7-76 2 Page TS / B 3.7-76 2 Page TS / B 3.7-6c 2 Page TS / B 3.7-76 3 Page TS / B 3.7-76 3 Pages TS / B 3.7-76 2 Pages TS / B 3.7-76 3 Pages TS / B 3.7-76 3 Pages TS / B 3.7-71 0 Pages TS / B 3.7-74 1 Pages TS / B 3.7-16a 1 Pages TS / B 3.7-17 3 Pages TS / B 3.7-16b 1 Pages TS / B 3.7-16b 1 Pages TS / B 3.7-16b 1 Pages TS / B 3.7-26 0 Pages TS / B 3.7-30 1 Pages TS / B 3.7-31 1<	<u>Section</u>	<u>Title</u>	Revision
Page TS / B 3.7-1 3 Page TS / B 3.7-2 4 Pages TS / B 3.7-3 through TS / B 3.7-5 3 Page TS / B 3.7-6a 1 Page TS / B 3.7-6a 2 Page TS / B 3.7-6a 2 Page TS / B 3.7-6a 2 Page TS / B 3.7-6b 1 Page TS / B 3.7-6c 2 Page TS / B 3.7-7 3 Page TS / B 3.7-8 2 Page TS / B 3.7-9 through B 3.7-11 0 Pages TS / B 3.7-12 and TS / B 3.7-13 2 Pages TS / B 3.7-14 through TS / B 3.7-18 3 Page TS / B 3.7-14 through TS / B 3.7-26 0 Pages TS / B 3.7-25 and TS / B 3.7-26 0 Pages TS / B 3.7-30 and TS / B 3.7-31 1 Pages TS / B 3.7-32 0 Pages TS / B 3.7-32 0 Pages TS / B 3.7-34 through TS / B 3.7-37 0 Pages TS / B 3.7-35 1 Pages TS / B 3.7-34 through TS / B 3.7-37 0 Pages TS / B 3.7-34 through TS / B 3.7-37 0 Pages TS / B 3.8-2 and TS / B 3.8-4 1 Pages TS / B 3.8-4 1 Pages TS / B 3.8-4 1	B 3.7	PLANT SYSTEMS BASES	
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	Page TS / B 3.8-36	1		
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	Page TS / B 3.8-38	1		
	Pages TS / B 3.8-39 through TS / B 3.8-46	0		
	Page TS / B 3.8-47	1		
	Pages TS / B 3.8-48 through TS / B 3.8-50	0		
	Pages IS / B 3.8-51 through IS / B 3.8-53	1		
	Page 15 / B 3.8-54	0		
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	Pages 15 / B 3.8-30 Infough 15 / B 3.8-39	2		
	Page TS / B 3.8-50 (1110091) 13 / B 3.0-04	3		
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	Pages TS / B 3 8-67 and TS / B 3 8-68	3 4		
	Page TS / B 3.8-69	5		
	Pages TS / B 3.8-70 through TS / B 3.8-83	1		
	Pages TS / B 3.8-83A through TS / B 3.8-83D	Ó		
	Pages B 3.8-84 through B 3.8-85	0		
	Page TS / B 3.8-86	1		
	Page TS / B 3.8-87	2		
	Pages TS / B 3.8-88 through TS / B 3.8-93	1		
	Pages B 3.8-94 through B 3.8-99	0		
B 3.9	REFUELING OPERATIONS BASES			
	Pages TS / B 3.9-1 and TS / B 3.9-2	1		
	Page TS / B 3.9-2a	1		
	Pages TS / B 3.9-3 and TS / B 3.9-4	1		
	Pages B 3.9-5 through B 3.9-18	0		
	Pages TS / B 3.9-19 through TS / B 3.9-21	1		
	Pages B 3.9-22 through B 3.9-30	0		
B 3.10	SPECIAL OPERATIONS BASES			
	Page TS / B 3.10-1	2		
	Pages TS / B 3.10-2 through TS / B 3.10-5	1		
	Pages B 3.10-6 through B 3.10-32	0		
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B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS) AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

B 3.5.3 RCIC System

BASES

BACKGROUND The RCIC System is not part of the ECCS; however, the RCIC System is included with the ECCS section because of their similar functions.

The RCIC System is designed to operate either automatically or manually following reactor pressure vessel (RPV) isolation accompanied by a loss of coolant flow from the feedwater system to provide adequate core cooling and control of the RPV water level. Under these conditions, the High Pressure Coolant Injection (HPCI) and RCIC systems perform similar functions. The RCIC System design requirements ensure that the criteria of Reference 1 are satisfied.

The RCIC System (Ref. 2) consists of a steam driven turbine pump unit, piping, and valves to provide steam to the turbine, as well as piping and valves to transfer water from the suction source to the core via the feedwater system line, where the coolant is distributed within the RPV through the feedwater sparger. Suction piping is provided from the condensate storage tank (CST) and the suppression pool. Pump suction is normally aligned to the CST to minimize injection of suppression pool water into the RPV. However, if the CST water supply is low, an automatic transfer to the suppression pool water source ensures an adequate suction head for the pump and an uninterrupted water supply for continuous operation of the RCIC System. The steam to the turbine is piped from a main steam line upstream of the associated inboard main steam line isolation valve.

The RCIC System is designed to provide core cooling for a wide range of reactor pressures (165 psia to 1225 psia). Upon receipt of an initiation signal, the RCIC turbine accelerates to a specified speed. As the RCIC flow increases, the turbine control valve is automatically adjusted to maintain design flow. Exhaust steam from the RCIC turbine is discharged to the suppression pool. A full flow test line is provided to route water to the CST to allow testing of the RCIC System during normal operation without injecting water into the RPV.

(continued)

SUSQUEHANNA - UNIT 2 TS / B 3.5-25

Revision 1

BASES	ES		
BACKGROUND (continued)	The RCIC pump is provided with a minimum flow bypass line, which discharges to the suppression pool. The valve in this line automatically opens to prevent pump damage due to overheating when other discharge line valves are closed. To ensure rapid delivery of water to the RPV and to minimize water hammer effects, the RCIC System discharge piping is kept full of water. The RCIC System is normally aligned to the CST. The RCIC discharge line is kept full of water using a "keep fill" system supplied by the condensate transfer system.		
APPLICABLE SAFETY ANALYSES	The function of the RCIC System is to respond to transient events by providing makeup coolant to the reactor. The RCIC System is not an Engineered Safety Feature System and no credit is taken in the safety analyses for RCIC System operation. Based on its contribution to the reduction of overall plant risk, however, the system is included in the Technical Specifications, as required by the NRC Policy Statement (Ref. 4).		
LCO	The OPERABILITY of the RCIC System provides adequate core cooling such that actuation of any of the low pressure ECCS subsystems is not required in the event of RPV isolation accompanied by a loss of feedwater flow. The RCIC System has sufficient capacity for maintaining RPV inventory during an isolation event.		
APPLICABILITY	The RCIC System is required to be OPERABLE during MODE 1, and MODES 2 and 3 with reactor steam dome pressure >150 psig, since RCIC is the primary non-ECCS water source for core cooling when the reactor is isolated and pressurized. In MODES 2 and 3 with reactor steam dome pressure \leq 150 psig, and in MODES 4 and 5, RCIC is not required to be OPERABLE since the low pressure ECCS injection/spray subsystems can provide sufficient flow to the RPV.		
ACTIONS	A Note prohibits the application of LCO 3.0.4.b to an inoperable RCIC system. There is an increased risk associated with entering a MODE or other specified condition in the Applicability with an inoperable RCIC system and the provisions of LCO 3.0.4.b, which allow entry into a MODE or other specified condition in the Applicability with the LCO not met after performance of a risk assessment addressing inoperable systems and components, should not be applied in this circumstance.		
	(continued)		

TS / B 3.5-26

Revision 1

ACTIONS

(continued)

A.1 and A.2

If the RCIC System is inoperable during MODE 1, or MODE 2 or 3 with reactor steam dome pressure >150 psig, and the HPCI System is verified to be OPERABLE, the RCIC System must be restored to OPERABLE status within 14 days. In this Condition, loss of the RCIC System will not affect the overall plant capability to provide makeup inventory at high reactor pressure since the HPCI System is the only high pressure system assumed to function during a loss of coolant accident (LOCA). OPERABILITY of HPCI is therefore verified immediately when the RCIC System is inoperable. This may be performed as an administrative check, by examining logs or other information, to determine if HPCI is out of service for maintenance or other reasons. It does not mean it is necessary to perform the Surveillances needed to demonstrate the OPERABILITY of the HPCI System. If the OPERABILITY of the HPCI System cannot be verified, however, Condition B must be immediately entered. For transients and certain abnormal events with no LOCA, RCIC (as opposed to HPCI) is the preferred source of makeup coolant because of its relatively small capacity, which allows easier control of the RPV water level. Therefore, a limited time is allowed to restore the inoperable **RCIC to OPERABLE status.**

The 14 day Completion Time is based on a reliability study (Ref. 3) that evaluated the impact on ECCS availability, assuming various components and subsystems were taken out of service. The results were used to calculate the average availability of ECCS equipment needed to mitigate the consequences of a LOCA as a function of allowed outage times (AOTs). Because of similar functions of HPCI and RCIC, the AOYs (i.e., Completion Times) determined for HPCI are also applied to RCIC.

<u>B.1 and B.2</u>

If the RCIC System cannot be restored to OPERABLE status within the associated Completion Time, or if the HPCI System is simultaneously inoperable, the plant must be brought to a condition in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and reactor steam dome pressure reduced to \leq 150 psig within 36 hours. The allowed Completion Times

(continued)

ACTIONS

B.1 and B.2 (continued)

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.

SURVEILLANCE <u>SR_3.5.3.1</u> REQUIREMENTS

The flow path piping has the potential to develop voids and pockets of entrained air. Maintaining the pump discharge line of the RCIC System full of water ensures that the system will perform properly, injecting its full capacity into the Reactor Coolant System upon demand. This will also prevent a water hammer following an initiation signal. One acceptable method of ensuring the line is full is to vent at the high points. The 31 day Frequency is based on the gradual nature of void buildup in the RCIC piping, the procedural controls governing system operation, and operating experience.

<u>SR 3.5.3.2</u>

Verifying the correct alignment for manual, power operated, and automatic valves in the RCIC flow path provides assurance that the proper flow path will exist for RCIC operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position since these valves were verified to be in the correct position prior to locking, sealing, or securing. A valve that receives an initiation signal is allowed to be in a non-accident position provided the valve will automatically reposition in the proper stroke time. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of potentially being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves. For the RCIC System, this SR also includes the steam flow path for the turbine and the flow controller position.

The 31 day Frequency of this SR was derived from the Inservice Testing Program requirements for performing valve testing at least once every 92 days. The Frequency of

(continued)

SURVEILLANCE REQUIREMENTS <u>SR 3.5.3.2</u> (continued)

31 days is further justified because the valves are operated under procedural control and because improper valve position would affect only the RCIC System. This Frequency has been shown to be acceptable through operating experience.

SR 3.5.3.3 and SR 3.5.3.4

The RCIC pump flow rates ensure that the system can maintain reactor coolant inventory during pressurized conditions with the RPV isolated. The flow tests for the RCIC System are performed at two different pressure ranges such that system capability to provide rated flow is tested both at the higher and lower operating ranges of the system. Additionally, adequate steam flow must be passing through the main turbine or turbine bypass valves to continue to control reactor pressure when the RCIC System diverts steam flow. Reactor steam pressure is considered adequate when \geq 920 psig to perform SR 3.5.3.3 and \geq 150 psig to perform SR 3.5.3.4. However, the requirements of SR 3.5.3.4 are met by a successful performance at any pressure \leq 165 psig. Adequate steam flow is represented by at least 1.25 turbine bypass valves open. Therefore, sufficient time is allowed after adequate pressure and flow are achieved to perform those SRs. Reactor startup is allowed prior to performing the low pressure Surveillance because the reactor pressure is low and the time allowed to satisfactorily perform the Surveillance is short. The reactor pressure is allowed to be increased to normal operating pressure since it is assumed that the low pressure Surveillance has been satisfactorily completed and there is no indication or reason to believe that RCIC is inoperable. Therefore, these SRs are modified by Notes that state the Surveillances are not required to be performed until 12 hours after the reactor steam pressure and flow are adequate to perform the test.

The Frequency for SR 3.5.3.3 is determined by the Inservice Testing Program requirements. The 24 month Frequency for SR 3.5.3.4 is based on the need to perform the Surveillance under conditions that apply just prior to or during a startup from a plant outage. Operating experience has shown that these components usually pass the SR when performed at the 24 month Frequency, which is base on the refueling

(continued)

SUSQUEHANNA - UNIT 2

TS / B 3.5-29

Revision 1

REQUIREMENTS

SURVEILLANCE <u>SR 3.5.3.3</u>, and <u>SR 3.5.3.4</u> (continued)

cycle. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

SR 3.5.3.5

The RCIC System is required to actuate automatically in order to verify its design function satisfactorily. This Surveillance verifies that, with a required system initiation signal (actual or simulated), the automatic initiation logic of the RCIC System will cause the system to operate as designed, including actuation of the system throughout its emergency operating sequence; that is, automatic pump startup and actuation of all automatic valves to their required positions. This test also ensures the RCIC System will automatically restart on a n RPV low water level (Level 2) signal received subsequent to an RPV high water level (Level 8) trip and that the suction is automatically transferred from the CST to the suppression pool. The LOGIC SYSTEM FUNCTIONAL TEST performed in LCO 3.3.5.2 overlaps this Surveillance to provide complete testing of the assumed safety function.

The 24 month Frequency is based on the need to perform portions of the Surveillance under the conditions that apply during a plant outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the SR when performed at the 24 month Frequency, which is based on the refueling cycle. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

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

REFERENCES 1. 10 CFE 50, Appendix A, GDC 33.

2. FSAR, Section 5.4.6.

(continued)

SUSQUEHANNA - UNIT 2 TS

Revision 1

BASES		
REFERENCES (continued)	3.	Memorandum from R.L. Baer (NRC) to V. Stello, Jr. (NRC), "Recommended Interim Revisions to LCOs for ECCS Components," December 1, 1975.
	4.	Final Policy Statement on Technical Specifications Improvements, July 22, 1993 (58 FR 39132).