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September 2, 2003

Attachment 1

APP-GW-GL-022, Revision 4

"AP1000 Probabilistic Risk Assessment"

dated August 29, 2003

AP1000 Probabilistic Risk Assessment

Instructions for Inserting Revision 4 Change Pages

(August 2003)

Volume 1

Remove the Revision No. 3 "AP1000 Document Cover Sheet" from the front of the volume, and insert the Revision No. 4 "AP1000 Document Cover Sheet."

Then after the AP1000 Volume 1 Title Page (color), remove the following pages and insert the Revision 4 pages as follows:

Remove Pages	Insert Pages
i (Rev. 3)/ii (Rev. 3) through cix (Rev. 3)/cx (Rev. 3)	i (Rev. 4)/ii (Rev. 4) through cxiii (Rev. 4)/Blank

Volume 2

After the AP1000 Volume 2 Title Page (color), remove the following pages and insert the Revision 4 pages as follows:

Remove Pages	Insert Pages
i (Rev. 3)/ii (Rev. 3) through cix (Rev. 3)/cx (Rev. 3)	i (Rev. 4)/ii (Rev. 4) through cxiii (Rev. 4)/Blank

Volume 3

After the AP1000 Volume 3 Title Page (color), remove the following pages and insert the Revision 4 pages as follows:

Remove Pages	Insert Pages
i (Rev. 3)/ii (Rev. 3) through cix (Rev. 3)/cx (Rev. 3)	i (Rev. 4)/ii (Rev. 4) through cxiii (Rev. 4)/Blank

After Tab 34 "Severe Accident Phenomena Treatment," remove all of the pages within this tab and insert the Revision 4 pages as follows:

Remove Pages	Insert Pages
34-1 (Rev. 1)/34-2 (Rev. 1) through 34-243 (Rev. 1)/Blank	34-1 (Rev. 4)/34-2 (Rev. 4) through 34-263 (Rev. 4)/34-264 (Rev. 4)

After Tab 42 "Conditional Containment Failure Probability Distribution," remove all of the pages within this tab and insert the Revision 4 pages as follows:

Remove Pages	Insert Pages
42-1 (Rev. 0)/42-2 (Rev. 0) through 42-11 (Rev. 0)/42-12 (Rev. 0)	42-1 (Rev. 4)/42-2 (Rev. 4) through 42-13 (Rev. 4)/Blank

After Tab 43 "Release Frequency Quantification," remove all of the pages within this tab and insert the Revision 4 pages as follows:

Remove Pages	Insert Page
43-1 (Rev. 1)/43-2 (Rev.1) through 43C-1 (Rev. 1)/43C-2 (Rev. 2)	43-1 (Rev. 4)/43-2 (Rev. 4) through 43E-1 (Rev. 4)/43E-2 (Rev. 4)

Volume 3 (Cont.)

After Tab 45 "Fission-Product Source Terms," remove all of the pages within this tab and insert the Revision 4 pages as follows:

Remove Pages	Insert Page
45-1 (Rev. 3)/45-2 (Rev.3) through 45A-23 (Rev. 3)/45A-24 (Rev. 3)	45-1 (Rev. 4)/45-2 (Rev.4) through 45-47 (Rev. 4)/45-48 (Rev. 4)

Volume 4

After the AP1000 Volume 4 Title Page (color), remove the following pages and insert the Revision 4 pages as follows:

Remove Pages	Insert Pages
i (Rev. 3)/ii (Rev. 3) through cix (Rev. 3)/cx (Rev. 3)	i (Rev. 4)/ii (Rev. 4) through cxiii (Rev. 4)/Blank

After Tab 49 "Offsite Dose Risk Quantification," remove all of the pages within this tab and insert the Revision 4 pages as follows:

Remove Pages	Insert Pages
49-1 (Rev. 1)/49-2 (Rev. 1) through 49-49 (Rev. 1)/Blank	49-1 (Rev. 4)/49-2 (Rev. 4) through 49-49 (Rev. 4)/Blank

After Tab 50 "Importance and Sensitivity Analysis," remove all of the pages within this tab and insert the Revision 4 pages as follows:

Remove Pages	Insert Pages
50-1 (Rev. 2)/50-1a (Rev. 2) through 50-119 (Rev. 1)/Blank	50-1 (Rev. 4)/50-2 (Rev. 4) through 50-119 (Rev. 4)/50-120 (Rev. 4)

Volume 4 (Cont.)

After Tab 54 "Low Power and Shutdown Risk Assessment," remove all of the pages within this tab and insert the Revision 4 pages as follows:

Remove Pages	Insert Pages
54-1 (Rev. 2)/54-2 (Rev. 2) through 54-131 (Rev. 2)/Blank	54-1 (Rev. 4)/54-2 (Rev. 4) through 54-147 (Rev. 4)/54-148 (Rev. 4)

After Tab 55 "Seismic Margin Analysis," remove all of the pages within this tab and insert the Revision 4 pages as follows:

Remove Pages	Insert Pages
55-1 (Rev. 0)/55-2 (Rev. 0) through 55-29 (Rev. 0)/55-30 (Rev. 0)	55-1 (Rev. 4)/55-2 (Rev. 4) through 55-29 (Rev. 4)/55-30 (Rev. 4)

After Tab 56 "Internal Flooding Analysis," remove all of the pages within this tab and insert the Revision 4 pages as follows:

Remove Pages	Insert Pages
56-1 (Rev. 2)/56-2 (Rev. 0) through 56-55 (Rev. 2)/Blank	56-1 (Rev. 4)/56-2 (Rev. 4) through 56-65 (Rev. 4)/56-66 (Rev. 4)

After Tab 59 "PRA Results and Insights," remove all of the pages within this tab and insert the Revision 7 pages as follows:

Remove Pages	Insert Pages
59-1 (Rev. 1)/59-2 (Rev. 1) through 59-99 (Rev. 1)/59-100 (Rev. 1)	59-1 (Rev. 4)/59-2 (Rev. 4) through 59-99 (Rev. 4)/59-100 (Rev. 4)

Volume 5

After the AP1000 Volume 5 Title Page (color), remove the following pages and insert the Revision 4 pages as follows:

Remove Pages	Insert Pages
i (Rev. 3)/ii (Rev. 3) through cix (Rev. 3)/cx (Rev. 3)	i (Rev. 4)/ii (Rev. 4) through cxiii (Rev. 4)/Blank

Volume 1

AP1000 DOCUMENT COVER SHEET

TDC: ______ Permanent File: ______ S ______

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AP1000 DOCUMENT NO.	REVISION NO.		ASSIGNED TO
APP-GW-GL-022	4	Page 1 of 1	W – R. P. Vijuk

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*Approval of the responsible manager signifies that document is complete, all required reviews are complete, electronic file is attached and document is released for use.

Probabilistic Risk Assessment, Revision 4

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TABLE OF CONTENTS

Section	Title	Page
	LIST OF TABLES	xxxv
	LIST OF FIGURES	liii
	REVISION 1 CHANGE ROADMAP	civ
	REVISION 2 CHANGE ROADMAP	cviii
	REVISION 3 CHANGE ROADMAP	cxi
	REVISION 4 CHANGE ROADMAP	cxii
CHAPTER 1	INTRODUCTION	
1.1	Introduction	1-1
	1.1.1 Background and Overview	1-1
	1.1.2 Objectives	1-1
	1.1.3 Technical Scope	1-2
	1.1.4 Project Methodology Overview	1-3
	1.1.5 Results	1-4
	1.1.6 Plant Definition	1-6
	1.1.7 References	1-6
CHAPTER 2	INTERNAL INITIATING EVENTS	
2.1	Introduction	2-1
2.2	Internal Initiating Event Identification and Categorization	2-1
	2.2.1 Logic Diagram for Internal Initiating Events	2-2
	2.2.2 Loss-of-Coolant Accidents	2-3
	2.2.3 Transients	2-6
	2.2.4 Anticipated Transient without Scram	2-8
	2.2.5 AP1000 Specific Initiating Event Analysis	2-10
	2.2.6 Consequential Events	2-19
	2.2.7 Summary of Internal Initiating Event Categories	2-19
2.3	Internal Initiating Event Frequency Quantification	2-20
	2.3.1 Quantification of LOCA Initiating Event Frequencies	2-20
	2.3.2 Quantification of Transient Initiating Event Frequencies	2-24
	2.3.3 ATWS Precursor Initiating Event Frequency	2-27
	2.3.4 Summary of Internal Initiating Event Frequencies	2-27
2.4	References	2-27
ATTACHMENT 2A	QUANTIFICATION OF LOCA INITIATING EVENT FREQUENCIES	
2A-1	Primary System Pipe Break Frequencies	2A-1
2A-2	Reactor Cooling System Leakage Initiating Event Frequency	2A-1
2A-3	Steam Generator Tube Rupture Initiating Event Frequency	2A-1
2A-4	Quantification of Stuck-Open Pressurizer Safety Valve, Accumulator Interface Break, and IRWST Interface Break	2A-1
2A-5	Initiating Events Review Data Summary and INPO Data	2A-1

TABLE OF CONTENTS (Cont.)

Section	Title	Page
ATTACHMENT 2B	QUANTIFICATION OF TRANSIENT INITIATING EVENT FREQUENCIES	
2B-1	Secondary Side Line Breaks & Stuck-open Main Steam Line Safety Valve Frequencies	2B-1
CHAPTER 3	MODELING OF SPECIAL INITIATORS	
3.1	Introduction	3-1
3.2	Ground Rules for Special Initiating Event Analysis	3-1
3.3	Loss of Component Cooling Water System/Service Water System Initiating Event	3-1
3.4	Loss of Compressed and Instrument Air System Initiating Event	3-2
3.5	Spurious Actuation of Automatic Depressurization System	3-2
	3.5.1 Evaluation of Automatic Depressurization System Spurious Actuation	3-3
CHAPTER 4	EVENT TREE MODELS	
4.1	Introduction	4-1
4.2	Large LOCA Event Tree Model	4-1
	4.2.1 Event Description	4-1
	4.2.2 Event Tree Model and its Nodes	4-2
	4.2.3 Event Tree Success Criteria and Core Damage Categories	4-4
	4.2.4 Operator Actions	4-4
	4.2.5 Transfers and Consequential Events	4-4
4.3	Large Spurious ADS Event Tree Model	4-4
	4.3.1 Event Description	4-4
	4.3.2 Event Tree Model and its Nodes	4-4
	4.3.3 Event Tree Success Criteria and Core Damage Categories	4-6
	4.3.4 Operator Actions	4-6
	4.3.5 Transfers and Consequential Events	4-6
4.4	Medium LOCA Event Tree Model	4-6
	4.4.1 Event Description	4-6
	4.4.2 Event Tree Model and its Nodes	4-7
	4.4.3 Event Tree Success Criteria and Core Damage Categories	4-9
	4.4.4 Operator Actions	4-9
	4.4.5 Transfers and Consequential Events	4-10
4.5	Core Makeup Tank Line Break Event Tree Model	4-10
	4.5.1 Event Description	4-10
	4.5.2 Event Tree Model and its Nodes	4-10
	4.5.3 Event Tree Success Criteria and Core Damage Categories	4-13
	4.5.4 Operator Actions	4-13
	4.5.5 Transfers and Consequential Events	4-13
4.6	Safety Injection Line Break Event Tree Model	4-13
	4.6.1 Event Description	4-13
	4.6.2 Event Tree Model and its Nodes	4-14
	4.6.3 Event Tree Success Criteria and Core Damage Categories	4-16

TABLE OF CONTENTS (Cont.)

Section	Title		Page
	4.6.4	Operator Actions	4-16
	4.6.5	Transfers and Consequential Events	4-17
4.7	Small LOCA Event Tree Model		4-17
	4.7.1	Event Description	4-17
	4.7.2	Event Tree Model and its Nodes	4-17
	4.7.3	Event Tree Success Criteria and Core Damage Categories	4-20
	4.7.4	Operator Actions	4-20
	4.7.5	Transfers and Consequential Events	4-21
4.8	RCS Leak Event Tree Model		4-21
	4.8.1	Event Description	4-21
	4.8.2	Event Tree Model and its Nodes	4-21
	4.8.3	Event Tree Success Criteria	4-22
	4.8.4	Operator Actions	4-22
	4.8.5	Transfers and Consequential Events	4-22
	4.8.6	Core Damage Categories	4-23
4.9	PRHR Tube Rupture Event Tree Model		4-23
	4.9.1	Event Description	4-23
	4.9.2	Event Tree Model and its Nodes	4-23
	4.9.3	Event Tree Success Criteria	4-24
	4.9.4	Operator Actions	4-24
	4.9.5	Transfers and Consequential Events	4-24
	4.9.6	Core Damage Categories	4-24
4.10	Steam Generator Tube Rupture Event Tree Model		4-25
	4.10.1	Event Description	4-25
	4.10.2	Event Tree Model and its Nodes	4-27
	4.10.3	Event Tree Success Criteria and Core Damage Categories	4-33
	4.10.4	Operator Actions	4-33
	4.10.5	Transfers and Consequential Events	4-33
4.11	Reactor Vessel Rupture Event Tree Model		4-34
	4.11.1	Event Description	4-34
	4.11.2	Event Tree Model and its Nodes	4-34
	4.11.3	Event Tree Success Criteria	4-34
	4.11.4	Operator Actions	4-34
	4.11.5	Transfers and Consequential Events	4-34
	4.11.6	Core Damage Categories	4-34
4.12	Interfacing System LOCA Event Tree Model		4-34
	4.12.1	Event Description	4-34
	4.12.2	Event Tree Model and its Nodes	4-35
	4.12.3	Event Tree Success Criteria	4-35
	4.12.4	Operator Actions	4-35
	4.12.5	Transfers and Consequential Events	4-35
	4.12.6	Core Damage Categories	4-35

TABLE OF CONTENTS (Cont.)

Section	Title	Page
4.13	Transients With MFW Event Tree Model	4-35
4.13.1	Event Description	4-35
4.13.2	Event Tree Model and its Nodes	4-37
4.13.3	Event Tree Success Criteria and Core Damage Categories	4-41
4.13.4	Operator Actions	4-41
4.13.5	Transfers and Consequential Events	4-42
4.14	Transients With Loss of RCS Flow Event Tree Model	4-42
4.14.1	Event Description	4-42
4.14.2	Event Tree Model and its Nodes	4-42
4.14.3	Event Tree Success Criteria and Core Damage Categories	4-46
4.14.4	Operator Actions	4-46
4.14.5	Transfers and Consequential Events	4-46
4.15	Transients With Loss of MFW to One Steam Generator Event Tree Model	4-46
4.15.1	Event Description	4-46
4.15.2	Event Tree Model and its Nodes	4-47
4.15.3	Event Tree Success Criteria and Core Damage Categories	4-50
4.15.4	Operator Actions	4-50
4.15.5	Transfers and Consequential Events	4-51
4.16	Transients With Core Power Excursion Event Tree Model	4-51
4.16.1	Event Description	4-51
4.16.2	Event Tree Model and its Nodes	4-51
4.16.3	Event Tree Success Criteria and Core Damage Categories	4-55
4.16.4	Operator Actions	4-55
4.16.5	Transfers and Consequential Events	4-55
4.17	Transients With Loss of CCW/SW Event Tree Model	4-56
4.17.1	Event Description	4-56
4.17.2	Event Tree Model and its Nodes	4-56
4.17.3	Event Tree Success Criteria and Core Damage Categories	4-59
4.17.4	Operator Actions	4-59
4.17.5	Transfers and Consequential Events	4-60
4.18	Loss of Main Feedwater Event Tree Model	4-60
4.18.1	Event Description	4-60
4.18.2	Event Tree Model and its Nodes	4-62
4.18.3	Event Tree Success Criteria and Core Damage Categories	4-65
4.18.4	Operator Actions	4-65
4.18.5	Transfers and Consequential Events	4-66
4.19	Loss of Condenser Event Tree Model	4-66
4.19.1	Event Description	4-66
4.19.2	Event Tree Model and its Nodes	4-66
4.19.3	Event Tree Success Criteria and Core Damage Categories	4-70
4.19.4	Operator Actions	4-70
4.19.5	Transfers and Consequential Events	4-70

TABLE OF CONTENTS (Cont.)

Section	Title	Page
4.20	Loss of Compressed Air Event Tree Model	4-70
	4.20.1 Event Description	4-70
	4.20.2 Event Tree Model and its Nodes	4-71
	4.20.3 Event Tree Success Criteria and Core Damage Categories	4-74
	4.20.4 Operator Actions	4-74
	4.20.5 Transfers and Consequential Events	4-75
4.21	Loss of Offsite Power Event Tree Model	4-75
	4.21.1 Event Description	4-75
	4.21.2 Event Tree Model and its Nodes	4-75
	4.21.3 Event Tree Success Criteria and Core Damage Categories	4-79
	4.21.4 Operator Actions	4-79
	4.21.5 Transfers and Consequential Events	4-80
4.22	Main Steam Line Break Downstream of MSIVs Event Tree Model	4-80
	4.22.1 Event Description	4-80
	4.22.2 Event Tree Model and its Nodes	4-81
	4.22.3 Event Tree Success Criteria and Core Damage Categories	4-84
	4.22.4 Operator Actions	4-84
	4.22.5 Transfers and Consequential Events	4-85
4.23	Main Steam Line Break Upstream of MSIVs Event Tree Model	4-85
	4.23.1 Event Description	4-85
	4.23.2 Event Tree Model and its Nodes	4-85
	4.23.3 Event Tree Success Criteria and Core Damage Categories	4-89
	4.23.4 Operator Actions	4-89
	4.23.5 Transfers and Consequential Events	4-90
4.24	Stuck-Open Secondary Side Safety Valve Event Tree Model	4-90
	4.24.1 Event Description	4-90
	4.24.2 Event Tree Model and its Nodes	4-91
	4.24.3 Event Tree Success Criteria and Core Damage Categories	4-94
	4.24.4 Operator Actions	4-94
	4.24.5 Transfers and Consequential Events	4-94
4.25	ATWS Precursors Without MFW Event Tree Model	4-95
	4.25.1 Event Description	4-95
	4.25.2 Event Tree Model and its Nodes	4-96
	4.25.3 Event Tree Success Criteria and Core Damage Categories	4-101
	4.25.4 Operator Actions	4-101
	4.25.5 Transfers and Consequential Events	4-101
4.26	ATWS Precursor with SI Event Tree Model	4-101
	4.26.1 Event Description	4-101
	4.26.2 Event Tree Model and its Nodes	4-102
	4.26.3 Event Tree Success Criteria and Core Damage Categories	4-106
	4.26.4 Operator Actions	4-106
	4.26.5 Transfers and Consequential Events	4-106

TABLE OF CONTENTS (Cont.)

Section	Title	Page
4.27	ATWS Precursor Transients with MFW Event Tree Model	4-106
4.27.1	Event Description	4-106
4.27.2	Event Tree Model and its Nodes	4-107
4.27.3	Event Tree Success Criteria and Core Damage Categories	4-110
4.27.4	Operator Actions	4-111
4.27.5	Transfers and Consequential Events	4-111
ATTACHMENT 4A	EVENT TREE GUIDELINES	
4A.1	Event Tree Analysis Methodology	4A-1
4A.2	Event Tree Guidelines for Core Damage	4A-3
4A.2.1	Event Trees	4A-3
4A.2.2	Success Criteria	4A-6
4A.2.3	Definition of End States	4A-7
4A.2.4	Plant Response Functions	4A-9
4A.2.5	Event Tree Node Notation	4A-13
4A.2.6	Consequential Events	4A-13
4A.2.7	Transient Template	4A-14
4A.2.8	Small LOCA Template	4A-15
ATTACHMENT 4B	EVENT TREE PICTURES	4B-1
CHAPTER 5	SUPPORT SYSTEMS	
5.1	Introduction	5-1
5.2	Support Systems and Their Interdependencies	5-1
5.3	Front Line Systems and Their Dependencies	5-1
CHAPTER 6	SUCCESS CRITERIA ANALYSIS	
6.1	Introduction	6-1
6.2	Acceptance Criteria and Critical Functions for Success Criteria	6-1
6.3	Event Sequences and Timing, Passive/Active System Interactions	6-3
6.3.1	General Sequence Success Criteria	6-3
6.3.2	Timing of Events and Key Operator Actions	6-9
6.3.3	Passive/Active System Interactions	6-15
6.3.4	Sequence Success Criteria Summary	6-18
6.4	Event Tree Top Events Success Criteria	6-18
6.5	References	6-19
CHAPTER 7	FAULT TREE GUIDELINES	
7.1	Purpose	7-1
7.2	Fault Tree Development	7-1
7.2.1	Procedural Steps for Fault Tree Preparation	7-1
7.2.2	Procedural Steps for Fault Tree Construction	7-2

TABLE OF CONTENTS (Cont.)

Section	Title	Page
7.3	Primary Events to be Considered in Fault Trees	7-3
	7.3.1 Random Component Failure	7-3
	7.3.2 Outage for Maintenance and Testing	7-5
	7.3.3 Common Cause Failures	7-6
	7.3.4 Human Errors	7-6
	7.3.5 Power and Control Model	7-9
7.4	Data Base	7-10
7.5	Fault Tree Model: Identification Codes	7-10
	7.5.1 Identification Code for Fault Tree Names	7-10
	7.5.2 Identification Code for Support Systems	7-10
	7.5.3 Identification Code for Primary Event Names	7-11
	7.5.4 Identification Code for Common Cause Failures	7-11
	7.5.5 Identification Code for Undeveloped Events (Modules)	7-12
	7.5.6 Identification Code for Operator Errors	7-13
7.6	Fault Tree Quantification	7-13
7.7	References	7-14
CHAPTER 8	PASSIVE CORE COOLING SYSTEM – PASSIVE RESIDUAL HEAT REMOVAL	
8.1	System Function	8-1
8.2	System Description	8-1
	8.2.1 Support Systems	8-1
	8.2.2 Instrumentation and Control	8-2
	8.2.3 Test and Maintenance	8-2
8.3	System Operation	8-3
8.4	Performance During Accident Conditions	8-3
	8.4.1 Plant Shutdown	8-3
	8.4.2 Loss of Coolant Accidents	8-3
	8.4.3 Passive Residual Heat Removal Heat Exchanger Tube Rupture	8-3
8.5	Initiating Events Review	8-4
	8.5.1 Initiating Events Impacting the PRHR System	8-4
	8.5.2 Initiating Events Caused by PRHR System Malfunction	8-4
8.6	System Logic Models	8-4
	8.6.1 Assumptions and Boundary Conditions	8-5
	8.6.2 Fault Tree Models	8-6
	8.6.3 Human Interactions	8-6
	8.6.4 Common Cause Failures	8-6
8.7	Quantification and Results	8-6

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 9	PASSIVE CORE COOLING SYSTEM – CORE MAKEUP TANK	
9.1	System Description	9-1
	9.1.1 Support Systems	9-1
	9.1.2 Instrumentation and Control	9-1
	9.1.3 Test and Maintenance Assumptions	9-2
9.2	System Operation	9-2
9.3	Performance During Accident Conditions	9-3
	9.3.1 Inadvertent Opening of a Steam Generator Relief or Safety Valve	9-3
	9.3.2 Steam Line Break	9-3
	9.3.3 Steam Generator Tube Rupture	9-3
	9.3.4 Reactor Coolant System Heatup Transients	9-4
	9.3.5 Loss-of-Coolant Accidents	9-4
	9.3.6 Loss of Offsite Power	9-4
	9.3.7 Anticipated Transient without Trip	9-4
9.4	Initiating Event Review	9-4
	9.4.1 Initiating Events Impacting the Core Makeup Tank Subsystem	9-5
	9.4.2 Initiating Events Due to Loss of the Core Makeup Tank Subsystem	9-5
9.5	System Logic Models	9-5
	9.5.1 Assumptions and Boundary Conditions	9-5
	9.5.2 Fault Tree Models	9-7
	9.5.3 Human Interactions	9-7
	9.5.4 Common Cause Failures	9-8
CHAPTER 10	PASSIVE CORE COOLING SYSTEM – ACCUMULATOR	
10.1	System Description	10-1
	10.1.1 Support Systems	10-1
	10.1.2 Instrumentation and Control	10-1
	10.1.3 Test and Maintenance Assumptions	10-1
10.2	System Operation	10-1
10.3	Performance During Accident Conditions	10-2
	10.3.1 Steam Line Break	10-2
	10.3.2 Loss-of-Coolant Accidents or Non-Loss-of-Coolant Accidents with Automatic Depressurization System	10-2
10.4	Initiating Event Review	10-3
	10.4.1 Initiating Events Impacting the Accumulator Subsystem	10-3
	10.4.2 Initiating Events Due to Loss of the Accumulator Subsystem	10-3
10.5	System Logic Models	10-3
	10.5.1 Assumptions and Boundary Conditions	10-3
	10.5.2 Fault Tree Models	10-4
	10.5.3 Human Interactions	10-4
	10.5.4 Common Cause Failures	10-4

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 11	PASSIVE COOLING SYSTEM – AUTOMATIC DEPRESSURIZATION SYSTEM	
11.1	System Function	11-1
11.2	System Description	11-1
	11.2.1 Support Systems	11-1
	11.2.2 Instrumentation and Control	11-2
	11.2.3 Test and Maintenance	11-2
11.3	System Operation	11-2
11.4	Performance During Accident Conditions	11-3
	11.4.1 Loss of Coolant Accidents	11-3
	11.4.2 Transients	11-3
11.5	Initiating Events Review	11-3
	11.5.1 Initiating Events Impacting the Automatic Depressurization System	11-3
	11.5.2 Initiating Events Caused by the ADS Malfunction	11-4
11.6	System Logic Model	11-4
	11.6.1 Assumptions and Boundary Conditions	11-4
	11.6.2 Fault Tree Models	11-5
	11.6.3 Human Interactions	11-6
	11.6.4 Common Cause Failures	11-7
11.7	Quantification and Results	11-7
CHAPTER 12	PASSIVE CORE COOLING SYSTEM – IN-CONTAINMENT REFUELING WATER STORAGE TANK	
12.1	System Function	12-1
12.2	System Description	12-1
	12.2.1 Support Systems	12-1
	12.2.2 Instrumentation and Control	12-1
	12.2.3 Test and Maintenance	12-2
12.3	System Operation	12-2
12.4	Performance During Accident Conditions	12-2
	12.4.1 Transients	12-3
	12.4.2 Loss of Coolant Accidents	12-4
	12.4.3 In-Vessel Core Damage Mitigation	12-5
	12.4.4 Containment Isolation System Failure	12-5
12.5	Initiating Event	12-5
	12.5.1 Initiating Event Impacting IRWST/Gravity Injection Subsystem	12-5
	12.5.2 Initiating Event due to Loss of IRWST/Gravity Injection Subsystem	12-5
12.6	System Logic Models	12-6
	12.6.1 Assumptions and Boundary Conditions	12-6
	12.6.2 Fault Tree Models	12-8
	12.6.3 Human Interactions	12-8
	12.6.4 Common Cause Failures	12-8
12.7	Quantification and Results	12-9

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 13	PASSIVE CONTAINMENT COOLING SYSTEM	
13.1	System Description	13-1
	13.1.1 Support Systems	13-1
	13.1.2 Instrumentation and Control	13-1
	13.1.3 Test and Maintenance Assumptions	13-2
13.2	System Operation	13-2
13.3	Performance During Accident Conditions	13-2
	13.3.1 Post-Reactor Trip with Loss of All ac Power	13-2
	13.3.2 Automatic Depressurization System Actuation	13-2
	13.3.3 Post-Loss-of-Coolant Accident	13-3
	13.3.4 Post-Main Steam Line Break	13-3
13.4	Initiating Event Review	13-3
	13.4.1 Initiating Events Impacting the Passive Containment Cooling System	13-3
	13.4.2 Initiating Events due to Loss of the Passive Containment Cooling System	13-3
13.5	System Logic Model	13-3
	13.5.1 Assumptions and Boundary Conditions	13-4
	13.5.2 Fault Tree Model	13-5
	13.5.3 Human Interactions	13-6
	13.5.4 Common Cause Failures	13-6
CHAPTER 14	MAIN AND STARTUP FEEDWATER SYSTEM	
14.1	System Description	14-1
	14.1.1 Support Systems	14-1
	14.1.2 Instrumentation and Control	14-2
	14.1.3 Test and Maintenance	14-2
14.2	System Operation	14-2
14.3	Performance During Accident Conditions	14-2
14.4	Initiating Event Review	14-4
	14.4.1 Initiating Event Impacting Main and Startup Feedwater/ Condensate System	14-4
	14.4.2 Initiating Event due to Loss of Main and Startup Feedwater/ Condensate System	14-4
14.5	System Logic Models	14-4
	14.5.1 Assumptions and Boundary Conditions	14-5
	14.5.2 Fault Tree Models	14-7
	14.5.3 Human Interactions	14-7
	14.5.4 Common Cause Failures	14-7
14.6	Quantification and Results	14-7

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 15	CHEMICAL AND VOLUME CONTROL SYSTEM	
15.1	System Description	15-1
15.1.1	Support Systems	15-1
15.1.2	Instrumentation and Control Assumptions	15-1
15.1.3	Test and Maintenance Assumptions	15-2
15.2	System Operation	15-3
15.3	Performance During Accident Conditions	15-3
15.4	Initiating Event Review	15-4
15.4.1	Initiating Events Impacting the Chemical and Volume Control System	15-5
15.4.2	Initiating Events Due to Loss of the Chemical and Volume Control System	15-5
15.5	System Logic Models	15-5
15.5.1	Assumptions and Boundary Conditions	15-5
15.5.2	Fault Tree Models	15-7
15.5.3	Human Interactions	15-7
15.5.4	Common Cause Failures	15-8
CHAPTER 16	CONTAINMENT HYDROGEN CONTROL SYSTEM	
16.1	System Description	16-1
16.1.1	Support Systems	16-1
16.1.2	Instrumentation and Control	16-1
16.1.3	Test and Maintenance	16-1
16.2	System Operation	16-2
16.3	Performance During Accident Conditions	16-2
16.4	Initiating Event Review	16-2
16.5	System Logic Model	16-2
16.5.1	Assumptions and Boundary Conditions	16-2
16.5.2	Fault Tree Model	16-3
16.5.3	Human Interactions	16-3
16.5.4	Common Cause Failures	16-4
CHAPTER 17	NORMAL RESIDUAL HEAT REMOVAL SYSTEM	
17.1	System Description	17-1
17.1.1	Support Systems	17-1
17.1.2	Instrumentation and Control	17-1
17.1.3	Test and Maintenance Assumptions	17-1
17.2	System Operation	17-1
17.3	Performance During Accident Conditions	17-2
17.4	Initiating Event Review	17-3
17.4.1	Initiating Events Impacting the Normal Residual Heat Removal System	17-3
17.4.2	Initiating Events Due to Loss of the Normal Residual Heat Removal System	17-4

TABLE OF CONTENTS (Cont.)

Section	Title	Page
17.5	System Logic Models	17-4
	17.5.1 Assumptions and Boundary Conditions	17-4
	17.5.2 Fault Tree Models	17-6
	17.5.3 Human Interactions	17-6
	17.5.4 Common Cause Failures	17-6
17.6	References	17-6
CHAPTER 18	COMPONENT COOLING WATER SYSTEM	
18.1	System Description	18-1
	18.1.1 Support Systems	18-1
	18.1.2 Instrumentation and Control	18-1
	18.1.3 Test and Maintenance Assumptions	18-1
18.2	System Operation	18-2
18.3	Performance During Accident Conditions	18-2
18.4	Initiating Event Review	18-2
	18.4.1 Initiating Events Impacting the Component Cooling Water System	18-2
	18.4.2 Initiating Events Due to Loss of the Component Cooling Water System	18-3
18.5	System Logic Models	18-3
	18.5.1 Assumptions and Boundary Conditions	18-3
	18.5.2 Fault Tree Models	18-4
	18.5.3 Human Interactions	18-4
	18.5.4 Common Cause Failures	18-5
CHAPTER 19	SERVICE WATER SYSTEM	
19.1	System Description	19-1
	19.1.1 Support Systems	19-1
	19.1.2 Instrumentation and Control	19-1
	19.1.3 Test and Maintenance Assumptions	19-1
19.2	System Operation	19-2
19.3	Performance During Accident Conditions	19-2
19.4	Initiating Event Review	19-2
	19.4.1 Initiating Events Impacting the Service Water System	19-2
	19.4.2 Initiating Events Due to Loss of the Service Water System	19-2
19.5	System Logic Models	19-3
	19.5.1 Assumptions and Boundary Conditions	19-3
	19.5.2 Fault Tree Models	19-4
	19.5.3 Human Interactions	19-5
	19.5.4 Common Cause Failures	19-5

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 20	CENTRAL CHILLED WATER SYSTEM	
20.1	System Description	20-1
	20.1.1 Support Systems	20-1
	20.1.2 Instrumentation and Control	20-1
	20.1.3 Test and Maintenance Assumptions	20-1
20.2	System Operation	20-2
20.3	Performance During Accident Conditions	20-2
20.4	Initiating Event Review	20-2
	20.4.1 Initiating Events Impacting the Central Chilled Water System	20-2
	20.4.2 Initiating Events Due to Loss of the Central Chilled Water System	20-3
20.5	System Logic Model	20-3
	20.5.1 Assumptions and Boundary Conditions	20-3
	20.5.2 Fault Tree Model	20-4
	20.5.3 Human Interactions	20-4
	20.5.4 Common Cause Failures	20-4
CHAPTER 21	AC POWER SYSTEM	
21.1	System Description	21-1
	21.1.1 Support Systems	21-1
	21.1.2 Instrumentation and Control	21-2
	21.1.3 Test and Maintenance Assumptions	21-2
21.2	System Operation	21-2
21.3	Performance During Accident Conditions	21-3
	21.3.1 Automatic Load Shedding	21-3
	21.3.2 Manual Transfer	21-3
	21.3.3 Electric Circuit Protection	21-3
21.4	Initiating Event Review	21-3
	21.4.1 Loss of the Main Generator	21-4
	21.4.2 Loss of Offsite Power	21-4
	21.4.3 Loss of 6900-vac and 480-vac Busses	21-4
21.5	System Logic Models	21-4
	21.5.1 Assumptions and Boundary Conditions	21-5
	21.5.2 Fault Tree Models	21-7
	21.5.3 Human Interactions	21-8
	21.5.4 Common Cause Failures	21-8
CHAPTER 22	CLASS 1E DC AND UNINTERRUPTIBLE POWER SUPPLY SYSTEM	
22.1	System Description	22-1
	22.1.1 Support Systems	22-1
	22.1.2 Instrumentation and Control	22-1
	22.1.3 Test and Maintenance Assumptions	22-1
22.2	System Operation	22-2
22.3	Performance During Accident Conditions	22-2

TABLE OF CONTENTS (Cont.)

Section	Title	Page
22.4	Initiating Event Review	22-2
	22.4.1 Initiating Events Impacting the Class 1E dc and UPS System	22-3
	22.4.2 Initiating Events Due to Loss of the Class 1E dc and UPS System	22-3
22.5	System Logic Models	22-3
	22.5.1 Assumptions and Boundary Conditions	22-3
	22.5.2 Fault Tree Models	22-4
	22.5.3 Human Interactions	22-4
	22.5.4 Common Cause Failures	22-4
22.6	References	22-5
CHAPTER 23	NON-CLASS 1E DC AND UPS SYSTEM	
23.1	System Description	23-1
	23.1.1 Support Systems	23-1
	23.1.2 Instrumentation and Control	23-1
	23.1.3 Test and Maintenance Assumptions	23-1
23.2	System Operation	23-2
23.3	Performance During Accident Conditions	23-2
23.4	Initiating Event Review	23-2
	23.4.1 Initiating Events Impacting the Non-Class 1E dc and UPS System	23-2
	23.4.2 Initiating Events Due to Loss of the Non-Class 1E dc and UPS Power System	23-3
23.5	System Logic Models	23-3
	23.5.1 Assumptions and Boundary Conditions	23-3
	23.5.2 Fault Tree Models	23-4
	23.5.3 Human Interactions	23-5
	23.5.4 Common Cause Failures	23-5
23.6	References	23-5
CHAPTER 24	CONTAINMENT ISOLATION	
24.1	System Description	24-1
	24.1.1 Support Systems	24-1
	24.1.2 Instrumentation and Control	24-1
	24.1.3 Test and Maintenance Assumptions	24-2
24.2	System Operation	24-2
24.3	Performance During Accident Conditions	24-2
24.4	Initiating Event Review	24-2
	24.4.1 Initiating Events Impacting Containment Isolation	24-2
	24.4.2 Initiating Events Due to Loss of the Containment Isolation System	24-2
24.5	System Logic Models	24-3
	24.5.1 Assumptions and Boundary Conditions	24-4
	24.5.2 Fault Tree Models	24-5
	24.5.3 Human Interactions	24-6
	24.5.4 Common Cause Failures	24-6
24.6	References	24-6

TABLE OF CONTENTS (Cont.)

Section	Title		Page
CHAPTER 25	COMPRESSED AND INSTRUMENT AIR SYSTEM		
25.1	System Description		25-1
	25.1.1	Support Systems	25-2
	25.1.2	Instrumentation and Control	25-2
	25.1.3	Test and Maintenance Assumptions	25-3
25.2	System Operation		25-3
25.3	Performance During Accident Conditions		25-3
25.4	Initiating Event Review		25-4
	25.4.1	Initiating Events Impacting the Instrument Air Subsystem	25-4
	25.4.2	Initiating Events Due to Loss of the Instrument Air Subsystem	25-4
25.5	System Logic Models		25-4
	25.5.1	Assumptions and Boundary Conditions	25-4
	25.5.2	Fault Tree Models	25-6
	25.5.3	Human Interactions	25-7
	25.5.4	Common Cause Failures	25-7
CHAPTER 26	PROTECTION AND SAFETY MONITORING SYSTEM		
26.1	System Analysis Description		26-1
	26.1.1	Analysis of Support Systems	26-4
	26.1.2	Analysis of Instrumentation	26-5
	26.1.3	Test and Maintenance Assumptions	26-6
26.2	Performance During Accident Conditions		26-7
26.3	Initiating Event Review		26-7
	26.3.1	Initiating Event Impacting PMS	26-7
	26.3.2	Initiating Event due to Loss of PMS	26-8
26.4	System Logic Model Development		26-8
	26.4.1	Assumptions and Boundary Conditions	26-8
	26.4.2	Fault Tree Models	26-12
	26.4.3	Description of I&C Subtree Development	26-12
	26.4.4	Human Interactions	26-19
26.5	Discussion of Methodology		26-19
	26.5.1	Fault Tree Analysis	26-20
	26.5.2	Unavailability	26-20
	26.5.3	Spurious Failure Rate Per Year	26-20
	26.5.4	Common Cause Failures	26-22
	26.5.5	Data Manipulation	26-23
26.6	References		26-24
CHAPTER 27	DIVERSE ACTUATION SYSTEM		
27.1	System Analysis Description		27-1
	27.1.1	Support Systems Analysis	27-2
	27.1.2	Analysis of Instrumentation and Control	27-2
	27.1.3	Test and Maintenance	27-2

TABLE OF CONTENTS (Cont.)

Section	Title	Page
27.2	Analysis of System Operation	27-2
27.3	Performance During Accident Conditions	27-6
27.4	Initiating Event Review	27-6
27.4.1	Initiating Events Impacting the Diverse Actuation System	27-6
27.4.2	Initiating Events Due to Loss of the Diverse Actuation System	27-6
27.5	System Logic Model	27-6
27.5.1	Assumptions and Boundary Conditions	27-7
27.5.2	Fault Tree Model	27-7
27.5.3	Human Interactions	27-7
27.5.4	Common Cause Failures	27-8
CHAPTER 28	PLANT CONTROL SYSTEM	
28.1	System Analysis Description	28-1
28.1.1	Analysis of Support Systems	28-3
28.1.2	Analysis of Instrumentation	28-4
28.1.3	Test and Maintenance Assumptions	28-4
28.2	Performance During Accident Conditions	28-6
28.3	Initiating Event Review	28-6
28.3.1	Initiating Events Impacting the Plant Control System	28-6
28.3.2	Initiating Event due to Loss of the Plant Control System	28-6
28.4	System Logic Model Development	28-7
28.4.1	Assumptions and Boundary Conditions	28-7
28.4.2	Fault Tree Models	28-9
28.4.3	Description of I&C Subtree Development	28-10
28.4.4	Human Interactions	28-16
28.5	Discussion of Methodology	28-17
28.5.1	Fault Tree Analysis	28-17
28.5.2	Unavailability	28-17
28.5.3	Common Cause Failures	28-17
28.5.4	Data Manipulation	28-18
CHAPTER 29	COMMON-CAUSE ANALYSIS	
29.1	Introduction	29-1
29.2	Dependent Failures	29-1
29.3	Common-Cause Analysis	29-4
29.3.1	Assumptions	29-4
29.3.2	Analysis of Potential Common-Cause Failures within the Systems	29-6
29.3.3	Analysis of Potential Common-Cause Failures among Several Systems	29-6
29.4	Calculations For Component Groups	29-6
29.4.1	DC Batteries	29-7
29.4.2	Reactor Trip Breakers	29-8
29.4.3	Automatic Depressurization System Explosive Valves	29-9

TABLE OF CONTENTS (Cont.)

Section	Title	Page
	29.4.4 Air-Operated Valves in Core Makeup Tanks	29-10
	29.4.5 Automatic Depressurization System Motor-Operated Valves	29-11
	29.4.6 Common-Cause Failure for IRWST Valves	29-14
29.5	Results	29-17
29.6	References	29-17
ATTACHMENT 29A	COMMON-CAUSE ANALYSIS GUIDELINES	29A-1
29A.1	Introduction	29A-1
29A.2	Types of Dependencies	29A-1
29A.3	Common Cause Failures Definition	29A-2
29A.4	Methodology	29A-3
29A.5	Common Cause Failures Calculation Procedure	29A-4
	29A.5.1 Procedure for Treatment of Common Cause Failures Within a System	29A-5
	29A.5.2 Procedure for Treatment of Common Cause Failures Among More Systems	29A-7
29A.6	Common Cause Failure Numerical Evaluation	29A-8
	29A.6.1 Evaluation through Beta Factor Method	29A-8
	29A.6.2 Evaluation through Multiple-Greek Letter (MGL) Method	29A-8
29A.7	References	29A-10
CHAPTER 30	HUMAN RELIABILITY ANALYSIS	
30.1	Introduction	30-1
30.2	Summary of Results	30-1
30.3	Methodology	30-2
30.4	Major Assumptions	30-4
30.5	Types of Human Interactions	30-10
	30.5.1 Quantification Model	30-11
30.6	Quantification	30-12
	30.6.1 ZON-MAN01 (Start the Onsite Standby Diesel Generator)	30-12
	30.6.2 LPM-MAN01 (Recognize the Need for Reactor Coolant System Depressurization)	30-13
	30.6.3 LPM-MAN02 (Recognize the Need for Reactor Coolant System Depressurization)	30-15
	30.6.4 LPM-MAN05 (Recognize the Need for Reactor Coolant System Depressurization)	30-16
	30.6.5 LPM-REC01 (Recognize the Need for Reactor Coolant System Depressurization)	30-17
	30.6.6 ADN-MAN01 (Actuate the Automatic Depressurization System)	30-17
	30.6.7 ADN-REC01 (Actuate the Automatic Depressurization System)	30-19
	30.6.8 CCB-MAN01 (Start the Standby Component Cooling Water Pump)	30-19
	30.6.9 CCN-MAN02 (Inadvertent Misalignment of Heat Exchanger)	30-20
	30.6.10 CIB-MAN00 (Diagnose Steam Generator Tube Rupture)	30-21
	30.6.11 DUMP-MAN01 (Operate Steam Dump Valves)	30-22

TABLE OF CONTENTS (Cont.)

Section	Title	Page
30.6.12	CIC-MAN01 (Isolate Containment)	30-23
30.6.13	ADS-MANTEST (Recognize the Need and Reclose ADS Stage MOV)	30-24
30.6.14	CAN-MAN0S (Locally Close Manual Valve CAS-V204 to Isolate Containment)	30-25
30.6.15	CIT-MAN0S (Isolate Containment)	30-26
30.6.16	CMN-MAN01 (Actuate Core Makeup Tank)	30-27
30.6.17	CMN-REC01 (Actuate the Core Makeup Tanks)	30-28
30.6.18	CVN-MAN00 (Align Chemical and Volume Control System)	30-29
30.6.19	CVN-MAN02 (Align Chemical and Volume Control System)	30-30
30.6.20	CVN-MAN03 (Start Chemical and Volume Control System Pump B)	30-30
30.6.21	ADF-MAN01 (Depressurize the RCS to Refill the Pressurizer)	30-31
30.6.22	SGHL-MAN01 (Isolate Feedwater to Failed Steam Generator)	30-32
30.6.23	CAN-MAN01 (Start Standby Compressor)	30-33
30.6.24	REN-MAN02 (Initiate Recirculation)	30-33
30.6.25	REN-MAN03 (Initiate Recirculation)	30-34
30.6.26	IWN-MAN00 (Operate In-Containment Refueling Water Storage Tank Motor-Operated Valves)	30-35
30.6.27	RHN-MAN01 (Align Normal Residual Heat Removal System)	30-36
30.6.28	RHN-MANDIV (Align Normal Residual Heat Removal System)	30-37
30.6.29	RHN-MAN02/RHN-MAN03 (Align Normal Residual Heat Removal System)	30-38
30.6.30	PCN-MAN01 (Actuate Passive Containment Cooling System)	30-40
30.6.31	HPM-MAN01 (Diagnose Need for High Pressure Heat Removal)	30-40
30.6.32	PRN-MAN01 (Align Passive Residual Heat Removal System)	30-41
30.6.33	PRN-MAN02 (Align Passive Residual Heat Removal System)	30-42
30.6.34	PRN-MAN03 (Align Passive Residual Heat Removal System)	30-43
30.6.35	PRI-MAN01 (Isolate Failed Passive Residual Heat Removal Heat Exchanger)	30-44
30.6.36	REN-MAN04 (Initiate Recirculation)	30-45
30.6.37	RCN-MAN01 (Trip Reactor Coolant Pumps)	30-46
30.6.38	ATW-MAN01 (Manually Insert Control Rods)	30-47
30.6.39	ATW-MAN03 (Manually Trip the Reactor through Protection and Safety Monitoring System in One Minute)	30-48
30.6.40	ATW-MAN04 (Manually Trip the Reactor through Diverse Actuation System in One Minute)	30-49
30.6.41	ATW-MAN05 (Manually Trip the Reactor through Protection and Safety Monitoring System in Seven Minutes)	30-49
30.6.42	ATW-MAN06 (Manually Trip the Reactor through Diverse Actuation System In Seven Minutes)	30-50
30.6.43	RTN-MAN01 (Perform Controlled Reactor Shutdown)	30-51
30.6.44	FWN-MAN02 (Start the Startup Feedwater Pumps)	30-52
30.6.45	FWN-MAN03 (Start the Startup Feedwater Pumps)	30-53
30.6.46	REG-MAN00 (Regulate Startup Feedwater)	30-54

TABLE OF CONTENTS (Cont.)

Section	Title	Page
30.6.47	CIA-MAN01 (Isolate Failed Steam Generator)	30-55
30.6.48	CIB-MAN01 (Close Main Steam Isolation Valve)	30-56
30.6.49	SGA-MAN01 (Inadvertent Opening of Steam Generator Power-Operated Relief Valve)	30-57
30.6.50	SWN-MAN01N (Open Air-Operated Valve on Motor Strainer Line)	30-58
30.6.51	SWB-MAN02 (Start Standby Service Water Pump)	30-58
30.6.52	SWB-MAN02N (Start Standby Service Water Pump)	30-59
30.6.53	TCB-MAN01 (Start Standby Turbine Closed Cooling Water Pump)	30-60
30.6.54	TCB-MAN02 (Locally Align Standby Turbine Closed Cooling Water Heat Exchanger)	30-61
30.6.55	VLN-MAN01 (Actuate Hydrogen Control System)	30-62
30.6.56	VWN-MAN01 (Align Standby Chiller)	30-63
30.6.57	ATW-MAN11 (Recognize the Need for Manual Boration)	30-64
30.6.58	REC-MANDAS (Diagnosis of an Event Through DAS Signals or Perform an Activity by Operating DAS Controls)	30-65
30.6.59	RHN-MAN04 (Isolate the RNS During Shutdown Conditions)	30-65
30.6.60	RHN-MAN05 (Initiate Gravity Injection from IRWST via RNS Suction Line)	30-66
30.6.61	RHN-MAN06 (Recognize the Need and Throttle RNS Valve V011)	30-68
30.6.62	RCS-MANODS1 (Close AOVs CVS-V045 or -V047, Given Failure of HL Level Instruments)	30-68
30.6.63	RCS-MANODS2 (Close AOVs CVS-V045 or -V047, Given Failure of Valves to Close Automatically)	30-70
30.6.64	SWN-MAN03 (Recognize the Need and Locally Refill Service Water Basin)	30-70
30.7	Conditional Probability Evaluation	30-71
30.7.1	Application	30-72
30.7.2	Process Used to Determine Dependencies	30-72
30.7.3	Calculation of Dependent Human Error Probabilities	30-72
30.8	References	30-74
ATTACHMENT 30A	HUMAN RELIABILITY ANALYSIS GUIDELINES	30A-1
30A.1	Introduction	30A-1
30A.2	Schedule for Human Reliability Analysis	30A-1
30A.3	Methodology	30A-1
30A.4	Responsibility	30A-2
30A.5	Procedure for Human Interaction Evaluation	30A-2
30A.5.1	Type A	30A-3
30A.5.2	Type B	30A-3
30A.5.3	Type C	30A-4
30A.5.4	Commission Errors That Have Detrimental Effects	30A-6

TABLE OF CONTENTS (Cont.)

Section	Title	Page
30A.6	Procedure for Human Error Probabilities Quantification	30A-8
	30A.6.1 Basic Assumptions for Human Interaction Analysis	30A-8
30A.7	References	30A-9
CHAPTER 31	OTHER EVENT TREE NODE PROBABILITIES	
31.1	Introduction	31-1
31.2	Identification of Cases Requiring Calculations	31-1
	31.2.1 BL – Main Steam Line Break Occurs Inside Containment	31-1
	31.2.2 CNB – Containment Isolation Fails Due to Reactor Coolant System Vessel Rupture	31-1
	31.2.3 MGSET – Control Rods Motor-Generator Set Trip	31-1
	31.2.4 NSGTR – Consequential Steam Generator Tube Rupture	31-2
	31.2.5 PO – Pre-existing Containment Opening Allowing Bypass	31-2
	31.2.6 PRES – Reactor Coolant System Pressure Relief via Pressurizer Safety Valves	31-2
	31.2.7 PRSOV – Pressurizer Safety Valves Reclose	31-2
	31.2.8 R05 – Offsite Power Recovered within One-Half Hour	31-2
	31.2.9 SLSOV – Main Steam Line Relief Valves Reclose	31-2
31.3	Case-Specific Calculations	31-3
	31.3.1 BL – Main Steam Line Break Occurs Inside Containment	31-3
	31.3.2 CNB – Containment Isolation Fails Due to RCS Vessel Rupture	31-3
	31.3.3 MGSET – Control Rods Motor-Generator Set Trip	31-3
	31.3.4 PO – Pre-existing Containment Opening Allowing Bypass	31-4
	31.3.5 PRES – Reactor Coolant System Pressure Relief via Pressurizer Safety Valves	31-4
	31.3.6 PRSOV – Pressurizer Safety Valves Reclose	31-5
	31.3.7 R05 – Offsite Power Recovered within One-Half Hour	31-6
	31.3.8 SGTR1 – Single Consequential Steam Generator Tube Rupture	31-6
	31.3.9 SGTR – Multiple Consequential Steam Generator Tube Rupture	31-8
	31.3.10 SLSOV – Main Steam Line Relief and Safety Valves Reclose	31-8
	31.3.11 SLSOV1 – Main Steam Line Relief and Safety Valves Reclose	31-9
	31.3.12 SLSOV2 – Main Steam Line Safety Valves Reclose	31-10
	31.3.13 SLSOV3 – Main Steamline Relief and Safety Valves Reclose, SGTR	31-10
31.4	References	31-11
CHAPTER 32	DATA ANALYSIS AND MASTER DATA BANK	
32.1	Data Analysis	32-1
	32.1.1 Random Component Failure Data	32-1
	32.1.2 Test and Maintenance Unavailability	32-2
	32.1.3 Common Cause Failure Data	32-2
	32.1.4 Human Reliability Data	32-2
	32.1.5 Initiating Event Frequency Data	32-2

TABLE OF CONTENTS (Cont.)

Section	Title	Page
32.2	Master Data Bank	32-2
	32.2.1 Initiating Event Frequencies	32-3
	32.2.2 Random Component Failures	32-3
	32.2.3 Common Cause Failure Probabilities	32-3
	32.2.4 Human Error Probabilities	32-3
	32.2.5 System-Specific Calculations	32-3
	32.2.6 Other Event Tree Node Probabilities	32-3
	32.2.7 Master Data Bank	32-4
32.3	References	32-4
CHAPTER 33	FAULT TREE AND CORE DAMAGE QUANTIFICATION	
33.1	Introduction	33-1
33.2	Fault Tree Model Quantification	33-1
33.3	Event Tree Model Calculation	33-1
	33.3.1 Core Damage Quantification Method	33-2
	33.3.2 Core Damage Quantification Input Files and Data	33-4
	33.3.3 Definition of Consequential Event Categories	33-4
	33.3.4 Incorporate Operator Action Dependencies Into Plant Core Damage Frequency Quantification	33-6
	33.3.5 Core Damage Frequency Results	33-6
CHAPTER 34	SEVERE ACCIDENT PHENOMENA TREATMENT	
34.1	Introduction	34-1
34.2	Treatment of Physical Processes	34-1
	34.2.1 In-Vessel Retention of Molten Core Debris	34-1
	34.2.2 Fuel-Coolant Interaction (Steam Explosions)	34-2
	34.2.3 Hydrogen Combustion and Detonation	34-4
	34.2.4 High-Pressure Melt Ejection	34-5
	34.2.5 Core Debris Coolability	34-5
	34.2.6 Containment Pressurization from Decay Heat	34-6
	34.2.7 Elevated Temperature (Equipment Survivability)	34-7
	34.2.8 Summary	34-7
34.3	Analysis Method	34-7
34.4	Severe Accident Analyses	34-8
	34.4.1 Accident Class 3BE – Intact Containment	34-8
	34.4.2 Accident Class 3BE – Failed Containment	34-10
	34.4.3 Accident Class 3BL – Intact Containment	34-11
	34.4.4 Accident Class 3BR – Intact Containment	34-12
	34.4.5 Accident Class 3C – Intact Containment	34-13
	34.4.6 Accident Class 3C – Failed Containment	34-14
	34.4.7 Accident Class 3D – Intact Containment	34-14
	34.4.8 Accident Class 3D – Failed Containment	34-16

TABLE OF CONTENTS (Cont.)

Section	Title	Page
	34.4.9 Accident Class 6E – Bypass Containment	34-16
	34.4.10 Accident Class 6L – Bypass Containment	34-17
	34.4.11 Accident Class 1AP	34-17
	34.4.12 Accident Class 1A	34-18
	34.4.13 Intermediate and Late Containment Failure Cases	34-19
34.5	Insights and Conclusions	34-21
34.6	References	34-21
CHAPTER 35	CONTAINMENT EVENT TREE ANALYSIS	
35.1	Introduction	35-1
35.2	Containment Event Tree – General Discussion	35-1
35.3	Event Tree Construction	35-2
35.4	Level 1/Level 2 Interface	35-3
35.5	Containment Event Tree Top Events	35-3
	35.5.1 Severe Accident Phenomena Considerations	35-3
	35.5.2 Operator Action and Systems Top-Event Considerations	35-5
35.6	Release Category Definitions	35-7
	35.6.1 Release Category BP – Containment Bypass	35-8
	35.6.2 Release Category CI – Containment Isolation Failure	35-9
	35.6.3 Release Category CFE – Early Containment Failure	35-9
	35.6.4 Release Category CFI – Intermediate Containment Failure	35-9
	35.6.5 Release Category CFL – Late Containment Failure	35-9
	35.6.6 Release Category CFV – Containment Venting	35-10
	35.6.7 Release Category IC – Intact Containment	35-10
35.7	Top-Event Nodal Questions and Success Criteria	35-10
	35.7.1 Top Event DP – RCS Depressurization After Core Uncovery	35-11
	35.7.2 Top Event IS – Containment Isolation	35-12
	35.7.3 Top Event IR – Reactor Cavity Flooding	35-13
	35.7.4 Top Event RFL – Reflooding of a Degraded Core	35-14
	35.7.5 Top Event VF – Debris Relocation to the Reactor Cavity	35-14
	35.7.6 Top Event PC – Passive Containment Cooling	35-15
	35.7.7 Top Event VNT – Containment Venting	35-16
	35.7.8 Top Event IF – Intermediate Containment Failure	35-16
	35.7.9 Top Event IG – Hydrogen Control System	35-17
	35.7.10 Top Event DF – Diffusion Flame	35-17
	35.7.11 Top Event DTE – Early Hydrogen Detonation	35-18
	35.7.12 Top Event DFG – Hydrogen Deflagration	35-19
	35.7.13 Top Event DTI – Intermediate Hydrogen Detonation	35-19
35.8	Summary	35-20
35.9	References	35-20

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 36	REACTOR COOLANT SYSTEM DEPRESSURIZATION	
36.1	Introduction	36-1
36.2	Definition of High Pressure	36-1
36.3	Node DP	36-2
36.4	Success Criteria	36-2
	36.4.1 Accident Classes 3BE, 3BL, 3BR, 3C	36-2
	36.4.2 Accident Class 3D/1D	36-3
	36.4.3 Accident Classes 1A and 1AP	36-3
	36.4.4 Steam Generator Tube Rupture – Accident Class 6	36-4
	36.4.5 Anticipated Transient Without Scram – Accident Class 3A	36-5
36.6	References	36-5
CHAPTER 37	CONTAINMENT ISOLATION	
37.1	Introduction	37-1
37.2	Definition of Containment Isolation	37-1
37.3	Success Criteria	37-1
	37.3.1 Accident Classes 1A and 1AP	37-2
	37.3.2 Accident Class 3A	37-2
	37.3.3 Accident Class 3BR	37-2
	37.3.4 Accident Class 3BE	37-2
	37.3.5 Accident Class 3BL	37-2
	37.3.6 Accident Class 3C	37-2
	37.3.7 Accident Class 3D/1D	37-3
	37.3.8 Accident Class 6	37-3
37.4	Summary	37-3
CHAPTER 38	REACTOR VESSEL REFLOODING	
38.1	Introduction	38-1
38.2	Definition of Reflooding Success	38-1
38.3	Success Criteria	38-1
	38.3.1 Accident Classes 1A and 1AP	38-1
	38.3.2 Accident Class 3BR	38-2
	38.3.3 Accident Class 3BE	38-2
	38.3.4 Accident Class 3BL	38-3
	38.3.5 Accident Class 3D/1D	38-3
	38.3.6 Accident Class 6	38-3
	38.3.7 Accident Class 3C	38-3
	38.3.8 Accident Class 3A	38-4
38.4	Summary	38-4

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 39	IN-VESSEL RETENTION OF MOLTEN CORE DEBRIS	
39.1	Introduction	39-1
39.2	Background on the Application of IVR to the Passive Plant	39-1
39.3	Application of IVR to the AP1000 Passive Plant	39-2
39.4	Reactor Vessel Failure Criteria	39-3
39.5	In-Vessel Melt Progression and Relocation	39-4
39.6	Application of Heat Transfer Correlations to the AP1000	39-6
	39.6.1 Debris Pool to Vessel Wall Heat Transfer	39-6
	39.6.2 Vessel Wall to External Cooling Water Heat Transfer	39-7
39.7	Quantification of Margin to Failure of the Reactor Vessel Wall	39-8
	39.7.1 Zirconium Oxidation Fraction Input Probability Distribution	39-9
	39.7.2 Steel Mass Input Probability Distribution	39-9
	39.7.3 Final Bounding State Timing Input Probability Distribution	39-10
	39.7.4 Critical Heat Flux	39-10
	39.7.5 Results and Conclusions of Heat Flux Quantification	39-10
39.8	Reactor Coolant System Depressurization	39-11
39.9	Reactor Cavity Flooding (Node IR)	39-11
	39.9.1 Node IR Success Criteria	39-12
	39.9.2 Cavity Flooding Scenario Dependencies	39-13
39.10	Reactor Vessel Insulation Design Concept	39-15
	39.10.1 Description of Reactor Vessel Insulation and Venting	39-15
	39.10.2 Design Analysis of the Insulation and Support Frame	39-17
39.11	Reactor Vessel External Surface Treatment	39-18
39.12	Reactor Vessel Failure (Node VF)	39-18
	39.12.1 Node VF Success Criteria	39-18
39.13	Summary	39-19
39.14	References	39-19
ATTACHMENT 39A	AP1000 IN-VESSEL CORE MELTING RELOCATION	39A-1
39A.1	Introduction	39A-1
39A.2	Phenomenological Issues	39A-1
	39A.2.1 Focusing Effect	39A-1
	39A.2.2 Material Interaction	39A-1
39A.3	AP1000 Reactor Vessel Lower Internals Geometry	39A-1
39A.4	Modeling of Core and Reactor Vessel Lower Internals Heatup	39A-2
	39A.4.1 MAAP4 Model	39A-2
	39A.4.2 Finite Difference Modeling	39A-3
	39A.4.3 Relocation of In-Core Debris to Lower Plenum	39A-3
39A-5	Base Core Damage Sequence for In-Vessel Retention	39A-3
	39A.5.1 Core Heatup and Formation of In-Core Molten Debris Layers	39A-4
	39A.5.2 Melting of Core Shroud and Core Barrel	39A-6
	39A.5.3 Initial Relocation of Molten Core Debris to Lower Plenum	39A-7
	39A.5.4 Lower Plenum Debris Pool Formation	39A-8

TABLE OF CONTENTS (Cont.)

Section	Title	Page
39A.6	Potential for Debris Interaction	39A-12
39A.7	Conclusions from Analysis of AP1000 In-Vessel Core Melting and Relocation	39A-12
39A.8	References	39A-13
CHAPTER 40	PASSIVE CONTAINMENT COOLING, LONG TERM CONTAINMENT INTEGRITY AND CONTAINMENT VENTING	
40.1	Passive Containment Cooling System	40-1
40.2	Passive Containment Cooling Water – Node PC	40-2
	40.2.1 Node PC Success Criteria	40-2
	40.2.2 Operator Action	40-2
	40.2.3 Node PC Failure Probability	40-3
40.3	Containment Venting – Node VT	40-3
	40.3.1 Venting Success Criteria	40-3
	40.3.2 Venting Failure Probability	40-4
40.4	Intermediate Containment Failure – Node IF	40-4
	40.4.1 Success Criterion	40-5
	40.4.2 Intermediate Containment Failure Probability	40-5
40.5	References	40-5
CHAPTER 41	HYDROGEN MIXING AND COMBUSTION ANALYSIS	
41.1	Discussion of the Issue	41-1
41.2	Controlling Phenomena	41-2
41.3	Major Assumptions and Phenomenological Uncertainties	41-3
	41.3.1 Hydrogen Generation	41-3
	41.3.2 Containment Pressure	41-3
	41.3.3 Flammability Limits	41-3
	41.3.4 Detonation Limits and Loads	41-4
	41.3.5 Igniter System	41-4
	41.3.6 Other Ignition Sources	41-5
	41.3.7 Severe Accident Management Actions	41-5
41.4	Hydrogen Generation and Mixing	41-5
	41.4.1 Accident Class 3BE – Failure of Gravity Injection	41-6
	41.4.2 Accident Class 3BL – Failure of Gravity Recirculation	41-9
	41.4.3 Accident Class 3BR – Large LOCA with Accumulator Failure	41-10
	41.4.4 Accident Class 3C	41-11
	41.4.5 Accident Classes 3D and 1D	41-12
	41.4.6 Accident Class 1AP	41-12
	41.4.7 Accident Class 1A	41-13
	41.4.8 Accident Class 3A	41-13
	41.4.9 Accident Class 6	41-13
	41.4.10 Overall Mixing Insights	41-14

TABLE OF CONTENTS (Cont.)

Section	Title	Page
41.5	Hydrogen Burning at Igniters	41-15
41.6	Early Hydrogen Combustion	41-15
41.6.1	Hydrogen Generation Rates	41-15
41.6.2	Hydrogen Release Locations	41-17
41.6.3	Early Hydrogen Combustion Ignition Sources	41-18
41.7	Diffusion Flame Analysis – CET Node DF	41-18
41.7.1	AP1000 Diffusion Flame Mitigation Strategy	41-19
41.7.2	Node DF Containment Failure Probability Assignment	41-20
41.8	Early Hydrogen Detonation – Containment Event Tree Node DTE	41-21
41.8.1	Containment Success Criteria at Node DTE	41-21
41.8.2	Early Hydrogen Detonation Decomposition Event Tree	41-22
41.9	Deflagration in Time Frame 3	41-23
41.9.1	Containment Success Criterion at Node DFL	41-23
41.9.2	AICC Peak Pressure	41-24
41.9.3	Conditional Containment Failure Probability from Deflagration	41-25
41.10	Detonation in Intermediate Time Frame	41-29
41.10.1	Containment Success Criterion at Node DTI	41-29
41.10.2	Mixing and Stratification	41-29
41.10.3	Quantification of DTI Failure Probabilities	41-30
41.11	Safety Margin Basis Containment Performance Requirement	41-30
41.12	Summary	41-31
41.13	References	41-31
ATTACHMENT 41A	AP1000 SPECIFIC MAAP4.04 ANALYSES	41A-1
ATTACHMENT 41B	ANALYSIS OF HYDROGEN BURNING AT IGNITERS	41B-1
CHAPTER 42	CONDITIONAL CONTAINMENT FAILURE PROBABILITY DISTRIBUTION	
42.1	Introduction	42-1
42.2	Probabilistic Model	42-1
42.3	Containment Failure Characteristics	42-2
42.3.1	Median Values for Containment Failure	42-2
42.3.2	Uncertainties in Containment Failure	42-3
42.4	Containment Failure Predictions	42-4
42.4.1	Containment Cylindrical Shell	42-4
42.4.2	Ellipsoidal Upper Head	42-5
42.4.3	Equipment Hatches	42-5
42.4.4	Personnel Airlock	42-6
42.5	Overall Failure Distribution	42-6
42.6	Summary and Conclusions	42-7
42.7	References	42-7

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 43	RELEASE FREQUENCY QUANTIFICATION	
43.1	Introduction	43-1
43.2	Plant Damage State Frequency Calculations	43-2
43.3	Containment Event Tree Node Frequencies	43-2
43.3.1	CET Nodes	43-2
43.3.2	CET Node Probabilities From Boolean Expressions	43-3
43.3.3	Probabilities for Hydrogen-Related CET Nodes	43-6
43.3.4	Other CET Node Probabilities	43-6
43.4	Containment Event Tree Quantification	43-7
43.4.1	Containment Event Tree	43-7
43.4.2	Dominant CET Sequences	43-7
43.4.3	LRF Cutsets for Dominant Sequences	43-7
43.5	Summary of Results	43-7
43.6	Importance and Sensitivity Analyses	43-8
43.6.1	CET Event Node Importance Analysis	43-8
43.6.2	No Credit Taken for DP Node for PDS-6	43-8
43.6.3	Lesser Reliability for Containment Isolation	43-8
43.6.4	Lesser Reliability for Hydrogen Igniters	43-8
43.6.5	Lesser Reliability for PCS	43-9
43.6.6	No Credit for Depressurization for High Pressure PDS	43-9
43.6.7	Set PDS-3C Vessel Failure Probability to 1.0	43-9
43.6.8	Set 3D and 1AP Diffusion Flame and Detonation Failure Probability to 1.0	43-9
43.7	Other Importance and Sensitivity Analyses	43-9
43.7.1	Initiating Event Importances	43-9
43.7.2	Sensitivity to Standby Systems	43-10
43.7.3	Sensitivity to Standby Systems With Credit for Manual DAS	43-10
43.8	Conclusions and Insights	43-10
ATTACHMENT 43A	PDS CALCULATIONS	43A-1
ATTACHMENT 43B	DP NODE PROBABILITY FOR PDS	43B-1
ATTACHMENT 43C	EVALUATION OF OPERATOR ACTIONS	43C-1
ATTACHMENT 43D	EFFECT OF "PRE-EXISTING CONTAINMENT OPENING" ON LRF	43D-1
ATTACHMENT 43E	EFFECT OF CONTAINMENT AIR-COOLING FAILURE ON PLANT RISK	43E-1

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 44	MAAP4 CODE DESCRIPTION AND AP1000 MODELING	
44.0	MAAP Background	44-1
44.1	MAAP4	44-1
44.2	The AP1000 MAAP4 Modeling	44-3
44.3	Benchmarking	44-5
44.4	Summary and Conclusions	44-6
44.5	References	44-7
CHAPTER 45	FISSION-PRODUCT SOURCE TERMS	
45.1	Summary of AP1000 Release Categories	45-1
45.2	Release Category Source Terms	45-2
	45.2.1 Release Category IC	45-2
	45.2.2 Release Category BP	45-2
	45.2.3 Release Category CI	45-2
	45.2.4 Release Category CFE	45-2
	45.2.5 Release Category CFI	45-3
	45.2.6 Release Category CFL	45-3
	45.2.7 Release Category CFV	45-3
45.3	Direct-Release Sensitivity Case	45-4
45.4	Summary	45-4
45.5	References	45-4
CHAPTERS 46 THROUGH 48 NOT USED		
CHAPTER 49	OFFSITE DOSE RISK QUANTIFICATION	
49.1	Introduction	49-1
49.2	Conformance with Regulatory Requirements	49-2
49.3	Assumptions	49-2
49.4	Methodology	49-2
49.5	Dose Evaluation Results and Discussion	49-5
49.6	Quantification of Site Risk	49-6
49.7	Risk Quantification Results	49-7
49.8	References	49-7
CHAPTER 50	IMPORTANCE AND SENSITIVITY ANALYSES	
50.1	Introduction	50-1
50.2	Importance Analyses for Core Damage	50-1
	50.2.1 Initiating Event Importances	50-2
	50.2.2 Accident Sequence Importances	50-3
	50.2.3 End State Importances	50-4
	50.2.4 Common Cause Failure Importances	50-4
	50.2.5 Human Error Importances	50-5
	50.2.6 Component Importances	50-6

TABLE OF CONTENTS (Cont.)

Section	Title	Page
50.3	System Importances for Core Damage	50-7
50.4	Human Error Sensitivity Analyses	50-8
50.4.1	Set HEPs to 1.0 (Failure) in Core Damage Output File	50-9
50.4.2	Set HEPs to 0.0 (Success) in Core Damage Output File	50-10
50.4.3	Set HEPs to 0.1 in Core Damage Output File	50-10
50.5	Other Sensitivity Analyses for Core Damage	50-10
50.5.1	Impact of Passive System Check Valves on Core Damage Frequency	50-10
50.5.2	Sensitivity to Squib Valve Failure Probability	50-11
50.5.3	Sensitivity to Circuit Breaker Failure Probability	50-11
50.5.4	Sensitivity to Standby Systems	50-12
50.5.5	Sensitivity to Standby Systems; Manual DAS Credited	50-14
50.6	Results	50-15
CHAPTER 51	UNCERTAINTY ANALYSIS	
51.1	Introduction	51-1
51.2	Input Data/Error Factors	51-2
51.3	Input Files	51-3
51.4	Output Files	51-3
51.5	Sensitivity Analyses	51-3
51.5.1	Sensitivity to Simulation Parameters	51-3
51.5.2	Sensitivity to Key Basic Events	51-3
51.5.3	Sensitivity to Operator Actions	51-4
51.6	Summary of Results	51-6
51.7	References	51-8
ATTACHMENT 51A	ASSIGNMENT OF ERROR FACTORS TO BASIC EVENT PROBABILITIES	51A-1
ATTACHMENT 51B	@RISK UNCERTAINTY ANALYSIS RESULTS	51B-1
CHAPTERS 52 AND 53 NOT USED		
CHAPTER 54	LOW-POWER AND SHUTDOWN RISK ASSESSMENT	
54.1	Introduction	54-1
54.2	Data Analysis	54-2
54.3	Initiating Event Analysis	54-3
54.4	Event Tree/Mitigation System Evaluation	54-3
54.5	Common Cause Analysis Update for AP1000	54-3
54.6	Human Reliability Assessment for AP1000	54-5
54.7	Core Damage Quantification	54-6
54.7.1	Discussion of Results	54-9
54.8	Estimation of Shutdown Large Release Frequency	54-9

TABLE OF CONTENTS (Cont.)

Section	Title	Page
54.9	Sensitivity Analyses	54-10
54.9.1	Case 1 – Minimum Equipment per Tech Specs During Drained Conditions	54-10
54.9.2	Case 2 – No Credit for Standby Nonsafety Systems	54-11
54.9.3	Case 3 – HEP's Set Equal to 0.5	54-12
54.9.4	Case 4 – No Credit for Standby Nonsafety Systems – Credit for Manual DAS	54-12
54.9.5	Case 5 – Assessment of Containment Closure Failure Probability	54-13
54.10	Conclusions	54-17
54.11	References	54-17
CHAPTER 55	AP1000 SEISMIC MARGINS EVALUATION	
55.1	Seismic Margin HCLPF Methodology	55-1
55.2	Calculation of HCLPF Values	55-1
55.2.1	Seismic Margin HCLPF Methodology	55-1
55.2.2	Calculation of HCLPF Values	55-2
55.3	Seismic Margin Model	55-11
55.3.1	Major SMA Model Assumptions	55-11
55.3.2	Seismic Initiating Events	55-12
55.3.3	Initiating Event Category HCLPFs	55-13
55.4	Calculation of Plant HCLPF	55-16
55.4.1	HCLPFs for Basic Events	55-16
55.4.2	Calculation of Initiating Event HCLPFs	55-17
55.5	Results and Insights	55-17
55.5.1	AP1000 SMA Results	55-17
55.5.2	AP1000 SMA Insights	55-18
55.6	References	55-20
CHAPTER 56	INTERNAL FLOODING ANALYSIS	
56.1	Introduction	56-1
56.1.1	Definitions	56-1
56.2	Methodology	56-1
56.2.1	Summary of Methodology	56-1
56.2.2	Information Collection	56-2
56.2.3	Initial Screening Assessment	56-2
56.2.4	Detailed Screening Assessment	56-4
56.2.5	Identification of Flood-Induced Initiating Events	56-5
56.2.6	Initiating Event Frequencies	56-6
56.3	Assumptions	56-6
56.3.1	General Flooding Analysis Assumptions and Engineering Judgments	56-6
56.3.2	AP1000-Specific Assumptions	56-8

TABLE OF CONTENTS (Cont.)

Section	Title	Page
56.4	Information Collection	56-10
	56.4.1 PRA-Modeled Equipment and Locations	56-10
	56.4.2 Identification of Areas for Flooding Evaluation	56-10
56.5	At-Power Operations	56-10
	56.5.1 Initial Screening Assessment	56-11
	56.5.2 Detailed Screening Assessment	56-11
	56.5.3 Identification of Flood-Induced Initiating Events	56-26
	56.5.4 Calculation of Flood-Induced Initiating Event Frequencies	56-29
	56.5.5 Quantification of At-Power Flood-Induced Events	56-36
56.6	Internal Flooding During Low-Power and Shutdown Conditions	56-38
	56.6.1 Detailed Screening Assessment	56-38
	56.6.2 Identification of Flood-Induced Initiating Events	56-39
	56.6.3 Calculation of Flood-Induced Initiating Event Frequencies	56-40
	56.6.4 Quantification of Shutdown Internal Flooding Scenario CDFs	56-45
	56.6.5 Total Shutdown Flooding Core Damage Frequency	56-47
	56.6.6 Seismically Induced Flooding	56-47
	56.6.7 Flooding Hazards During Refueling Outages	56-47
	56.6.8 Summary of Results	56-47
56.7	Large Release Frequency Estimates for Internal Flooding	56-48
56.8	Results of AP1000 Internal Flooding Analysis	56-49
CHAPTER 57	FIRE RISK ASSESSMENT	
57.1	Introduction	57-1
57.2	Qualitative Analysis	57-1
	57.2.1 AP600 Qualitative Analysis	57-1
	57.2.2 AP1000 Qualitative Analysis	57-5
	57.2.3 AP1000 Fire Areas	57-6
57.3	Initiating Event Frequencies	57-6
	57.3.1 Introduction	57-6
	57.3.2 Methodology	57-7
	57.3.3 Results for Plant Except Containment and the Main Control Room	57-7
	57.3.4 Results for the Containment	57-7
	57.3.5 Results for the Main Control Room	57-7
57.4	Development of Fire Scenarios	57-10
	57.4.1 Spurious Actuation Model	57-11
	57.4.2 Propagation Model	57-14
	57.4.3 Fire Suppression Model	57-15
	57.4.4 Operation Actions	57-15
	57.4.5 Development of Fire Scenarios	57-16
57.5	Calculation of Conditional Core Damage Probabilities (CCDP)	57-22
57.6	Calculation of CDF from Fire Events	57-23
	57.6.1 Calculation of Plant Fire CDF	57-23
	57.6.2 Comments on Plant Areas	57-23

TABLE OF CONTENTS (Cont.)

Section	Title	Page
57.6.3	Importances of Fire Areas	57-25
57.6.4	Conclusion	57-27
57.7	Sensitivity Studies	57-27
57.7.1	Manual Fire Suppression Systems	57-27
57.7.2	Sensitivity Analysis of the Probability of a Spurious Actuation of ADS Valves	57-27
57.7.3	Sensitivity of Human Action on Fire	57-28
57.7.4	Sensitivity Analysis on Ignition Frequencies	57-28
57.7.5	Sensitivity Analysis on ADS Actuation by DAS	57-29
57.7.6	Sensitivity Analysis on 1E to Non-1E Separation in the Containment	57-29
57.7.7	Sensitivity Analysis to Area to Area Propagation	57-30
57.7.8	Importance of Hot Shorts	57-30
57.8	Shutdown Fire Analysis	57-30
57.8.1	Introduction	57-30
57.8.2	Evaluation of AP1000 Shutdown Risk (Non-Drained Conditions)	57-33
57.8.3	Evaluation for Drained Shutdown Operations	57-37
57.8.4	Evaluation of Main Control Room	57-40
57.9	Conclusion and Insights	57-40
57.9.1	At-Power Analysis	57-40
57.9.2	Shutdown Fire Analysis	57-41
57.9.3	Conclusions	57-42
57.10	References	57-42
ATTACHMENT 57A	CALCULATION OF SCENARIO CCDPs	57A-1
57A.1	Calculation of Scenario CCDPs	57A-1
57A.2	Calculation of Scenario CCDPs for Overly Conservative Cases	57A-3
ATTACHMENT 57B	MODELING OF OPERATOR ACTIONS IN FIRE SCENARIOS	57B-1
57B.1	Calculation of Failure Probability of OPA-01	57B-1
57B.2	Calculation of Failure Probability of OPA-02	57B-3
57B.3	Operator Actions at Remote Shutdown Panel	57B-6
57B.4	More Reliable REC-MANDAS	57B-6
ATTACHMENT 57C	FIRE AREA EVENT TREES DEFINING SCENARIOS	57C-1
ATTACHMENT 57D	AP1000 POTENTIAL FOR FIRE-INDUCED SPURIOUS ACTUATION OF FUNCTIONS THAT RESULT IN A BREACH OF HIGH/LOW PRESSURE BOUNDARY	57D-1

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 58	WINDS, FLOODS, AND OTHER EXTERNAL EVENTS	
58.1	Introduction	58-1
58.2	External Events Analysis	58-1
	58.2.1 Severe Winds and Tornadoes	58-1
	58.2.2 External Floods	58-2
	58.2.3 Transportation and Nearby Facility Accidents	58-2
58.3	Conclusion	58-2
58.4	References	58-3
CHAPTER 59	PRA RESULTS AND INSIGHTS	
59.1	Introduction	59-1
59.2	Use of PRA in the Design Process	59-3
59.3	Core Damage Frequency from Internal Initiating Events at Power	59-4
	59.3.1 Dominant Core Damage Sequences	59-6
	59.3.2 Component Importances for At-Power Core Damage Frequency	59-7
	59.3.3 System Importances for At-Power Core Damage	59-8
	59.3.4 System Failure Probabilities for At-Power Core Damage	59-9
	59.3.5 Common Cause Failure Importances for At-Power Core Damage	59-9
	59.3.6 Human Error Importances for At-Power Core Damage	59-9
	59.3.7 Accident Class Importances	59-10
	59.3.8 Sensitivity Analyses Summary for At-Power Core Damage	59-11
	59.3.9 Summary of Important Level 1 At-Power Results	59-12
59.4	Large Release Frequency for Internal Initiating Events at Power	59-15
	59.4.1 Dominant Large Release Frequency Sequences	59-15
	59.4.2 Summary of Important Level 2 At-Power Results	59-16
59.5	Core Damage and Severe Release Frequency from Events at Shutdown	59-19
	59.5.1 Summary of Shutdown Level 1 Results	59-19
	59.5.2 Large Release Frequency for Shutdown and Low-Power Events	59-22
	59.5.3 Shutdown Results Summary	59-22
59.6	Results from Internal Flooding, Internal Fire, and Seismic Margin Analyses	59-23
	59.6.1 Results of Internal Flooding Assessment	59-23
	59.6.2 Results of Internal Fire Assessment	59-24
	59.6.3 Results of Seismic Margin Analysis	59-25
59.7	Plant Dose Risk From Release of Fission-Products	59-26
59.8	Overall Plant Risk Results	59-26
59.9	Plant Features Important to Reducing Risk	59-27
	59.9.1 Reactor Design	59-28
	59.9.2 Systems Design	59-28
	59.9.3 Instrumentation and Control Design	59-31
	59.9.4 Plant Layout	59-32
	59.9.5 Containment Design	59-32

TABLE OF CONTENTS (Cont.)

Section	Title	Page
59.10	PRA Input to Design Certification Process	59-36
	59.10.1 PRA Input to Reliability Assurance Program	59-36
	59.10.2 PRA Input to Tier 1 Information	59-36
	59.10.3 PRA Input to MMI/Human Factors/Emergency Response Guidelines	59-36
	59.10.4 Summary of PRA Based Insights	59-37
	59.10.5 Combined License Information	59-37
59.11	References	59-38
APPENDIX A	THERMAL HYDRAULIC ANALYSIS TO SUPPORT SUCCESS CRITERIA	A-1
APPENDIX B	EX-VESSEL SEVERE ACCIDENT PHENOMENA	B-1
APPENDIX C	ADDITIONAL ASSESSMENT OF AP1000 DESIGN FEATURES	C-1
APPENDIX D	EQUIPMENT SURVIVABILITY ASSESSMENT	D-1
APPENDIX E	AP1000 PRA FAULT TREE PICTURES FOR LEVEL 1 ANALYSIS FOR EVENTS AT POWER OPERATION	E-1

LIST OF TABLES

Table No.	Title	Page
2-1	Internal Initiating Event Grouping Plant Systems and Equipment Available for Transient/Accident Conditions (Sheets 1 – 10)	2-28
2-2	NUREG/CR 3862 Initiator Categories (Sheets 1 – 4)	2-38
2-3	NUREG/CR 3862 Initiator Categories not Considered in the AP1000 PRA Analysis	2-42
2-4	AP1000 Internal Initiating Event Frequencies (Sheets 1 – 3)	2-43
2-5	Initiating Event Frequencies Used in Event Trees Quantification	2-46
2A-1	Summary of Primary System Piping Data	2A-2
2A-2	Summary of Primary System Pipe Break Frequency Quantification	2A-3
2A-3	Summary of Steam Generator Tube Rupture Events	2A-4
2A-4	Spurious Stuck-Open Pressurizer Safety Valve	2A-5
2A-5	Interface Break on Accumulator Lines	2A-6
2A-6	Interface Break on IRWST Injection Lines	2A-7
2A-7	Initiating Events Review Data Summary (Sheets 1 – 8)	2A-8
2B-1	Summary of Main Steam Line and Feedwater Line Piping Data for Secondary Side Break Frequency Quantification	2B-2
2B-2	Secondary Side Line Break Frequency Quantification	2B-3
2B-3	Stuck-Open Main Steam Line Safety Valve Frequency Quantification (Sheets 1 – 2)	2B-4
3-1	Loss of CCS/SWS Initiating Event Fault Tree CSWF Success Criteria Summary	3-8
3-2	Spurious Actuation of Automatic Depressurization Failure Criteria Summary	3-9
3-3	Evaluation of Spurious Automatic Depressurization System Frequencies (Sheets 1 – 6)	3-10
4-1	AP1000 Large LOCA Event End State Summary	4-112
4-2	AP1000 Spurious ADS Actuation Event End State Summary	4-112
4-3	AP1000 Medium LOCA Event End State Summary	4-113
4-4	AP1000 CMT Line Break LOCA Event End State Summary	4-114
4-5	AP1000 SI Line Break Event End State Summary	4-115
4-6	AP1000 Small LOCA Event End State Summary	4-116
4-7	AP1000 RCS Leak Event End State Summary	4-117
4-8	AP1000 PRHR Tube Rupture Event End State Summary	4-117
4-9	AP1000 SGTR Event End State Summary	4-118
4-10	AP1000 Vessel Rupture Event End State Summary	4-119
4-11	AP1000 Interfacing Systems LOCA Event End State Summary	4-119
4-12	AP1000 Transients with MFW Event End State Summary	4-120
4-13	AP1000 Transients with Loss of RCS Flow Event End State Summary	4-121

LIST OF TABLES (Cont.)

Table No.	Title	Page
4-14	AP1000 Transients with Loss of MFW to One SG Event End State Summary	4-122
4-15	AP1000 Transients with Core Power Excursion Event End State Summary	4-123
4-16	AP1000 Transients with Loss of CCW/SW Event End State Summary	4-124
4-17	AP1000 Transients without Main Feedwater Event End State Summary	4-125
4-18	AP1000 Transients with Loss of Condenser Event End State Summary	4-126
4-19	AP1000 Transients with Loss of Compressed Air Event End State Summary	4-127
4-20	AP1000 Loss of Offsite Power Event End State Summary	4-128
4-21	AP1000 SLB Downstream of MSIVs Event End State Summary	4-129
4-22	AP1000 SLB Downstream of MSIVs Event End State Summary	4-130
4-23	AP1000 Stuck Open Secondary Side Safety Valve Event End State Summary	4-131
4-24	AP1000 ATWS Precursor without MFW Event End State Summary	4-132
4-25	AP1000 ATWS Precursor with SI Event End State Summary	4-133
4-26	AP1000 ATWS Precursor Transients with MFW Event End State Summary	4-134
4A-1	End States (Plant Damage States)	4A-17
4A-2	Summary of Systems Associated with Mitigating Functions for AP1000	4A-18
5-1	AP1000 Safety-Related Plant Support Systems with Letter Designators	5-3
5-2	AP1000 Non Safety-Related Plant Support Systems with Letter Designators	5-3
5-3	AP1000 Support Systems Interdependency Matrix (Sheets 1 – 14)	5-4
5-4	AP1000 Safety-Related Front Line Plant Systems Letter Designators	5-18
5-5	AP1000 Non Safety-Related Front Line Plant Systems Letter Designators	5-18
5-6	AP1000 Front Line System Dependencies Matrix (Sheets 1 – 18)	5-19
6-1	Summary of Event Tree Top Events Success Criteria (Internal Initiating Events at Power Cases) (Sheets 1 – 34)	6-20
6-2	Summary of Success Criteria for the Mitigating Systems (Sheets 1 – 9)	6-54
6-3	Summary of Success Criteria for Operator Actions and Mission Times (Sheets 1 – 4)	6-68
7-1	Example for Fault Tree XXX Success Criteria Summary	7-15
7-2	Example for System Dependency Matrix	7-15
7-3	Example for Component Test Assumptions	7-16
7-4	Example for Component Maintenance Assumptions	7-16
7-5	Example for Operator Actions and Misposition Analysis Summary	7-16
7-6	Fault Tree Identification Codes (Sheets 1 – 3)	7-17
7-7	System Identification Codes for Basic Events (Sheets 1 – 3)	7-20
7-8	Component Identification Codes (Sheets 1 – 7)	7-23
7-9	Failure Mode Identification Codes (Sheets 1 – 3)	7-30
8-1	List of Passive Residual Heat Removal System Fault Trees	8-7
8-2a	Fault Tree "PRT" Success Criteria	8-8
8-2b	Fault Tree "PRTA" Success Criteria	8-9

LIST OF TABLES (Cont.)

Table No.	Title	Page
8-2c	Fault Tree "PRL" Success Criteria	8-10
8-2d	Fault Tree "PRP" Success Criteria	8-11
8-2e	Fault Tree "PRS" Success Criteria	8-12
8-2f	Fault Tree "PRW" Success Criteria	8-13
8-2g	Fault Tree "PRI" Success Criteria	8-14
8-3	System Dependency Matrix	8-15
8-4	Component Test Assumptions	8-16
8-5	Component Maintenance Assumptions	8-17
8-6	Operator Actions and Misposition Analysis Summary	8-18
8-7	Common Cause Failures Summary	8-19
8-8	Basic Events Database for the PRHR System Fault Trees (Sheets 1 – 3)	8-20
9-1	List of System Fault Trees	9-9
9-2a	Fault Tree CM2AB Success Criteria Summary	9-10
9-2b	Fault Tree CM2SL Success Criteria Summary	9-11
9-2c	Fault Tree CM2L Success Criteria Summary	9-12
9-2d	Fault Tree CM2P Success Criteria Summary	9-13
9-2e	Fault Tree CM1A Success Criteria Summary	9-14
9-2f	Fault Tree CM2LLT Success Criteria Summary	9-15
9-2g	Fault Tree CMBOTH Success Criteria Summary	9-16
9-2h	Fault Tree CM2LA Success Criteria Summary	9-17
9-3	Notes Related to System Fault Tree Assumptions	9-18
9-4	System Dependency Matrix	9-18
9-5	Component Test Assumptions	9-19
9-6	Component Maintenance Assumptions	9-19
9-7	Operator Actions and Misposition Analysis Summary	9-20
9-8	Common Cause Failure Analysis Summary	9-20
9-9	Fault Tree Basic Events for Core Makeup Tank Subsystem (Sheets 1 – 3)	9-21
10-1	List of System Fault Trees	10-5
10-2a	Fault Tree AC2AB Success Criteria Summary	10-6
10-2b	Fault Tree AC1A Success Criteria Summary	10-7
10-2c	Fault Tree ACBOTH Success Criteria Summary	10-8
10-3	Notes Related to System Fault Tree Assumptions	10-9
10-4	System Dependency Matrix	10-9
10-5	Component Test Assumptions	10-9
10-6	Component Maintenance Assumptions	10-10
10-7	Operator Actions and Misposition Analysis Summary	10-10
10-8	Common Cause Failure Analysis Summary	10-10
10-9	Fault Tree Basic Events for Accumulator Subsystem	10-11

LIST OF TABLES (Cont.)

Table No.	Title	Page
11-1a	List of ADS System Fault Trees (Sheets 1 – 2)	11-8
11-1b	List of ADS System Fault Trees (for Plant Damage States Analysis)	11-10
11-2a	ADS Success Criteria Versus Accident Conditions (Full Depressurization)	11-11
11-2b	ADS Success Criteria Versus Accident Conditions (Partial Depressurization)	11-12
11-2c	Automatic Depressurization System Fault Tree Summary (For Plant Damage States)	11-13
11-2d	Fault Tree "ADA" Success Criteria	11-13
11-2e	Fault Tree "ADAB" Success Criteria	11-14
11-2f	Fault Tree "ADAL" Success Criteria	11-15
11-2g	Fault Tree "ADB" Success Criteria	11-15
11-2h	Fault Tree "ADL" Success Criteria	11-16
11-2i	Fault Tree "ADM" Success Criteria	11-16
11-2j	Fault Tree "ADMA" Success Criteria	11-17
11-2k	Fault Tree "ADQ" Success Criteria	11-17
11-2l	Fault Tree "ADS" Success Criteria	11-18
11-2m	Fault Tree "ADT" Success Criteria	11-18
11-2n	Fault Tree "ADW" Success Criteria	11-19
11-2o	Fault Tree "AD1" Success Criteria	11-19
11-2p	Fault Tree "AD1A" Success Criteria	11-20
11-2q	Fault Tree "ADF" Success Criteria	11-20
11-2r	Fault Tree "ADR" Success Criteria	11-21
11-2s	Fault Tree "ADRA" Success Criteria	11-21
11-2t	Fault Tree "ADU" Success Criteria	11-22
11-2u	Fault Tree "ADUM" Success Criteria	11-22
11-2v	Fault Tree "ADV" Success Criteria	11-23
11-2w	Fault Tree "ADZ" Success Criteria	11-23
11-2x	Fault Tree "ADQLT" Data Summary	11-24
11-2y	Fault Tree "ADTLT" Success Criteria	11-24
11-3	Notes Related to ADS System Fault Tree Assumptions	11-25
11-4	System Dependencies Matrix	11-26
11-5	Component Test Assumptions	11-27
11-6	Component Maintenance Assumptions	11-27
11-7	Failure Probabilities Calculated	11-27
11-8	Operator Action Analysis Summary	11-28
11-9	Common Cause Failures Summary	11-28
11-10	Basic Events Data Base for the ADA System Fault Tree (Sheets 1 – 20)	11-29
12-1	List of System Fault Trees (FT)	12-10
12-2a	Fault Tree "IW2AB" Success Criteria Summary	12-11
12-2b	Fault Tree "IW2ABM" Success Criteria Summary	12-12
12-2c	Fault Tree "IW2ABA" Success Criteria Summary	12-13
12-2d	Fault Tree "IW2ABP" Success Criteria Summary	12-14
12-2e	Fault Tree "IW2ABPM" Success Criteria Summary	12-15

LIST OF TABLES (Cont.)

Table No.	Title	Page
12-2f	Fault Tree "IW2ABB" Success Criteria Summary	12-16
12-2g	Fault Tree "IW2ABBM" Success Criteria Summary	12-17
12-2h	Fault Tree "IW1A" Success Criteria Summary	12-18
12-2i	Fault Tree "IW1AM" Success Criteria Summary	12-19
12-2j	Fault Tree "IWF" Success Criteria Summary	12-20
12-2k	Fault Tree "RECIRC" Success Criteria Summary	12-21
12-2l	Fault Tree "RECIRCP" Success Criteria Summary	12-22
12-2m	Fault Tree "RECIRCB" Success Criteria Summary	12-23
12-2n	Fault Tree "RECIRC1" Success Criteria Summary	12-24
12-2o	Fault Tree "RECIRC1P" Success Criteria Summary	12-25
12-2p	Fault Tree "RECIRC1B" Success Criteria Summary	12-26
12-3	System Dependency Matrix	12-27
12-4	Component Test Assumptions	12-28
12-5	Component Maintenance Assumptions	12-28
12-6	Failure Probabilities Calculated	12-29
12-7	Operator Actions and Misposition Analysis Summary	12-29
12-8	Common Cause Failure Analysis Summary	12-30
12-9	Fault Tree Basic Events (Sheets 1 – 11)	12-31
13-1	List of System Fault Trees	13-7
13-2	Fault Tree PCT Success Criteria Summary	13-7
13-3	Notes Related to System Fault Trees Assumptions	13-7
13-4	System Dependency Matrix	13-8
13-5	Component Test Assumptions	13-8
13-6	Component Maintenance Assumptions	13-9
13-7	Operator Actions and Misposition Analysis Summary	13-9
13-8	Common Cause Failure Analysis Summary	13-9
13-9	Fault Tree Basic Events for Passive Containment Cooling System	13-10
14-1	List of System Fault Trees (At-Power)	14-8
14-2.a	Success Criteria Summary Fault Tree "FWT"	14-9
14-2.b	Success Criteria Summary Fault Tree "FWF"	14-10
14-2.c	Success Criteria Summary Fault Tree "SFWT"	14-11
14-2.d	Success Criteria Summary Fault Tree "SFW"	14-12
14-2.e	Success Criteria Summary Fault Tree "SFW1"	14-13
14-2.f	Success Criteria Summary Fault Tree "SFWP"	14-14
14-2.g	Success Criteria Summary Fault Tree "SFWM"	14-15
14-2.h	Success Criteria Summary Fault Tree "SFWA"	14-16
14-2.i	Success Criteria Summary Fault Tree "COND"	14-17
14-2.j	Success Criteria Summary Fault Tree "COND1"	14-18
14-2.k	Success Criteria Summary Fault Tree "CDS"	14-19
14-2.l	Success Criteria Summary Fault Tree "TCCW"	14-20
14-3	Notes to System Fault Tree Assumptions	14-21

LIST OF TABLES (Cont.)

Table No.	Title	Page
14-4	System Dependency Matrix (Sheets 1 – 2)	14-22
14-5	Component Test Assumptions	14-24
14-6	Component Maintenance Assumptions	14-25
14-7	Failure Probabilities Calculated in this Section	14-25
14-8	Operator Action Analysis Summary	14-26
14-9	Common Cause Failure (CCF) Summary	14-27
14-10	Fault Tree Basic Event for Main and Startup Feedwater System (Sheets 1 – 9)	14-28
15-1	List of System Fault Trees	15-9
15-2a	Fault Tree CSBOR1 Success Criteria Summary	15-10
15-2b	Fault Tree CVS1 Success Criteria Summary	15-11
15-2c	Fault Tree CSAX Success Criteria Summary	15-12
15-2d	Fault Tree SGHL Success Criteria Summary	15-13
15-2e	Fault Tree CSP Success Criteria Summary	15-14
15-3	Notes Related to System Fault Tree Assumptions	15-15
15-4	System Dependency Matrix	15-16
15-5	Component Test Assumptions	15-17
15-6	Component Maintenance Assumptions	15-18
15-7	Operator Actions and Misposition Analysis Summary	15-19
15-8	Common Cause Failure Analysis Summary	15-20
15-9	Fault Tree Basic Events for Chemical and Volume Control System (Sheets 1 – 4)	15-21
16-1	List of System Fault Trees	16-5
16-2	Fault Tree VLH Success Criteria Summary	16-5
16-3	Notes Related to System Fault Tree Assumptions	16-5
16-4	System Dependency Matrix	16-6
16-5	Component Test Assumptions	16-6
16-6	Component Maintenance Assumptions	16-6
16-7	Operator Actions and Misposition Analysis Summary	16-7
16-8	Common Cause Failure Analysis Summary	16-7
16-9	Fault Tree Basic Events for Containment Hydrogen Control System	16-8
17-1	List of System Fault Trees	17-7
17-2	Fault Tree Success Criteria Summary (Sheets 1 – 2)	17-8
17-3	Notes Related to System Fault Tree Assumptions	17-10
17-4	System Dependencies Matrix	17-11
17-5	Component Test Assumptions	17-12
17-6	Component Maintenance Assumptions	17-12
17-7	Operator Actions and System Misposition Analysis Summary	17-13
17-8	Common Cause Failure Summary	17-13
17-9	Fault Tree Basic Events for Normal Residual Heat Removal System (Sheets 1 – 5)	17-14

LIST OF TABLES (Cont.)

Table No.	Title	Page
18-1	List of System Fault Trees	18-6
18-2a	Fault Tree CCN Success Criteria Summary	18-6
18-2b	Fault Tree CCT Success Criteria Summary	18-7
18-2c	Fault Tree CCP Success Criteria Summary	18-7
18-3	Notes Related to System Fault Tree Assumptions	18-8
18-4	System Dependency Matrix	18-8
18-5	Component Test Assumptions	18-9
18-6	Component Maintenance Assumptions	18-9
18-7	Operator Actions and Misposition Analysis Summary	18-10
18-8	Common Cause Failure Analysis Summary	18-10
18-9	Fault Tree Basic Events for Component Cooling Water System (Sheets 1 – 2)	18-11
19-1	List of System Fault Trees	19-6
19-2a	Fault Tree SWN Success Criteria Summary	19-6
19-2b	Fault Tree SWT Success Criteria Summary	19-7
19-2c	Fault Tree SWP Success Criteria Summary	19-7
19-3	Notes Related to System Fault Tree Assumptions	19-8
19-4	System Dependency Matrix	19-9
19-5	Component Test Assumptions	19-10
19-6	Component Maintenance Assumptions	19-10
19-7	Operator Actions and Misposition Analysis Summary	19-11
19-8	Common Cause Failure Analysis Summary	19-11
19-9	Fault Tree Basic Events for Service Water System (Sheets 1 – 4)	19-12
20-1	List of System Fault Trees	20-5
20-2	Fault Tree VWH Success Criteria Summary	20-5
20-3	Notes Related to System Fault Tree Assumptions	20-5
20-4	System Dependency Matrix	20-6
20-5	Component Test Assumptions	20-7
20-6	Component Maintenance Assumptions	20-7
20-7	Operator Actions and Misposition Analysis Summary	20-8
20-8	Common Cause Failure Analysis Summary	20-8
20-9	Fault Tree Basic Events for Central Chilled Water System (Sheets 1 – 2)	20-9
21-1	List of System Fault Trees (Sheets 1 – 3)	21-9
21-2	Fault Tree Success Criteria Summary (Sheets 1 – 16)	21-12
21-3	Notes Related to System Fault Tree Assumptions (Sheets 1 – 3)	21-28
21-4	System Dependency Matrix	21-31
21-5	Component Test Assumptions	21-31
21-6	Component Maintenance Assumptions	21-32
21-7	Operator Actions and Misposition Analysis Summary	21-32
21-8	Common Cause Failure Analysis Summary	21-32
21-9	Fault Tree Basic Events for AC Power System (Sheets 1 – 22)	21-33

LIST OF TABLES (Cont.)

Table No.	Title	Page
22-1	List of System Fault Trees (Sheets 1 – 4)	22-6
22-2	Fault Tree Success Criteria Summary (Sheets 1 – 16)	22-10
22-3	Notes Related to System Fault Tree Assumptions	22-26
22-4	Systems Dependency Matrix	22-26
22-5	Component Test Assumptions	22-27
22-6	Component Maintenance Assumptions	22-27
22-7	Operator Actions and Misposition Analysis Summary	22-27
22-8	Common Cause Failure Analysis Summary	22-28
22-9	Fault Tree Basic Events for Class 1E DC and UPS System (Sheets 1 – 12)	22-29
22-10	System Power Requirements/Dependencies (Sheets 1 – 11)	22-41
23-1	List of System Fault Trees (Sheets 1 – 3)	23-6
23-2	Fault Tree Success Criteria Summary (Sheets 1 – 10)	23-9
23-3	Notes Related to System Fault Tree Assumptions	23-19
23-4	System Dependency Matrix	23-19
23-5	Component Test Assumptions	23-20
23-6	Component Maintenance Assumptions	23-20
23-7	Operator Actions and Misposition Analysis Summary	23-20
23-8	Common Cause Failure Analysis Summary	23-21
23-9	Fault Tree Basic Events for Non-Class 1E DC and UPS Power System (Sheets 1 – 20)	23-22
24-1	AP1000 Containment Penetration List (Sheets 1 – 4)	24-7
24-2	Screening Analysis Evaluation (Sheets 1 – 5)	24-16
24-3	Containment Penetrations Not Screened Out for Normal Operation at Power Analysis	24-21
24-4	List of System Fault Trees	24-21
24-5a	Fault Tree CIC Success Criteria Summary	24-22
24-5b	Fault Tree CIA Success Criteria Summary	24-22
24-5c	Fault Tree CIB Success Criteria Summary	24-23
24-6	Notes Related to System Fault Tree Assumptions	24-23
24-7	System Dependency Matrix (Sheets 1 – 3)	24-24
24-8	Component Test Assumptions	24-27
24-9	Component Maintenance Assumptions	24-27
24-10	Operator Actions and Misposition Analysis Summary	24-28
24-11	Common Cause Failure Analysis Summary	24-28
24-12	Fault Tree Basic Events for Containment Isolation System (Sheets 1 – 3)	24-29
25-1	List of System Fault Trees	25-8
25-2a	Fault Tree CAIAIR Success Criteria Summary	25-9
25-2b	Fault Tree CAIR Success Criteria Summary	25-9
25-2c	Fault Tree CAIAIRP Success Criteria Summary	25-10
25-2d	Fault Tree ENDCAIAI Success Criteria Summary	25-10

LIST OF TABLES (Cont.)

Table No.	Title	Page
25-2e	Fault Tree ENDCAIAP Success Criteria Summary	25-11
25-2f	Fault Tree CASF Success Criteria Summary	25-11
25-3	Notes Related to System Fault Tree Assumptions	25-12
25-4	System Dependency Matrix	25-12
25-5	Component Test Assumptions	25-12
25-6	Component Maintenance Assumptions	25-13
25-7	Operator Actions and Misposition Analysis Summary	25-13
25-8	Common Cause Failure Analysis Summary	25-13
25-9	Fault Tree Basic Events for Instrument Air Subsystem (Sheets 1 – 4)	25-14
26-1	List of System Fault Trees	26-25
26-2a	Fault Tree RTPMS, and RTPMS1 Success Criteria Summary	26-26
26-2b	Fault Tree RTSTP Success Criteria Summary	26-26
26-2c	Fault Tree RCL Success Criteria Summary	26-27
26-2d.1	Fault Tree RCT Success Criteria Summary	26-27
26-2d.2	Fault Tree RCN Success Criteria Summary	26-28
26-2e	I&C Subtree Success Criteria Summary (Sheets 1 – 98)	26-29
26-3a	PMS I&C Subtree Constructions (Sheets 1 – 19)	26-127
26-3b	Representative PMS I&C Subtree Plot Listing (Sheets 1 – 14)	26-146
26-4	PMS Dependency Matrix (Sheets 1 – 3)	26-160
26-5	PMS Components Test Assumptions	26-163
26-6	Component Maintenance Assumptions	26-163
26-7	Failure Probabilities Calculated in this Section (Sheets 1 – 5)	26-164
26-8	Operator Actions and System Misposition Analysis Summary (Sheets 1 – 3)	26-169
26-9	Common Cause Failure Analysis Summary (Sheets 1 – 2)	26-172
26-10a	Fault Tree Basic Events for Reactor Trip System (Sheets 1 – 4)	26-174
26-10b	Fault Tree Basic Events for the I&C Subsystem (Sheets 1 – 49)	26-178
26-11	Assumed List of I&C Instrumentation (Sheets 1 – 3)	26-227
27-1	List of System Fault Trees	27-9
27-2a	Fault Tree DAS Success Criteria Summary	27-9
27-2b	Fault Tree DAS1 Success Criteria Summary	27-9
27-3	Notes Related to System Fault Tree Assumptions	27-10
27-4	System Dependency Matrix	27-10
27-5	Component Test Assumptions	27-10
27-6	Component Maintenance Assumptions	27-10
27-7	Operator Actions and Misposition Analysis Summary	27-10
27-8	Common Cause Failure Analysis Summary	27-11
27-9	Fault Tree Basic Events for Diverse Actuation System	27-12
28-1	List of System Fault Trees	28-20
28-2	Fault Tree Success Criteria Summary (Sheets 1 – 22)	28-21
28-3	PLS I&C Subtree Constructions (Sheets 1 – 9)	28-43

LIST OF TABLES (Cont.)

Table No.	Title	Page
28-4	PLS Dependency Matrix (Sheets 1 – 2)	28-52
28-5	PLS Components Test Assumptions	28-54
28-6	Component Maintenance Assumptions	28-54
28-7	Failure Probabilities Calculated in this Section (Sheets 1 – 3)	28-55
28-8	Operator Actions and System Misposition Analysis Summary (Sheets 1 – 2)	28-58
28-9	Common Cause Failure Analysis Summary (Sheets 1 – 2)	28-60
28-10	Fault Tree Basic Events for I&C Subsystem (Sheets 1 – 68)	28-62
28-11	Assumed List of I&C Instrumentation (Sheets 1 – 3)	28-130
28-12	Assignments of Plant Systems to Logic Cabinets	28-133
28-13	Assignments of Plant Systems to the Control Group Cabinets	28-134
29-1	Electrical Components with Low CCF Rate	29-18
29-2	Common-Cause Failure Calculations (Sheets 1 – 5)	29-19
29-3	Simplification of Q_K/Q_T Equations	29-24
29A-1	Extreme Environmental Conditions (Generic Causes of Dependent Failures) Excerpted from the ANS/IEEE PRA Procedures Guide (NUREG-2300)	29A-11
29A-2	Common-Cause Failures Among Systems	29A-12
29A-3	Common-Cause Failure Equations for MGL Method	29A-13
30-1	AP1000 Human Error Probability Summary Results (Sheets 1 – 16)	30-75
30-2	Manual DAS Actuation (Sheets 1 – 2)	30-91
30-3	Dependency Level Evaluation Summary (Sheets 1 – 14)	30-93
30-4	Dependency Level Evaluation (Sheets 1 – 3)	30-107
30-5	List of Acronyms	30-110
30A-1	Analyst Responsibility Based on Sharp Steps	30A-10
30A-2	Summary of Screening Values	30A-11
30A-3	Example of Operator Action Definition	30A-12
30A-4	HEP Data Bank (Sheets 1 – 5)	30A-13
31-1	Summary of Event Tree Scalar Probabilities	31-12
32-1	Generic Data Base (Sheets 1 – 13)	32-5
32-2	Test and Maintenance Outage Generic Data	32-21
32-3	Test and Maintenance Unavailabilities Used in AP1000 Core Damage Quantification	32-22
32-4	Common Cause Factors (Sheets 1 – 5)	32-23
32-5	SIMON.OUT File (Sheets 1 – 21)	32-29
33-1	Summary of AP1000 System Fault Tree Failure Probabilities (Sheets 1 – 13)	33-7
33-2	Example Accident Sequence Definitions for Large LOCA	33-20
33-3	AP1000 PRA Dominant CDF Cutsets (Sheets 1 – 10)	33-21

LIST OF TABLES (Cont.)

Table No.	Title	Page
33-4	AP1000 PRA Dominant CDF Sequences (Sheets 1 – 18)	33-31
33-5	Contribution of Initiating Events to Plant Core Damage Frequency	33-49
33-6	List of Basic Events and Their Descriptions (Sheets 1 – 33)	33-50
34-1	Post-Accident Monitoring Equipment (Sheets 1 – 2)	34-23
34-2	Level 1 Accident Class	34-25
34-3	Summary of Release Categories	34-26
34-4	3BE-1 Event Summary	34-27
34-5	3BE-2 Event Summary	34-28
34-6	3BE-4 Event Summary	34-29
34-7	3BE-5 Event Summary	34-30
34-8	3BE-6 Event Summary	34-31
34-9	3BE-7 Event Summary	34-32
34-10	3BE-3 Event Summary	34-33
34-11	3BL-1 Event Summary	34-34
34-12	3BL-2 Event Summary	34-35
34-13	3BR-1 Event Summary	34-36
34-14	3BR-1a Event Summary	34-37
34-15	3C-1 Event Summary	34-38
34-16	3C-2 Event Summary	34-39
34-17	3D-1 Event Summary	34-40
34-18	3D-2 Event Summary	34-41
34-19	3D-3 Event Summary	34-42
34-20	3D-4 Event Summary	34-43
34-21	6E-1 Event Summary	34-44
34-22	6L-1 Event Summary	34-45
34-23	1AP-1 Event Summary	34-46
34-24	1AP-2 Event Summary	34-47
34-25	1A-1 Event Summary	34-48
34-26	1A-2 Event Summary	34-49
34-27	CFI Event Summary	34-50
34-28	CFL Event Summary	34-51
35-1	Functional Definitions of Level 1 Accident Classes	35-21
35-2	CET Initial Conditions for Level 1 Accident Classes	35-22
35-3	Containment Event Tree Nodal Questions	35-23
35-4	Summary of Release Category Definitions	35-24
35-5	Summary of Containment Event Tree Success Criteria (Sheets 1 – 3)	35-25
35-6	Summary of Operator Actions Credited on Containment Event Tree	35-28
36-1	Summary Table for RCS Depressurization (CET Node DP)	36-6
37-1	Summary Table for Containment Isolation (CET Node IS)	37-4

LIST OF TABLES (Cont.)

Table No.	Title	Page
38-1	Summary Table for Reflooding (CET Node RFL)	38-5
39-1	Material Inventories in AP1000 Reactor Vessel	39-21
39-2	Summary Table for Reactor Cavity Flooding (CET Node IR)	39-22
39-3	Summary Table for Debris Relocation to Cavity (CET Node VF)	39-22
39A-1	Core and Lower Internals Material Inventories in AP1000 Reactor Vessel	39A-14
39A-2a	Mass and Power Distributions of Debris Layers in Top-Skewed Power Shape Case	39A-15
39A-2b	Mass and Power Distributions of Debris Layers in Chopped Cosine Power Shape Case	39A-16
39A-3a	Results of Top-Skewed Power Shape Case	39A-17
39A-3b	Relocation Results of the Chopped Cosine Power Shape Case	39A-18
39A-4	Material Properties Used in In-Vessel Melting and Relocation Calculation	39A-19
39A-5	Debris Relocation Time Line	39A-20
40-1	Summary of Nodal Failure Probabilities	40-6
40-2	Nominal and Bounding Containment Failure Probability at 24 and 72 Hours	40-6
41-1	Containment Event Tree IG Nodal Failure Probability	41-33
41-2	Containment Event Tree Nodal Failure Probabilities	41-33
41-3	AP600 Scenario Dependencies for Early Detonation Analysis	41-34
41-4	Safety Margin Basis Containment Performance Requirement	41-35
41A-1	Summary of System Assumptions for AP1000 MAAP4.04 Hydrogen Analyses (Sheets 1 – 7)	41A-2
41A-2	Summary of Hydrogen Generation Results MAAP4 Hydrogen Mixing Analyses	41A-10
41A-3	Summary of Early Compartment Gas Composition Results For MAAP4 Hydrogen Mixing Analyses	41A-10
41A-4	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-11
41A-5	Summary of Hydrogen Generation Results MAAP4 Hydrogen Mixing Analyses	41A-11
41A-6	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-12
41A-7	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-12
41A-8	Summary of Hydrogen Generation Results MAAP4 Hydrogen Mixing Analyses	41A-13
41A-9	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-14
41A-10	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-15
41A-11	Summary of Hydrogen Generation Results MAAP4 Hydrogen Mixing Analyses	41A-15

LIST OF TABLES (Cont.)

Table No.	Title	Page
41A-12	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-16
41A-13	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-16
41A-14	Summary of Hydrogen Generation Results MAAP4 Hydrogen Mixing Analyses	41A-17
41A-15	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-17
41A-16	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-18
41A-17	Summary of Hydrogen Generation Results MAAP4 Hydrogen Mixing Analyses	41A-18
41A-18	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-19
41A-19	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-19
41A-20	Summary of Hydrogen Generation Results MAAP4 Hydrogen Mixing Analyses	41A-20
41A-21	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-20
41A-22	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-21
41A-23	Sequence 1A-3a	41A-22
41A-24	Sequence 1A-4a	41A-23
41A-25	Sequence 1AP-3	41A-24
41A-26	Sequence 1AP-4	41A-25
41A-27	Sequence 3D-1	41A-26
41A-28	Sequence 3D-2	41A-27
41A-29	Sequence 3D-3	41A-28
41A-30	Sequence 3D-5	41A-29
41A-31	Sequence 3BL-1	41A-30
41A-32	Sequence 3BL-2	41A-31
41A-33	Sequence 3C-1	41A-32
41A-34	Sequence 3BR-1a	41A-33
41A-35	Sequence 3BE-1	41A-34
41A-36	Sequence 3BE-2	41A-35
41A-37	Sequence 3BE-4	41A-36
41A-38	Sequence 3BE-5	41A-37
41A-39	Sequence 3BE-6	41A-38
41A-40	Sequence 3BE-8	41A-39
41A-41	Sequence 3BE-9	41A-40
42-1	Parameters Used in the Construction of the AP1000 Conditional Containment Failure Probability Distribution for Containment Temperature = 400°F	42-9
42-2	Parameters Used in the Construction of the AP1000 Conditional Containment Failure Probability Distribution for Containment Temperature = 331°F	42-9

LIST OF TABLES (Cont.)

Table No.	Title	Page
42-3	Cumulative Containment Failure Probability, Temperature = 400°F	42-10
42-4	Cumulative Containment Failure Probability, Temperature = 331°F	42-11
43-1	Accident Class Frequencies	43-13
43-2	Boolean Expressions to Calculate Q1-Q29	43-14
43-3	CET Node Probabilities (Sheets 1 – 3)	43-15
43-4	Boolean Expressions for P1-P15	43-18
43-5	Contribution of PDS to LRF (Sheets 1 – 3)	43-19
43-6	Dominant CET Sequences Contributing to LRF (Sheets 1 – 69)	43-22
43-7	Summary of Release Frequency Calculations (Sheets 1 – 2)	43-91
43-8	LRF and Containment Effectiveness by Accident Class	43-93
43-9	Summary of AP1000 LRF Quantification for Internal Events At-Power	43-94
43-10	CET Event Tree Node Importances	43-95
43-11	Contribution of Initiating Events to Large Release	43-96
43-12	LRF Sensitivity Case – Non Credit for Standby Non-Safety Systems (Sheets 1 – 9)	43-97
43-13	LRF Cutsets for the Case – Sensitivity to Standby Systems With Credit for Manual DAS (Sheets 1 – 13)	43-106
43A-1	AP1000 PRA Dominant CDF Sequences for At-Power Events (Sheets 1 – 6)	43A-2
43A-2	AP1000 PRA PDS Frequencies for At-Power Events	43A-8
43B-1	Calculation of Failure Probability of DP for PDS 6 (Sheets 1 – 7)	43B-2
43C-1	Evaluation of CET-Related Operator Actions	43C-2
44-1	MAAP Model Benchmarks (Sheets 1 – 4)	44-8
45-1	Environmental Release Fractions at 24 Hours After Core Damage Per Release Category	45-5
45-2	Environmental Release Fractions at 72 Hours After Core Damage Per Release Category	45-6
49-1	AP1000 Source Terms from Level 2 Analysis (MAAP)	49-9
49-2	AP1000 Source Terms for Dose Evaluation (MACCS2)	49-10
49-3	Site Boundary Whole Body Dose [Effective Dose Equivalent (EDE)], Sieverts	49-11
49-4	Site Boundary Thyroid Dose, Sieverts	49-12
49-5	Population Whole Body Dose [Effective Dose Equivalent (EDE)], 0-80.5 km Person-Sieverts	49-13
49-6	Site Boundary Red Marrow Dose (Total Acute), Sieverts	49-14
49-7	Dose Summary	49-15
49-8	Site Boundary Whole Body EDE Dose Risk – 24 Hours	49-16

LIST OF TABLES (Cont.)

Table No.	Title	Page
49-9	Site Boundary Whole Body EDE Dose Risk – 72 Hours	49-17
49-10	Population Whole Body EDE Dose Risk – 24 Hours	49-18
49-11	Population Whole Body EDE Dose Risk – 72 Hours	49-19
50-1	Core Damage for At-Power Events Contribution of Initiating Events to Plant Core Damage Frequency	50-16
50-2	Core Damage for At-Power Events Conditional Core Damage Probability of Initiating Events	50-17
50-3	AP1000 PRA Core Damage for At-Power Events Accident Sequence Importances (Sheets 1 – 5)	50-18
50-4	Core Damage for At-Power Events End State Importances	50-23
50-5	Common Cause Importances – Risk Decrease (Sheets 1 – 2)	50-24
50-6	Common Cause Importances – Risk Increase (Sheets 1 – 3)	50-26
50-7	Human Error Risk Importances – Risk Decrease (Sheets 1 – 2)	50-29
50-8	Human Error Risk Importances – Risk Increase (Sheets 1 – 2)	50-31
50-9	Component Importances – Risk Decrease (Sheets 1 – 2)	50-33
50-10	Component Importances – Risk Increase (Sheets 1 – 4)	50-35
50-11	List of Systems for System Importance Analyses (Sheets 1 – 4)	50-39
50-12	System Importance Calculation Results (Sheets 1 – 2)	50-43
50-13	Systems Grouped by PRA System Importance	50-45
50-14	Operator Actions in "CMTOT.OUT" File	50-46
50-15	Contribution of IEVs to Core Damage Frequency	50-47
50-16	Case 29 – Top 50 Dominant Cutsets (Sheets 1 – 2)	50-48
50-17	Case 30 – Top 50 Dominant Cutsets (Sheets 1 – 2)	50-50
50-18	Case 31 – Top 50 Dominant Cutsets (Sheets 1 – 3)	50-52
50-19	Passive System Check Valves in "CMTOT.OUT" File	50-55
50-20	Sensitivity Case 36 – Contribution of Initiating Events to CDF	50-56
50-21	Sensitivity Case 36 – Top 50 CDF Cutsets (Sheets 1 – 8)	50-57
50-22	Risk Importances Sorted by Basic Event Identification (Sheets 1 – 13)	50-65
50-23	Risk Importances Sorted by Risk Increase (Sheets 1 – 15)	50-78
50-24	Risk Importances Sorted by Risk Decrease (Sheets 1 – 15)	50-93
50-25	Risk Increases Sorted by Slope (Birnbaum) Importance (Sheets 1 – 13)	50-108
51-1	Summary of Results of AP1000 PRA Uncertainty Analysis for Internal Initiating Events at Power	51-9
51-2	List of Input Cutset Files	51-10
51A-1	Basic Event Uncertainties (Sheets 1 – 32)	51A-3
54-1	AP1000 Initiating Event Frequencies During Shutdown Conditions	54-18
54-2	AP1000 Design Impact on AP600 Shutdown Model	54-19
54-3	Times for Loss of RNS at Mid-loop Without IRWST Injection	54-20
54-4	AP1000 & AP600 Initiating Event CDF Contributions	54-21

LIST OF TABLES (Cont.)

Table No.	Title	Page
54-5	AP600 Shutdown Level 1 PRA Top 200 Cutsets (Sheets 1 – 25)	54-22
54-6	AP1000 Shutdown Level 1 PRA Top 200 Cutsets (Sheets 1 – 25)	54-47
54-7	Basic Event Probabilities Revised in Case 1	54-72
54-8	Revised CCF Basic Event Probabilities (Sheets 1 – 2)	54-73
54-9	Contribution of Initiating Events to Plant CDF – Shutdown Sensitivity Case 1	54-75
54-10	AP1000 Shutdown PRA Sensitivity Case 2 CDF Cutsets (Sheets 1 – 5)	54-76
54-11	List of Basic Events "Dropped" to Make the Sensitivity Case 2	54-81
54-12	Contribution of Initiating Events to Plant CDF – Shutdown Sensitivity Case 2	54-82
54-13	Shutdown PRA Sensitivity Case 3 (Sheets 1 – 28)	54-83
54-14	Basic Events Whose Probabilities are Changed in Case 3	54-111
54-15	AP1000 Shutdown PRA Sensitivity Case 4 CDF Cutsets (Sheets 1 – 7)	54-112
54-16	List of Basic Events "Dropped" to Make the Sensitivity Case 4	54-119
54-17	Contribution of Initiating Events to Plant CDF – Shutdown Sensitivity Case 4	54-120
54-18	AP1000 Shutdown PRA Basic Event Risk Importances – RAW (Sheets 1 – 8)	54-121
54-19	AP1000 Shutdown PRA Basic Event Risk Importances – RRW (Sheets 1 – 3)	54-129
54-20	AP1000 Shutdown PRA Case 2 Basic Event Risk Importances – RAW (Sheets 1 – 4)	54-132
54-21	AP1000 Shutdown PRA Case 2 Basic Event Risk Importances – RRW (Sheets 1 – 2)	54-136
55-1	Seismic Margin HCLPF Values (Sheets 1 – 4)	55-21
55-2	Basic Event HCLPF Values (Sheets 1 – 3)	55-25
55-3	EQ-IEV-STRUC HCLPF	55-28
55-4	EQ-IEV-RVFA HCLPF	55-28
55-5	EQ-IEV-LLOCA HCLPF	55-29
55-6	EQ-IEV-SLOCA HCLPF	55-29
55-7	EQ-IEV-ATWS HCLPF	55-29
56-1	Flooding Analysis Initial Screening Results (Sheets 1 – 3)	56-50
56-2	At-Power Detailed Screening Results (Sheets 1 – 5)	56-53
56-3	At-Power Flooding-Induced Core Damage Frequency Quantification Summary Results (Sheets 1 – 6)	56-58
56-4	Power Upgrade Difference Between AP1000 and AP600	56-64
56-5	Shutdown Flooding PRA	56-65
56-6	Shutdown Initiating Event CCDPs	56-66
57-1	AP1000 Fire Areas Excluding the Containment (Sheets 1 – 6)	57-43
57-2	AP1000 Fire Areas in the Containment (Sheets 1 – 2)	57-49
57-3	Fire Ignition Frequencies for AP1000 Fire Areas (Sheets 1 – 4)	57-51
57-4	Fire Ignition Frequencies for AP1000 Containment Fire Area	57-58
57-5	Fire Barrier Failure Probabilities	57-61
57-6	Automatic Suppression System Reliability	57-62

LIST OF TABLES (Cont.)

Table No.	Title	Page
57-7	Summary of Qualitative Evaluation Results – Power Operation – Plant except Containment and Main Control Room (Sheets 1 – 15)	57-63
57-8	Summary of Qualitative Evaluation Results for Containment at Power Operation (Sheets 1 – 4)	57-82
57-9	Summary of Results (Sheets 1 – 5)	57-88
57-10	Distribution of Fire CDF Frequency by Three Major Plant Areas	57-93
57-11	Distribution of Fire CDF Frequency by Eight Plant Areas	57-94
57-12	Fire Areas Sorted by CDF (Sheets 1 – 5)	57-95
57-13	Fire Areas Sorted by CDF/FIEV (Sheets 1 – 5)	57-100
57-14	Credit for Manual Fire Suppression	57-105
57-15	Reduction of Hot Short Probability	57-106
57-16	Increase of Hot Short Probability	57-107
57-17	Sensitivity to Human Actions	57-108
57-18	Sensitivity to Fire Ignition Frequencies	57-109
57-19	Sensitivity to Actuation by DAS	57-110
57-20	Plant Fire CDF Without Hot Shorts	57-111
57-21	Contribution of the Plant Areas to CDF	57-112
57-22	Dominant Fire Scenarios (Sheets 1 – 4)	57-113
57-23	AP1000 Shutdown CCDPs	57-117
57-24	AP1000 Dominant Fire Sequences (Sheets 1 – 4)	57-118
57-25	Dominant Fire Scenarios from AP600 Shutdown Fire PRA	57-122
57-26	Summary of AP1000 Shutdown Fire Evaluation	57-123
57-27	Main Contributors for Shutdown Fire Risk	57-124
57A-1	Summary of Scenario CCDPs (Sheets 1 – 5)	57A-7
57A-2	AP1000 Base Case CCDPs for Initiating Events	57A-12
57A-3	DAS-ACT Fault Tree Cutsets Before Subtree Reduction	57A-13
57A-4	DAS-ACT Fault Tree Cutsets After Subtree Reduction (Sheets 1 – 10)	57A-14
57A-5	DAS-ACT Fault Tree Cutsets After Subtree Reduction (Sheets 1 – 9)	57A-24
57A-6	AP1000 Fire PRA Scenario CCDPs for Over-Conservative Cases (Sheets 1 – 3)	57A-33
57C-1	Data Used in Event Tree Scenario Frequency Calculations (Sheets 1 – 5)	57C-2
57C-2	CCDPs Used in Fire Event Trees (Sheets 1 – 5)	57C-7
59-1	Contribution of Initiating Events to Core Damage	59-39
59-2	Conditional Core Damage Probability of Initiating Events	59-40
59-3	Internal Initiating Events at Power Dominant Core Damage Sequences (Sheets 1 – 4)	59-41
59-4	Sequence 1 – Safety Injection Line Break Dominant Cutsets (SI-LB-07) (Sheets 1 – 3)	59-45
59-5	Sequence 2 – Large LOCA Dominant Cutsets (LLOCA-09)	59-48

LIST OF TABLES (Cont.)

Table No.	Title	Page
59-6	Sequence 3 – Spurious ADS Actuation Dominant Cutsets (SPADS-08) (Sheets 1 – 3)	59-49
59-7	Sequence 4 – Safety Injection Line Break Dominant Cutsets (SI-LB-08) (Sheets 1 – 3)	59-52
59-8	Sequence 5 – Reactor Vessel Rupture Cutset (RV-RP-02)	59-55
59-9	Sequence 6 – Small LOCA Dominant Cutsets (SLOCA-05) (Sheets 1 – 3)	59-56
59-10	Sequence 7 – Medium LOCA Dominant Cutsets (MLOCA-05) (Sheets 1 – 3)	59-59
59-11	Sequence 8 – Small LOCA Dominant Cutsets (SLOCA-12) (Sheets 1 – 3)	59-62
59-12	Sequence 9 – Medium LOCA Dominant Cutsets (MLOCA-12) (Sheets 1 – 3)	59-65
59-13	Sequence 10 – Spurious ADS Actuation Dominant Cutsets (SPADS-09) (Sheets 1 – 3)	59-68
59-14	Typical System Failure Probabilities, Showing Higher Reliabilities for Safety Systems	59-71
59-15	Summary of AP1000 PRA Results	59-72
59-16	Site Boundary Whole Body EDE Dose Risk – 24 Hours	59-73
59-17	Comparison of AP1000 PRA Results to Risk Goals	59-74
59-18	AP1000 PRA-Based Insights (Sheets 1 –24)	59-75

LIST OF FIGURES

Figure No.	Title	Page
2-1	Core Damage Logic Diagram for Internal Initiators (Sheets 1 – 4)	2-47
4A-1	Example Event Tree for Illustration of Terminology	4A-19
4A-2	Functional Event Tree	4A-20
4A-3	Illustration of A/B and A&B Notation	4A-21
4A-4	Illustration of Consequential Event and ATWS End States	4A-22
4A-5	AP1000 PRA Transients Template Event Tree (Sheets 1 – 3)	4A-23
4A-6	AP1000 PRA Small LOCA Template Event Tree (Sheets 1 – 2)	4A-26
4B-1	AP1000 Large LOCA Event Tree (Sheets 1 – 2)	4B-2
4B-2	AP1000 Large Spurious ADS Actuation Event Tree (Sheets 1 – 2)	4B-4
4B-3	AP1000 Medium LOCA Event Tree (Sheets 1 – 4)	4B-6
4B-4	AP1000 CMT Line Break Event Tree (Sheets 1 – 4)	4B-10
4B-5	AP1000 SI Line Break Event Tree (Sheets 1 – 3)	4B-14
4B-6	AP1000 Small LOCA Event Tree (Sheets 1 – 6)	4B-17
4B-7	AP1000 RCS Leak Event Tree	4B-23
4B-8	AP1000 Passive RHR Tube Rupture Event Tree	4B-24
4B-9a	AP1000 Steam Generator Tube Rupture Event Tree (Sheets 1 – 3)	4B-25
4B-9b	AP1000 SGTR Continues Event Tree (Sheets 1 – 6)	4B-28
4B-10	AP1000 Reactor Vessel Rupture Event Tree	4B-34
4B-11	AP1000 Interfacing Systems LOCA Event Tree	4B-35
4B-12	AP1000 Transients With Main Feedwater Event Tree (Sheets 1 – 4)	4B-36
4B-13	AP1000 Loss of Reactor Coolant Flow Event Tree (Sheets 1 – 4)	4B-40
4B-14	AP1000 Loss of Feedwater to One SG Tree (Sheets 1 – 4)	4B-44
4B-15	AP1000 Transients With Core Power Excursion Event Tree (Sheets 1 – 4)	4B-48
4B-16	AP1000 Transients With Loss of CCW/SW Event Tree (Sheets 1 – 4)	4B-52
4B-17	AP1000 Loss of MFW Event Tree (Sheets 1 – 4)	4B-56
4B-18	AP1000 Loss of Condenser Event Tree (Sheets 1 – 4)	4B-60
4B-19	AP1000 Loss of Main Compressed Air Event Tree (Sheets 1 – 4)	4B-64
4B-20	AP1000 Loss of Offsite Power Event Tree (Sheets 1 – 7)	4B-68
4B-21	Main Steam Line Break Downstream of MSIVs Event Tree (Sheets 1 – 5)	4B-75
4B-22	Main Steam Line Break Upstream of MSIVs Event Tree (Sheets 1 – 9)	4B-80
4B-23	Stuck Open Secondary Side Safety Valve Event Tree (Sheets 1 – 5)	4B-89
4B-24a	ATWS Precursor Without Main Feedwater	4B-94
4B-24b	AP1000 ATWS Precursor Without Main Feedwater Continues Event Tree (Sheets 1 – 6)	4B-95
4B-25	ATWS Precursor With SI (Sheets 1 – 6)	4B-101
4B-26	ATWS Precursor With MFW (Sheets 1 – 4)	4B-107
7-1	Power/Control Model for Large Loads (6900-vac/480-vac Pumps, Fans, and Motors)	7-33
7-2	Power/Control Model for Motor-Operated Valves	7-35
7-3	Power/Control Model for Air-Operated Valves	7-37

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
7-4	Power/Control Model for Variable Speed Motor	7-39
7-5	An Illustration of Fault Tree Basic Events for a Pump Following the Model Given in Figure 7-1	7-41
8-1	PRHR – Simplified Piping and Instrumentation Diagram	8-23
8-2	PRHR – Simplified Valve Control Diagram	8-25
9-1	Passive Core Cooling System Simplified Sketch	9-24
9-2	Passive Core Cooling System Piping and Instrumentation Diagram	9-25
10-1	Passive Core Cooling System – Accumulator Subsystem	10-12
11-1	Automatic Depressurization System Simplified Piping and Instrumentation Diagram	11-49
12-1	Simplified Piping & Instrumentation Diagram of the IRWST/Gravity Injection Subsystem	12-42
13-1	Passive Containment Cooling System Sketch	13-11
15-1	Chemical and Volume Control System Piping and Instrumentation Diagram (Sheets 1 – 2)	15-25
17-1	Normal Residual Heat Removal System Sketch	17-19
18-1	Component Cooling Water System Piping and Instrumentation Diagram	18-13
19-1	Service Water System Piping and Instrumentation Diagram	19-17
20-1	Central Chilled Water Low-Capacity Subsystem Piping and Instrumentation Diagram (Sheets 1 – 2)	20-11
21-1	AC Power System One-Line Diagram	21-55
22-1	Class 1E DC System One-Line Diagram (Sheets 1 – 2)	22-53
22-2	Class 1E UPS One-Line Diagram	22-57
25-1	Compressed & Instrument Air System Piping and Instrumentation Diagram	25-19
29-1	IRWST Valve Configuration	29-25
30-1	Human Reliability Analysis Quantification Model	30-111
30A-1	Links Between SHARP Steps	30A-18

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-1	Case 3BE-1: Reactor Coolant System and Steam Generator Pressure DVI Line Break, Containment Water Level	34-52
34-2	Case 3BE-1: ADS Stage 4 Flow Rates DVI Line Break, Containment Water Level	34-52
34-3	Case 3BE-1: Accumulator/CMT Water Mass DVI Line Break, Containment Water Level	34-53
34-4	Case 3BE-1: IRWST Injection Flow Rate DVI Line Break, Containment Water Level	34-53
34-5	Case 3BE-1: Break Flow Rate DVI Line Break, Containment Water Level	34-54
34-6	Case 3BE-1: Reactor Vessel Water Level DVI Line Break, Containment Water Level	34-54
34-7	Case 3BE-1: Core Temperatures DVI Line Break, Containment Water Level	34-55
34-8	Case 3BE-1: Containment Water Pool Elevations DVI Line Break, Containment Water Level	34-55
34-9	Case 3BE-1: Containment Pressure DVI Line Break, Containment Water Level	34-56
34-10	Case 3BE-1: Containment Gas Temperatures DVI Line Break, Containment Water Level	34-56
34-11	Case 3BE-1: Core Mass DVI Line Break, Containment Water Level	34-57
34-12	Case 3BE-1: Reactor Pressure Vessel to Cavity Water Heat Transfer DVI Line Break, Containment Water Level	34-57
34-13	Case 3BE-1: In-Vessel Hydrogen Generation DVI Line Break, Containment Water Level	34-58
34-14	Case 3BE-1: Mass Fraction of CsI Released to Containment DVI Line Break, Containment Water Level	34-58
34-15	Case 3BE-1: Mass Fraction of Noble Gases Released to Environment DVI Line Break, Containment Water Level	34-59
34-16	Case 3BE-1: Mass Fraction of Fission Products Released to Environment DVI Line Break, Containment Water Level	34-59
34-17	Case 3BE-1: Mass Fraction of SrO Released to Environment DVI Line Break, Containment Water Level	34-60
34-18	Case 3BE-2: Reactor Coolant System and Steam Generator Pressure DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-60
34-19	Case 3BE-2: ADS Stage 4 Flow Rates DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-61
34-20	Case 3BE-2: Accumulator/CMT Water Mass DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-61
34-21	Case 3BE-2: IRWST Injection Flow Rate DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-62
34-22	Case 3BE-2: Break Flow Rate DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-62

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-23	Case 3BE-2: Reactor Vessel Water Level DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-63
34-24	Case 3BE-2: Core Temperatures DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-63
34-25	Case 3BE-2: Containment Water Pool Elevations DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-64
34-26	Case 3BE-2: Containment Pressure DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-64
34-27	Case 3BE-2: Containment Gas Temperatures DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-65
34-28	Case 3BE-2: Core Mass DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-65
34-29	Case 3BE-2: Reactor Pressure Vessel to Cavity Water Heat Transfer DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-66
34-30	Case 3BE-2: In-Vessel Hydrogen Generation DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-66
34-31	Case 3BE-2: Mass Fraction of CsI Released to Containment DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-67
34-32	Case 3BE-2: Mass Fraction of Noble Gases Released to Environment DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-67
34-33	Case 3BE-2: Mass Fraction of Fission Products Released to Environment DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-68
34-34	Case 3BE-2: Mass Fraction of SrO Released to Environment DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-68
34-35	Case 3BE-4: Reactor Coolant System and Steam Generator Pressure Spurious ADS, Failed Gravity Injection	34-69
34-36	Case 3BE-4: ADS Stage 4 Flow Rates Spurious ADS, Failed Gravity Injection	34-69
34-37	Case 3BE-4: Accumulator/CMT Water Mass Spurious ADS, Failed Gravity Injection	34-70
34-38	Case 3BE-4: IRWST Injection Flow Rate Spurious ADS, Failed Gravity Injection	34-70
34-39	Case 3BE-4: Break Flow Rate Spurious ADS, Failed Gravity Injection	34-71
34-40	Case 3BE-4: Reactor Vessel Water Level Spurious ADS, Failed Gravity Injection	34-71
34-41	Case 3BE-4: Core Temperatures Spurious ADS, Failed Gravity Injection	34-72
34-42	Case 3BE-4: Containment Water Pool Elevations Spurious ADS, Failed Gravity Injection	34-72
34-43	Case 3BE-4: Containment Pressure Spurious ADS, Failed Gravity Injection	34-73
34-44	Case 3BE-4: Containment Gas Temperatures Spurious ADS, Failed Gravity Injection	34-73
34-45	Case 3BE-4: Core Mass Spurious ADS, Failed Gravity Injection	34-74

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-46	Case 3BE-4: Reactor Pressure Vessel to Cavity Water Heat Transfer Spurious ADS, Failed Gravity Injection	34-74
34-47	Case 3BE-4: In-Vessel Hydrogen Generation Spurious ADS, Failed Gravity Injection	34-75
34-48	Case 3BE-4: Mass Fraction of CsI Released to Containment Spurious ADS, Failed Gravity Injection	34-75
34-49	Case 3BE-4: Mass Fraction of Noble Gases Released to Environment Spurious ADS, Failed Gravity Injection	34-76
34-50	Case 3BE-4: Mass Fraction of Fission Products Released to Environment Spurious ADS, Failed Gravity Injection	34-76
34-51	Case 3BE-4: Mass Fraction of SrO Released to Environment Spurious ADS, Failed Gravity Injection	34-77
34-52	Case 3BE-5: Reactor Coolant System and Steam Generator Pressure SBLOCA with Failed Gravity Injection	34-77
34-53	Case 3BE-5: ADS Stage 4 Flow Rates SBLOCA with Failed Gravity Injection	34-78
34-54	Case 3BE-5: Accumulator/CMT Water Mass SBLOCA with Failed Gravity Injection	34-78
34-55	Case 3BE-5: IRWST Injection Flow Rate SBLOCA with Failed Gravity Injection	34-79
34-56	Case 3BE-5: Break Flow Rate SBLOCA with Failed Gravity Injection	34-79
34-57	Case 3BE-5: Reactor Vessel Water Level SBLOCA with Failed Gravity Injection	34-80
34-58	Case 3BE-5: Core Temperatures SBLOCA with Failed Gravity Injection	34-80
34-59	Case 3BE-5: Containment Water Pool Elevations SBLOCA with Failed Gravity Injection	34-81
34-60	Case 3BE-5: Containment Pressure SBLOCA with Failed Gravity Injection	34-81
34-61	Case 3BE-5: Containment Gas Temperature SBLOCA with Failed Gravity Injection	34-82
34-62	Case 3BE-5: Core Mass SBLOCA with Failed Gravity Injection	34-82
34-63	Case 3BE-5: Reactor Pressure Vessel to Cavity Water Heat Transfer SBLOCA with Failed Gravity Injection	34-83
34-64	Case 3BE-5: In-Vessel Hydrogen Generation SBLOCA with Failed Gravity Injection	34-83
34-65	Case 3BE-5: Mass Fraction of CsI Released to Containment SBLOCA with Failed Gravity Injection	34-84
34-66	Case 3BE-5: Mass Fraction of Noble Gases Released to Environment SBLOCA with Failed Gravity Injection	34-84
34-67	Case 3BE-5: Mass Fraction of Fission Products Released to Environment SBLOCA with Failed Gravity Injection	34-85
34-68	Case 3BE-5: Mass Fraction of SrO Released to Environment SBLOCA with Failed Gravity Injection	34-85

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-69	Case 3BE-6: Reactor Coolant System and Steam Generator Pressure SBLOCA with Failed Gravity Injection	34-86
34-70	Case 3BE-6: ADS Stage 4 Flow Rates SBLOCA with Failed Gravity Injection	34-86
34-71	Case 3BE-6: Accumulator/CMT Water Mass SBLOCA with Failed Gravity Injection	34-87
34-72	Case 3BE-6: IRWST Injection Flow Rate SBLOCA with Failed Gravity Injection	34-87
34-73	Case 3BE-6: Break Flow Rate SBLOCA with Failed Gravity Injection	34-88
34-74	Case 3BE-6: Reactor Vessel Water Level SBLOCA with Failed Gravity Injection	34-88
34-75	Case 3BE-6: Core Temperatures SBLOCA with Failed Gravity Injection	34-89
34-76	Case 3BE-6: Containment Water Pool Elevations SBLOCA with Failed Gravity Injection	34-89
34-77	Case 3BE-6: Containment Pressure SBLOCA with Failed Gravity Injection	34-90
34-78	Case 3BE-6: Containment Gas Temperature SBLOCA with Failed Gravity Injection	34-90
34-79	Case 3BE-6: Core Mass SBLOCA with Failed Gravity Injection	34-91
34-80	Case 3BE-6: Reactor Pressure Vessel to Cavity Water Heat Transfer SBLOCA with Failed Gravity Injection	34-91
34-81	Case 3BE-6: In-Vessel Hydrogen Generation SBLOCA with Failed Gravity Injection	34-92
34-82	Case 3BE-6: Mass Fraction of CsI Released to Containment SBLOCA with Failed Gravity Injection	34-92
34-83	Case 3BE-6: Mass Fraction of Noble Gases Released to Environment SBLOCA with Failed Gravity Injection	34-93
34-84	Case 3BE-6: Mass Fraction of Fission Products Released to Environment SBLOCA with Failed Gravity Injection	34-93
34-85	Case 3BE-6: Mass Fraction of SrO Released to Environment SBLOCA with Failed Gravity Injection	34-94
34-86	Case 3BE-7: Reactor Coolant System and Steam Generator Pressure SBLOCA with Failed Gravity Injection	34-94
34-87	Case 3BE-7: ADS Stage 4 Flow Rates SBLOCA with Failed Gravity Injection	34-95
34-88	Case 3BE-7: Accumulator/CMT Water Mass SBLOCA with Failed Gravity Injection	34-95
34-89	Case 3BE-7: IRWST Injection Flow Rate SBLOCA with Failed Gravity Injection	34-96
34-90	Case 3BE-7: Break Flow Rate SBLOCA with Failed Gravity Injection	34-96
34-91	Case 3BE-7: Reactor Vessel Water Level SBLOCA with Failed Gravity Injection	34-97
34-92	Case 3BE-7: Core Temperatures SBLOCA with Failed Gravity Injection	34-97

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-93	Case 3BE-7: Containment Water Pool Elevations SBLOCA with Failed Gravity Injection	34-98
34-94	Case 3BE-7: Containment Pressure SBLOCA with Failed Gravity Injection	34-98
34-95	Case 3BE-7: Containment Gas Temperature SBLOCA with Failed Gravity Injection	34-99
34-96	Case 3BE-7: Core Mass SBLOCA with Failed Gravity Injection	34-99
34-97	Case 3BE-7: Reactor Pressure Vessel to Cavity Water Heat Transfer SBLOCA with Failed Gravity Injection	34-100
34-98	Case 3BE-7: In-Vessel Hydrogen Generation SBLOCA with Failed Gravity Injection	34-100
34-99	Case 3BE-7: Mass Fraction of CsI Released to Containment SBLOCA with Failed Gravity Injection	34-101
34-100	Case 3BE-7: Mass Fraction of Noble Gases Released to Environment SBLOCA with Failed Gravity Injection	34-101
34-101	Case 3BE-7: Mass Fraction of Fission Products Released to Environment SBLOCA with Failed Gravity Injection	34-102
34-102	Case 3BE-7: Mass Fraction of SrO Released to Environment SBLOCA with Failed Gravity Injection	34-102
34-103	Case 3BE-3: Reactor Coolant System and Steam Generator Pressure DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-103
34-104	Case 3BE-3: ADS Stage 4 Flow Rate DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-103
34-105	Case 3BE-3: Accumulator/CMT Water Mass DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-104
34-106	Case 3BE-3: IRWST Injection Flow Rate DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-104
34-107	Case 3BE-3: Break Flow Rate DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-105
34-108	Case 3BE-3: Reactor Vessel Water Level DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-105
34-109	Case 3BE-3: Core Temperatures DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-106
34-110	Case 3BE-3: Containment Water Pool Elevations DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-106
34-111	Case 3BE-3: Containment Pressure DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-107
34-112	Case 3BE-3: Containment Gas Temperature DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-107
34-113	Case 3BE-3: Core Mass DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-108
34-114	Case 3BE-3: Reactor Pressure Vessel to Cavity Water Heat Transfer DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-108

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-115	Case 3BE-3: In-Vessel Hydrogen Generation DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-109
34-116	Case 3BE-3: Mass Fraction of CsI Released to Containment DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-109
34-117	Case 3BE-3: Mass Fraction of Noble Gases Released to Environment DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-110
34-118	Case 3BE-3: Mass Fraction of Fission Products Released to Environment DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-110
34-119	Case 3BE-3: Mass Fraction of SrO Released to Environment DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-111
34-120	Case 3BL-1: Reactor Coolant System and Steam Generator Pressure SBLOCA with Failed Gravity Injection	34-111
34-121	Case 3BL-1: ADS Stage 4 Flow Rates SBLOCA with Failed Gravity Injection	34-112
34-122	Case 3BL-1: Accumulator/CMT Water Mass SBLOCA with Failed Gravity Injection	34-112
34-123	Case 3BL-1: IRWST Injection Flow Rate SBLOCA with Failed Gravity Injection	34-113
34-124	Case 3BL-1: Break Flow Rate SBLOCA with Failed Gravity Injection	34-113
34-125	Case 3BL-1: Reactor Vessel Water Level SBLOCA with Failed Gravity Injection	34-114
34-126	Case 3BL-1: Core Temperatures SBLOCA with Failed Gravity Injection	34-114
34-127	Case 3BL-1: Containment Water Pool Elevations SBLOCA with Failed Gravity Injection	34-115
34-128	Case 3BL-1: Containment Pressure SBLOCA with Failed Gravity Injection	34-115
34-129	Case 3BL-1: Containment Gas Temperature SBLOCA with Failed Gravity Injection	34-116
34-130	Case 3BL-1: Core Mass SBLOCA with Failed Gravity Injection	34-116
34-131	Case 3BL-1: Reactor Pressure Vessel to Cavity Water Heat Transfer SBLOCA with Failed Gravity Injection	34-117
34-132	Case 3BL-1: In-Vessel Hydrogen Generation SBLOCA with Failed Gravity Injection	34-117
34-133	Case 3BL-1: Mass Fraction of CsI Released to Containment SBLOCA with Failed Gravity Injection	34-118
34-134	Case 3BL-1: Mass Fraction of Noble Gases Released to Environment SBLOCA with Failed Gravity Injection	34-118
34-135	Case 3BL-1: Mass Fraction of Fission Products Released to Environment SBLOCA with Failed Gravity Injection	34-119
34-136	Case 3BL-1: Mass Fraction of SrO Released to Environment SBLOCA with Failed Gravity Injection	34-119
34-137	Case 3BL-2: Reactor Coolant System and Steam Generator Pressure DVI Line Break with Failed Gravity Injection	34-120

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-138	Case 3BL-2: ADS Stage 4 Flow Rates DVI Line Break with Failed Gravity Injection	34-120
34-139	Case 3BL-2: Accumulator/CMT Water Mass DVI Line Break with Failed Gravity Injection	34-121
34-140	Case 3BL-2: IRWST Injection Flow Rate DVI Line Break with Failed Gravity Injection	34-121
34-141	Case 3BL-2: Break Flow Rate DVI Line Break with Failed Gravity Injection	34-122
34-142	Case 3BL-2: Reactor Vessel Water Level DVI Line Break with Failed Gravity Injection	34-122
34-143	Case 3BL-2: Core Temperatures DVI Line Break with Failed Gravity Injection	34-123
34-144	Case 3BL-2: Containment Water Pool Elevations DVI Line Break with Failed Gravity Injection	34-123
34-145	Case 3BL-2: Containment Pressure DVI Line Break with Failed Gravity Injection	34-124
34-146	Case 3BL-2: Containment Gas Temperature DVI Line Break with Failed Gravity Injection	34-124
34-147	Case 3BL-2: Core Mass DVI Line Break with Failed Gravity Injection	34-125
34-148	Case 3BL-2: Reactor Pressure Vessel to Cavity Water Heat Transfer DVI Line Break with Failed Gravity Injection	34-125
34-149	Case 3BL-2: In-Vessel Hydrogen Generation DVI Line Break with Failed Gravity Injection	34-126
34-150	Case 3BL-2: Mass Fraction of CsI Released to Containment DVI Line Break with Failed Gravity Injection	34-126
34-151	Case 3BL-2: Mass Fraction of Noble Gases Released to Environment DVI Line Break with Failed Gravity Injection	34-127
34-152	Case 3BL-2: Mass Fraction of Fission Products Released to Environment DVI Line Break with Failed Gravity Injection	34-127
34-153	Case 3BL-2: Mass Fraction of SrO Released to Environment DVI Line Break with Failed Gravity Injection	34-128
34-154	Case 3BR-1: Reactor Coolant System and Steam Generator Pressure CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-128
34-155	Case 3BR-1: ADS Stage 4 Flow Rates CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-129
34-156	Case 3BR-1: Accumulator/CMT Water Mass CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-129
34-157	Case 3BR-1: IRWST Injection Flow Rate CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-130
34-158	Case 3BR-1: Break Flow Rate CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-130
34-159	Case 3BR-1: Reactor Vessel Water Level CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-131

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-160	Case 3BR-1: Core Temperatures CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-131
34-161	Case 3BR-1: Containment Water Pool Elevations CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-132
34-162	Case 3BR-1: Containment Pressure CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-132
34-163	Case 3BR-1: Containment Gas Temperature CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-133
34-164	Case 3BR-1: Core Mass CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-133
34-165	Case 3BR-1: Reactor Pressure Vessel to Cavity Water Heat Transfer CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-134
34-166	Case 3BR-1: In-Vessel Hydrogen Generation CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-134
34-167	Case 3BR-1: Mass Fraction of CsI Released to Containment CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-135
34-168	Case 3BR-1: Mass Fraction of Noble Gases Released to Environment CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-135
34-169	Case 3BR-1: Mass Fraction of Fission Products Released to Environment CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-136
34-170	Case 3BR-1: Mass Fraction of SrO Released to Environment CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-136
34-171	Case 3BR-1a: Reactor Coolant System and Steam Generator Pressure CL LBLOCA with Failed Accumulators	34-137
34-172	Case 3BR-1a: ADS Stage 4 Flow Rates CL LBLOCA with Failed Accumulators	34-137
34-173	Case 3BR-1a: Accumulator/CMT Water Mass CL LBLOCA with Failed Accumulators	34-138
34-174	Case 3BR-1a: IRWST Injection Flow Rate CL LBLOCA with Failed Accumulators	34-138
34-175	Case 3BR-1a: Break Flow Rate CL LBLOCA with Failed Accumulators	34-139
34-176	Case 3BR-1a: Reactor Vessel Water Level CL LBLOCA with Failed Accumulators	34-139
34-177	Case 3BR-1a: Core Temperatures CL LBLOCA with Failed Accumulators	34-140
34-178	Case 3BR-1a: Containment Water Pool Elevations CL LBLOCA with Failed Accumulators	34-140
34-179	Case 3BR-1a: Containment Pressure CL LBLOCA with Failed Accumulators	34-141

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-180	Case 3BR-1a: Containment Gas Temperature CL LBLOCA with Failed Accumulators	34-141
34-181	Case 3BR-1a: Core Mass CL LBLOCA with Failed Accumulators	34-142
34-182	Case 3BR-1a: Reactor Pressure Vessel to Cavity Water Heat Transfer CL LBLOCA with Failed Accumulators	34-142
34-183	Case 3BR-1a: In-Vessel Hydrogen Generation CL LBLOCA with Failed Accumulators	34-143
34-184	Case 3BR-1a: Mass Fraction of CsI Released to Containment CL LBLOCA with Failed Accumulators	34-143
34-185	Case 3BR-1a: Mass Fraction of Noble Gases Released to Environment CL LBLOCA with Failed Accumulators	34-144
34-186	Case 3BR-1a: Mass Fraction of Fission Products Released to Environment CL LBLOCA with Failed Accumulators	34-144
34-187	Case 3BR-1a: Mass Fraction of SrO Released to Environment CL LBLOCA with Failed Accumulators	34-145
34-188	Case 3C-1: Reactor Coolant System and Steam Generator Pressure Vessel Rupture	34-145
34-189	Case 3C-1: ADS Stage 4 Flow Rates Vessel Rupture	34-146
34-190	Case 3C-1: Accumulator/CMT Water Mass Vessel Rupture	34-146
34-191	Case 3C-1: IRWST Injection Flow Rate Vessel Rupture	34-147
34-192	Case 3C-1: Break Flow Rate Vessel Rupture	34-147
34-193	Case 3C-1: Reactor Vessel Water Level Vessel Rupture	34-148
34-194	Case 3C-1: Core Temperatures Vessel Rupture	34-148
34-195	Case 3C-1: Containment Water Pool Elevations Vessel Rupture	34-149
34-196	Case 3C-1: Containment Pressure Vessel Rupture	34-149
34-197	Case 3C-1: Containment Gas Temperature Vessel Rupture	34-150
34-198	Case 3C-1: Core Mass Vessel Rupture	34-150
34-199	Case 3C-1: Reactor Pressure Vessel to Cavity Water Heat Transfer Vessel Rupture	34-151
34-200	Case 3C-1: In-Vessel Hydrogen Generation Vessel Rupture	34-151
34-201	Case 3C-1: Mass Fraction of CsI Released to Containment Vessel Rupture	34-152
34-202	Case 3C-1: Mass Fraction of Noble Gas Released to Environment Vessel Rupture	34-152
34-203	Case 3C-1: Mass Fraction of Fission Products Released to Environment Vessel Rupture	34-153
34-204	Case 3C-1: Mass Fraction of SrO Released to Environment Vessel Rupture	34-153
34-205	Case 3C-2: Reactor Coolant System and Steam Generator Pressure Vessel Rupture with Containment Failure	34-154
34-206	Case 3C-2: ADS Stage 4 Flow Rates Vessel Rupture with Containment Failure	34-154
34-207	Case 3C-2: Accumulator/CMT Water Mass Vessel Rupture with Containment Failure	34-155

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-208	Case 3C-2: IRWST Injection Flow Rate Vessel Rupture with Containment Failure	34-155
34-209	Case 3C-2: Break Flow Rate Vessel Rupture with Containment Failure	34-156
34-210	Case 3C-2: Reactor Vessel Water Level Vessel Rupture with Containment Failure	34-156
34-211	Case 3C-2: Core Temperatures Vessel Rupture with Containment Failure	34-157
34-212	Case 3C-2: Containment Water Pool Elevations Vessel Rupture with Containment Failure	34-157
34-213	Case 3C-2: Containment Pressure Vessel Rupture with Containment Failure	34-158
34-214	Case 3C-2: Containment Gas Temperature Vessel Rupture with Containment Failure	34-158
34-215	Case 3C-2: Core Mass Vessel Rupture with Containment Failure	34-159
34-216	Case 3C-2: Reactor Pressure Vessel to Cavity Water Heat Transfer Vessel Rupture with Containment Failure	34-159
34-217	Case 3C-2: In-Vessel Hydrogen Generation Vessel Rupture with Containment Failure	34-160
34-218	Case 3C-2: Mass Fraction of CsI Released to Containment Vessel Rupture with Containment Failure	34-160
34-219	Case 3C-2: Mass Fraction of Noble Gases Released to Environment Vessel Rupture with Containment Failure	34-161
34-220	Case 3C-2: Mass Fraction of Fission Products Released to Environment Vessel Rupture with Containment Failure	34-161
34-221	Case 3C-2: Mass Fraction of SrO Released to Environment Vessel Rupture with Containment Failure	34-162
34-222	Case 3D-1: Reactor Coolant System and Steam Generator Pressure Spurious ADS-4 with Failed CMTs	34-162
34-223	Case 3D-1: ADS Stage 4 Flow Rates Spurious ADS-4 with Failed CMTs	34-163
34-224	Case 3D-1: Accumulator/CMT Water Mass Spurious ADS-4 with Failed CMTs	34-163
34-225	Case 3D-1: IRWST Injection Flow Rate Spurious ADS-4 with Failed CMTs	34-164
34-226	Case 3D-1: Break Flow Rate Spurious ADS-4 with Failed CMTs	34-164
34-227	Case 3D-1: Reactor Vessel Water Level Spurious ADS-4 with Failed CMTs	34-165
34-228	Case 3D-1: Core Temperatures Spurious ADS-4 with Failed CMTs	34-165
34-229	Case 3D-1: Containment Water Pool Elevations Spurious ADS-4 with Failed CMTs	34-166
34-230	Case 3D-1: Containment Pressure Spurious ADS-4 with Failed CMTs	34-166
34-231	Case 3D-1: Containment Gas Temperature Spurious ADS-4 with Failed CMTs	34-167
34-232	Case 3D-1: Core Mass Spurious ADS-4 with Failed CMTs	34-167

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-233	Case 3D-1: Reactor Pressure Vessel to Cavity Water Heat Transfer Spurious ADS-4 with Failed CMTs	34-168
34-234	Case 3D-1: In-Vessel Hydrogen Generation Spurious ADS-4 with Failed CMTs	34-168
34-235	Case 3D-1: Mass Fraction of CsI Released to Containment Spurious ADS-4 with Failed CMTs	34-169
34-236	Case 3D-1: Mass Fraction of Noble Gases Released to Environment Spurious ADS-4 with Failed CMTs	34-169
34-237	Case 3D-1: Mass Fraction of Fission Products Released to Environment Spurious ADS-4 with Failed CMTs	34-170
34-238	Case 3D-1: Mass Fraction of SrO Released to Environment Spurious ADS-4 with Failed CMTs	34-170
34-239	Case 3D-2: Reactor Coolant System and Steam Generator Pressure Spurious ADS-2 with Failed CMTs	34-171
34-240	Case 3D-2: ADS Stage 4 Flow Rates Spurious ADS-2 with Failed CMTs	34-171
34-241	Case 3D-2: Accumulator/CMT Water Mass Spurious ADS-2 with Failed CMTs	34-172
34-242	Case 3D-2: IRWST Injection Flow Rate Spurious ADS-2 with Failed CMTs	34-172
34-243	Case 3D-2: Break Flow Rate Spurious ADS-2 with Failed CMTs	34-173
34-244	Case 3D-2: Reactor Vessel Water Level Spurious ADS-2 with Failed CMTs	34-173
34-245	Case 3D-2: Core Temperatures Spurious ADS-2 with Failed CMTs	34-174
34-246	Case 3D-2: Containment Pool Water Elevations Spurious ADS-2 with Failed CMTs	34-174
34-247	Case 3D-2: Containment Pressure Spurious ADS-2 with Failed CMTs	34-175
34-248	Case 3D-2: Containment Gas Temperature Spurious ADS-2 with Failed CMTs	34-175
34-249	Case 3D-2: Core Mass Spurious ADS-2 with Failed CMTs	34-176
34-250	Case 3D-2: Reactor Pressure Vessel to Cavity Water Heat Transfer Spurious ADS-2 with Failed CMTs	34-176
34-251	Case 3D-2: In-Vessel Hydrogen Generation Spurious ADS-2 with Failed CMTs	34-177
34-252	Case 3D-2: Mass Fraction of CsI Released to Containment Spurious ADS-2 with Failed CMTs	34-177
34-253	Case 3D-2: Mass Fraction of Noble Gas Released to Environment Spurious ADS-2 with Failed CMTs	34-178
34-254	Case 3D-2: Mass Fraction of Fission Products Released to Environment Spurious ADS-2 with Failed CMTs	34-178
34-255	Case 3D-2: Mass Fraction of SrO Released to Environment Spurious ADS-2 with Failed CMTs	34-179
34-256	Case 3D-3: Reactor Coolant System and Steam Generator Pressure DVI Line Break with Failed ADS	34-179
34-257	Case 3D-3: ADS Stage 4 Flow Rates DVI Line Break with Failed ADS	34-180

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-258	Case 3D-3: Accumulator/CMT Water Mass DVI Line Break with Failed ADS	34-180
34-259	Case 3D-3: IRWST Injection Flow Rate DVI Line Break with Failed ADS	34-181
34-260	Case 3D-3: Break Flow Rate DVI Line Break with Failed ADS	34-181
34-261	Case 3D-3: Reactor Vessel Water Level DVI Line Break with Failed ADS	34-182
34-262	Case 3D-3: Core Temperatures DVI Line Break with Failed ADS	34-182
34-263	Case 3D-3: Containment Water Pool Elevations DVI Line Break with Failed ADS	34-183
34-264	Case 3D-3: Containment Pressure DVI Line Break with Failed ADS	34-183
34-265	Case 3D-3: Containment Gas Temperature DVI Line Break with Failed ADS	34-184
34-266	Case 3D-3: Core Mass DVI Line Break with Failed ADS	34-184
34-267	Case 3D-3: Reactor Pressure Vessel to Cavity Water Heat Transfer DVI Line Break with Failed ADS	34-185
34-268	Case 3D-3: In-Vessel Hydrogen Generation DVI Line Break with Failed ADS	34-185
34-269	Case 3D-3: Mass Fraction of CsI Released to Containment DVI Line Break with Failed ADS	34-186
34-270	Case 3D-3: Mass Fraction of Noble Gases Released to Environment DVI Line Break with Failed ADS	34-186
34-271	Case 3D-3: Mass Fraction of Fission Products Released to Environment DVI Line Break with Failed ADS	34-187
34-272	Case 3D-3: Mass Fraction of SrO Released to Environment DVI Line Break with Failed ADS	34-187
34-273	Case 3D-4: Reactor Coolant System and Steam Generator Pressure Spurious ADS-2, Failed CMTs, Diffusion Flame	34-188
34-274	Case 3D-4: ADS Stage 4 Flow Rates Spurious ADS-2, Failed CMTs, Diffusion Flame	34-188
34-275	Case 3D-4: Accumulator/CMT Water Mass Spurious ADS-2, Failed CMTs, Diffusion Flame	34-189
34-276	Case 3D-4: IRWST Injection Flow Rate Spurious ADS-2, Failed CMTs, Diffusion Flame	34-189
34-277	Case 3D-4: Break Flow Rate Spurious ADS-2, Failed CMTs, Diffusion Flame	34-190
34-278	Case 3D-4: Reactor Vessel Water Level Spurious ADS-2, Failed CMTs, Diffusion Flame	34-190
34-279	Case 3D-4: Core Temperatures Spurious ADS-2, Failed CMTs, Diffusion Flame	34-191
34-280	Case 3D-4: Containment Water Pool Elevations Spurious ADS-2, Failed CMTs, Diffusion Flame	34-191
34-281	Case 3D-4: Containment Pressure Spurious ADS-2, Failed CMTs, Diffusion Flame	34-192

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-282	Case 3D-4: Containment Gas Temperature Spurious ADS-2, Failed CMTs, Diffusion Flame	34-192
34-283	Case 3D-4: Core Mass Spurious ADS-2, Failed CMTs, Diffusion Flame	34-193
34-284	Case 3D-4: Reactor Pressure Vessel to Cavity Water Heat Transfer Spurious ADS-2, Failed CMTs, Diffusion Flame	34-193
34-285	Case 3D-4: In-Vessel Hydrogen Generation Spurious ADS-2, Failed CMTs, Diffusion Flame	34-194
34-286	Case 3D-4: Mass Fraction of CsI Released to Containment Spurious ADS-2, Failed CMTs, Diffusion Flame	34-194
34-287	Case 3D-4: Mass Fraction of Noble Gases Released to Environment Spurious ADS-2, Failed CMTs, Diffusion Flame	34-195
34-288	Case 3D-4: Mass Fraction of Fission Products Released to Environment Spurious ADS-2, Failed CMTs, Diffusion Flame	34-195
34-289	Case 3D-4: Mass Fraction of SrO Release to Environment Spurious ADS-2, Failed CMTs, Diffusion Flame	34-196
34-290	Case 6E-1: Reactor Coolant System and Steam Generator Pressure SGTR Early Core Melt	34-196
34-291	Case 6E-1: ADS Stage 4 Flow Rates SGTR Early Core Melt	34-197
34-292	Case 6E-1: Accumulator/CMT Water Mass SGTR Early Core Melt	34-197
34-293	Case 6E-1: IRWST Injection Flow Rate SGTR Early Core Melt	34-198
34-294	Case 6E-1: Break Flow Rate SGTR Early Core Melt	34-198
34-295	Case 6E-1: Reactor Vessel Water Level SGTR Early Core Melt	34-199
34-296	Case 6E-1: Core Temperatures SGTR Early Core Melt	34-199
34-297	Case 6E-1: Containment Water Pool Elevations SGTR Early Core Melt	34-200
34-298	Case 6E-1: Containment Pressure SGTR Early Core Melt	34-200
34-299	Case 6E-1: Containment Gas Temperature SGTR Early Core Melt	34-201
34-300	Case 6E-1: Core Mass SGTR Early Core Melt	34-201
34-301	Case 6E-1: Reactor Pressure Vessel to Cavity Water Heat Transfer SGTR Early Core Melt	34-202
34-302	Case 6E-1: In-Vessel Hydrogen Generation SGTR Early Core Melt	34-202
34-303	Case 6E-1: Mass Fraction of CsI Released to Containment SGTR Early Core Melt	34-203
34-304	Case 6E-1: Mass Fraction of Noble Gases Released to Environment SGTR Early Core Melt	34-203
34-305	Case 6E-1: Mass Fraction of Fission Products Released to Environment SGTR Early Core Melt	34-204
34-306	Case 6E-1: Mass Fraction of SrO Released to Environment SGTR Early Core Melt	34-204
34-307	Case 6L-1: Reactor Coolant System and Steam Generator Pressure SGTR Core Melt Failure at Recirculation	34-205
34-308	Case 6L-1: ADS Stage 4 Flow Rates SGTR Core Melt Failure at Recirculation	34-205

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-309	Case 6L-1: Accumulator/CMT Water Mass SGTR Core Melt Failure at Recirculation	34-206
34-310	Case 6L-1: IRWST Injection Flow Rate SGTR Core Melt Failure at Recirculation	34-206
34-311	Case 6L-1: Break Flow Rate SGTR Core Melt Failure at Recirculation	34-207
34-312	Case 6L-1: Reactor Vessel Water Level SGTR Core Melt Failure at Recirculation	34-207
34-313	Case 6L-1: Core Temperatures SGTR Core Melt Failure at Recirculation	34-208
34-314	Case 6L-1: Containment Water Pool Elevations SGTR Core Melt Failure at Recirculation	34-208
34-315	Case 6L-1: Containment Pressure SGTR Core Melt Failure at Recirculation	34-209
34-316	Case 6L-1: Containment Gas Temperature SGTR Core Melt Failure at Recirculation	34-209
34-317	Case 6L-1: Core Mass SGTR Core Melt Failure at Recirculation	34-210
34-318	Case 6L-1: Reactor Pressure Vessel to Cavity Water Heat Transfer SGTR Core Melt Failure at Recirculation	34-210
34-319	Case 6L-1: In-Vessel Hydrogen Generation SGTR Core Melt Failure at Recirculation	34-211
34-320	Case 6L-1: Mass Fraction of CsI Released to Containment SGTR Core Melt Failure at Recirculation	34-211
34-321	Case 6L-1: Mass Fraction of Noble Gases Released to Environment SGTR Core Melt Failure at Recirculation	34-212
34-322	Case 6L-1: Mass Fraction of Fission Products Released to Environment SGTR Core Melt Failure at Recirculation	34-212
34-323	Case 6L-1: Mass Fraction of SrO Released to Environment SGTR Core Melt Failure at Recirculation	34-213
34-324	Case 1AP-1: Reactor Coolant System and Steam Generator Pressure SBLOCA with PRHR, CMTs Failed	34-213
34-325	Case 1AP-1: ADS Stage 4 Flow Rates SBLOCA with PRHR, CMTs Failed	34-214
34-326	Case 1AP-1: Accumulator/CMT Water Mass SBLOCA with PRHR, CMTs Failed	34-214
34-327	Case 1AP-1: IRWST Injection Flow Rate SBLOCA with PRHR, CMTs Failed	34-215
34-328	Case 1AP-1: Break Flow Rate SBLOCA with PRHR, CMTs Failed	34-215
34-329	Case 1AP-1: Reactor Vessel Water Level SBLOCA with PRHR, CMTs Failed	34-216
34-330	Case 1AP-1: Core Temperatures SBLOCA with PRHR, CMTs Failed	34-216
34-331	Case 1AP-1: Containment Pool Water Elevations SBLOCA with PRHR, CMTs Failed	34-217
34-332	Case 1AP-1: Containment Pressure SBLOCA with PRHR, CMTs Failed	34-217
34-333	Case 1AP-1: Containment Gas Temperature SBLOCA with PRHR, CMTs Failed	34-218

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-334	Case 1AP-1: Core Mass SBLOCA with PRHR, CMTs Failed	34-218
34-335	Case 1AP-1: Reactor Pressure Vessel to Cavity Water Heat Transfer SBLOCA with PRHR, CMTs Failed	34-219
34-336	Case 1AP-1: In-Vessel Hydrogen Generation SBLOCA with PRHR, CMTs Failed	34-219
34-337	Case 1AP-1: Mass Fraction of CsI Released to Containment SBLOCA with PRHR, CMTs Failed	34-220
34-338	Case 1AP-1: Mass Fraction of Noble Gases Released to Environment SBLOCA with PRHR, CMTs Failed	34-220
34-339	Case 1AP-1: Mass Fraction of Fission Products Released to Environment SBLOCA with PRHR, CMTs Failed	34-221
34-340	Case 1AP-1: Mass Fraction of SrO Released to Environment SBLOCA with PRHR, CMTs Failed	34-221
34-341	Case 1AP-2: Reactor Coolant System and Steam Generator Pressure SBLOCA with PRHR, CMTs Failed	34-222
34-342	Case 1AP-2: ADS Stage 4 Flow Rates SBLOCA with PRHR, CMTs Failed	34-222
34-343	Case 1AP-2: Accumulator/CMT Water Mass SBLOCA with PRHR, CMTs Failed	34-223
34-344	Case 1AP-2: IRWST Injection Flow Rate SBLOCA with PRHR, CMTs Failed	34-223
34-345	Case 1AP-2: Break Flow Rate SBLOCA with PRHR, CMTs Failed	34-224
34-346	Case 1AP-2: Reactor Vessel Water Level SBLOCA with PRHR, CMTs Failed	34-224
34-347	Case 1AP-2: Core Temperatures SBLOCA with PRHR, CMTs Failed	34-225
34-348	Case 1AP-2: Containment Water Pool Elevations SBLOCA with PRHR, CMTs Failed	34-225
34-349	Case 1AP-2: Containment Pressure SBLOCA with PRHR, CMTs Failed	34-226
34-350	Case 1AP-2: Containment Gas Temperature SBLOCA with PRHR, CMTs Failed	34-226
34-351	Case 1AP-2: Core Mass SBLOCA with PRHR, CMTs Failed	34-227
34-352	Case 1AP-2: Reactor Pressure Vessel to Cavity Water Heat Transfer SBLOCA with PRHR, CMTs Failed	34-227
34-353	Case 1AP-2: In-Vessel Hydrogen Generation SBLOCA with PRHR, CMTs Failed	34-228
34-354	Case 1AP-2: Mass Fraction of CsI Released to Containment SBLOCA with PRHR, CMTs Failed	34-228
34-355	Case 1AP-2: Mass Fraction of Noble Gases Released to Environment SBLOCA with PRHR, CMTs Failed	34-229
34-356	Case 1AP-2: Mass Fraction of Fission Products Released to Environment SBLOCA with PRHR, CMTs Failed	34-229
34-357	Case 1AP-2: Mass Fraction of SrO Released to Environment SBLOCA with PRHR, CMTs Failed	34-230

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-358	Case 1A-1: Reactor Coolant System and Steam Generator Pressure Transient with Creep of SG Tubes	34-230
34-359	Case 1A-1: ADS Stage 4 Flow Rates Transient with Creep of SG Tubes	34-231
34-360	Case 1A-1: Accumulator/CMT Water Mass Transient with Creep of SG Tubes	34-231
34-361	Case 1A-1: IRWST Injection Flow Rate Transient with Creep of SG Tubes	34-232
34-362	Case 1A-1: Break Flow Rate Transient with Creep of SG Tubes	34-232
34-363	Case 1A-1: Reactor Vessel Water Level Transient with Creep of SG Tubes	34-233
34-364	Case 1A-1: Core Temperatures Transient with Creep of SG Tubes	34-233
34-365	Case 1A-1: Containment Pool Water Elevations Transient with Creep of SG Tubes	34-234
34-366	Case 1A-1: Containment Pressure Transient with Creep of SG Tubes	34-234
34-367	Case 1A-1: Containment Gas Temperature Transient with Creep of SG Tubes	34-235
34-368	Case 1A-1: Core Mass Transient with Creep of SG Tubes	34-235
34-369	Case 1A-1: Reactor Pressure Vessel to Cavity Water Heat Transfer Transient with Creep of SG Tubes	34-236
34-370	Case 1A-1: In-Vessel Hydrogen Generation Transient with Creep of SG Tubes	34-236
34-371	Case 1A-1: Mass Fraction of CsI Released to Containment Transient with Creep of SG Tubes	34-237
34-372	Case 1A-1: Mass Fraction of Noble Gases Released to Environment Transient with Creep of SG Tubes	34-237
34-373	Case 1A-1: Mass Fraction of Fission Products Released to Environment Transient with Creep of SG Tubes	34-238
34-374	Case 1A-1: Mass Fraction of SrO Released to Environment Transient with Creep of SG Tubes	34-238
34-375	Case 1A-2: Reactor Coolant System and Steam Generator Pressure Transient with Creep of SG Tubes	34-239
34-376	Case 1A-2: ADS Stage 4 Flow Rates Transient with Creep of SG Tubes	34-239
34-377	Case 1A-2: Accumulator/CMT Water Mass Transient with Creep of SG Tubes	34-240
34-378	Case 1A-2: IRWST Injection Flow Rate Transient with Creep of SG Tubes	34-240
34-379	Case 1A-2: Break Flow Rate Transient with Creep of SG Tubes	34-241
34-380	Case 1A-2: Reactor Vessel Water Level Transient with Creep of SG Tubes	34-241
34-381	Case 1A-2: Core Temperatures Transient with Creep of SG Tubes	34-242
34-382	Case 1A-2: Containment Water Pool Elevations Transient with Creep of SG Tubes	34-242
34-383	Case 1A-2: Containment Pressure Transient with Creep of SG Tubes	34-243
34-384	Case 1A-2: Containment Gas Temperature Transient with Creep of SG Tubes	34-243
34-385	Case 1A-2: Core Mass Transient with Creep of SG Tubes	34-244

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-386	Case 1A-2: Reactor Pressure Vessel to Cavity Water Heat Transfer Transient with Creep of SG Tubes	34-244
34-387	Case 1A-2: In-Vessel Hydrogen Generation Transient with Creep of SG Tubes	34-245
34-388	Case 1A-2: Mass Fraction of CsI Released to Containment Transient with Creep of SG Tubes	34-245
34-389	Case 1A-2: Mass Fraction of Noble Gases Released to Environment Transient with Creep of SG Tubes	34-246
34-390	Case 1A-2: Mass Fraction of Fission Products Released to Environment Transient with Creep of SG Tubes	34-246
34-391	Case 1A-2: Mass Fraction of SrO Released to Environment Transient with Creep of SG Tubes	34-247
34-392	Case 3BE-1: Containment Pressure DDT Intermediate Containment Failure	34-247
34-393	Case 3BE-1: Containment Gas Temperature DDT Intermediate Containment Failure	34-248
34-394	Case 3BE-1: Containment Hydrogen Concentration DDT Intermediate Containment Failure	34-248
34-395	Case 3BE-1: Noble Gases Release Fraction DDT Intermediate Containment Failure	34-249
34-396	Case 3BE-1: CsI and RbI Release Fraction DDT Intermediate Containment Failure	34-249
34-397	Case 3BE-1: $Te0_2$ Release Fraction DDT Intermediate Containment Failure	34-250
34-398	Case 3BE-1: Sr0 Release Fraction DDT Intermediate Containment Failure	34-250
34-399	Case 3BE-1: $Mo0_2$ Release Fraction DDT Intermediate Containment Failure	34-251
34-400	Case 3BE-1: Cs0H and Rb0H Release Fraction DDT Intermediate Containment Failure	34-251
34-401	Case 3BE-1: Ba0 Release Fraction DDT Intermediate Containment Failure	34-252
34-402	Case 3BE-1: La_20_3 Release Fraction DDT Intermediate Containment Failure	34-252
34-403	Case 3BE-1: $Ce0_2$ Release Fraction DDT Intermediate Containment Failure	34-253
34-404	Case 3BE-1: Sb Release Fraction DDT Intermediate Containment Failure	34-253
34-405	Case 3BE-1: Te_2 Release Fraction DDT Intermediate Containment Failure	34-254
34-406	Case 3BE-1: $U0_2$ Release Fraction DDT Intermediate Containment Failure	34-254
34-407	Case 3BE-1: RCS Pressure No PCS Water Cooling and Late Containment Failure	34-255
34-408	Case 3BE-1: Reactor Vessel Mixture Level No PCS Water Cooling and Late Containment Failure	34-255
34-409	Case 3BE-1: Core-Exit Temperature No PCS Water Cooling and Late Containment Failure	34-256
34-410	Case 3BE-1: In-Vessel Hydrogen Generation No PCS Water Cooling and Late Containment Failure	34-256
34-411	Case 3BE-1: Containment Pressure No PCS Water Cooling and Late Containment Failure	34-257

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-412	Case 3BE-1: Containment Gas Temperature No PCS Water Cooling and Late Containment Failure	34-257
34-413	Case 3BE-1: Containment Hydrogen Concentration No PCS Water Cooling and Late Containment Failure	34-258
34-414	Case 3BE-1: Noble Gas Release Fraction No PCS Water Cooling and Late Containment Failure	34-258
34-415	Case 3BE-1: CsI and RbI Release Fraction No PCS Water Cooling and Late Containment Failure	34-259
34-416	Case 3BE-1: $Te0_2$ Release Fraction No PCS Water Cooling and Late Containment Failure	34-259
34-417	Case 3BE-1: Sr0 Release Fraction No PCS Water Cooling and Late Containment Failure	34-260
34-418	Case 3BE-1: $Mo0_2$ Release Fraction No PCS Water Cooling and Late Containment Failure	34-260
34-419	Case 3BE-1: CsOH and RbOH Release Fraction No PCS Water Cooling and Late Containment Failure	34-261
34-420	Case 3BE-1: Ba0 Release Fraction No PCS Water Cooling and Late Containment Failure	34-261
34-421	Case 3BE-1: La_20_3 Release Fraction No PCS Water Cooling and Late Containment Failure	34-262
34-422	Case 3BE-1: $Ce0_2$ Release Fraction No PCS Water Cooling and Late Containment Failure	34-262
34-423	Case 3BE-1: Sb Release Fraction No PCS Water Cooling and Late Containment Failure	34-263
34-424	Case 3BE-1: Te_2 Release Fraction No PCS Water Cooling and Late Containment Failure	34-263
34-425	Case 3BE-1: $U0_2$ Release Fraction No PCS Water Cooling and Late Containment Failure	34-264
35-1	Containment Event Tree	35-29
36-1	AP1000 Accident Class 1A Base Case for Node DP Success – RCS Pressure	36-7
36-2	AP1000 Accident Class 1A Base Case for Node DP Success – Core-Exit Gas Temperature	36-8
36-3	AP1000 Accident Class 1A Base Case for Node DP Success – Steam Generator Tube Creep Damage	36-9
36-4	AP1000 Steam Generator Tube Rupture with PRHR and Stuck-Open SV – Passive RHR Heat Removal	36-10
36-5	AP1000 Steam Generator Tube Rupture with PRHR and Stuck-Open SV – Core Makeup Tank Flow (one tank)	36-11
36-6	AP1000 Steam Generator Tube Rupture with PRHR and Stuck-Open SV – Reactor Coolant System Pressure	36-12

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
36-7	AP1000 Steam Generator Tube Rupture with PRHR and Stuck-Open SV – Core-Exit Gas Temperature	36-13
39-1	AP1000 Base Case In-Vessel Retention of Molten Core Debris	39-23
39-2	AP1000 Core Shroud	39-24
39-3	Comparison of ULPU-2000 Configuration III and ULPU-2000 Configuration IV	39-25
39-4	Effect of Water Level on Water Circulation During IVR	39-26
39-5	ULPU-2000 Configuration IV Results (Reference 39-4)	39-27
39-6	AP1000 In-Vessel Retention of Molten Core Debris Quantification Zirconium Oxidation Fraction Input Probability Distribution	39-28
39-7	AP1000 In-Vessel Retention of Molten Core Debris Quantification Mass of Steel in Debris Input Probability Distribution	39-29
39-8	AP1000 In-Vessel Retention of Molten Core Debris Quantification Time of Final Bounding State Input Probability Distribution	39-30
39-9	AP1000 In-Vessel Retention of Molten Core Debris Quantification Height of the Oxide Layer	39-31
39-10	AP1000 In-Vessel Retention of Molten Core Debris Quantification Height of the Metal Layer	39-32
39-11	AP1000 In-Vessel Retention of Molten Core Debris Quantification Power Density in Oxide Debris	39-33
39-12	AP1000 In-Vessel Retention of Molten Core Debris Quantification Internal Rayleigh Number in the Oxide Layer	39-34
39-13	AP1000 In-Vessel Retention of Molten Core Debris Quantification External Rayleigh Number in the Metal Layer	39-35
39-14	AP1000 In-Vessel Retention of Molten Core Debris Quantification Normalized Heat Fluxes	39-36
39-15	AP1000 Passive Core Cooling System	39-37
39-16	Containment Floodable Region	39-38
39-17	Containment Floodable Region – Exploded View	39-39
39-18	AP1000 Cavity Flooding Rate	39-40
39-19	Schematic of the AP1000 Reactor Vessel, Vessel Cavity, Vessel Insulation, and Vents	39-41
39A-1	AP1000 Reactor Pressure Vessel, Core and Lower Internals	39A-21
39A-2	Core Shroud	39A-22
39A-3	Bottom of Core Shroud, Core Barrel, and Lower Core Support Plate (Not to Scale)	39A-23
39A-4	Axial Power Shapes Used for Core Relocation Analysis	39A-24
39A-5	Radial Power Shape Used for Core Relocation Analysis	39A-25
39A-6	Cross Section Geometry of Finite Difference Computational Model	39A-26
39A-7	Computational Mesh for Finite Difference Computational Model	39A-27
39A-8	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape Reactor – Coolant System Pressure	39A-28

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
39A-9	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape – Containment and Reactor Coolant System Pressure	39A-28
39A-10	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape – Reactor Vessel Mixture Level	39A-29
39A-11	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape – Hottest Temperature in Core	39A-29
39A-12	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape – Mass of Hydrogen Generated in Core	39A-30
39A-13	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape Temperature of Core Shroud/Barrel (Core Elevation 1.7 – 2.0 m)	39A-30
39A-14	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape Temperature of Core Shroud/Barrel (Core Elevation 2.0 – 2.3 m)	39A-31
39A-15	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape – Mass of Core Shroud/Barrel	39A-31
39A-16	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape Volume of Debris in Reactor Vessel Lower Plenum	39A-32
39A-17	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape – Reactor Coolant System Pressure	39A-32
39A-18	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape – Containment and Reactor Coolant System Pressure	39A-33
39A-19	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape – Reactor Vessel Mixture Level	39A-33
39A-20	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape – Hottest Temperature in Core	39A-34
39A-21	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape – Mass of Hydrogen Generated in Core	39A-34
39A-22	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape Temperature of Core Shroud/Barrel (Core Elevation 1.1 – 1.4 m)	39A-35
39A-23	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape Temperature of Core Shroud/Barrel (Core Elevation 1.4 – 1.7 m)	39A-35
39A-24	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape – Mass of Core Shroud/Barrel	39A-36
39A-25	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape Volume of Debris in Reactor Vessel Lower Plenum	39A-36
39A-26	Initial Oxide Relocation to Lower Plenum	39A-37
39A-27	Finite Difference Result for Top-Skewed Power Shape at Level 5	39A-38
39A-28	Finite Difference Temperature Map Level 5 at 5380 Seconds for Top-Skewed Power Shape Case	39A-38
39A-29	MAAP4 Core Temperature Profile for Top-Skewed Power Shape Core Elevation = 2.0 – 2.3 m Above Bottom of Active Fuel (Core Axial Row 12)	39A-39
39A-30	Relocation of Corium	39A-39
39A-31	Model for Relocation to Lower Plenum	39A-40

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
40-1	AP1000 Passive Containment Cooling System	40-7
40-2	Schematic of Passive Containment Cooling System Piping	40-8
40-3	AP1000 Containment Venting Pressure Response	40-9
40-4	AP1000 Containment Venting Loss of Containment Air	40-10
40-5	AP1000 Dry PCS Containment Pressure Response	40-11
40-6	AP1000 Dry PCS Containment Temperature Response	40-12
41-1	IRWST Hydrogen Venting	41-36
41-2	Accident Class 3BE Early Detonation Decomposition Event Tree – Given RFL Success	41-37
41-3	Accident Class 3BE Early Detonation Decomposition Event Tree – Given RFL Failure	41-38
41-4	Accident Class 3BL Early Detonation Decomposition Event Tree	41-39
41-5	Accident Class 3C/3BR Early Detonation Decomposition Event Tree	41-40
41-6	Accident Class 3D/1D Early Detonation Decomposition Event Tree	41-41
41-7	Accident Class AP Early Detonation Decomposition Event Tree	41-42
41-8	Boil-Off Hydrogen Generation Probability Density Function	41-43
41-9	No Reflood Pre-Burn Containment Pressure Probability Density Function	41-44
41-10	No-Reflood Hydrogen Deflagration Peak Pressure Probability	41-45
41-11	Early Reflood Hydrogen Generation Probability Density Function	41-46
41-12	Early Reflood Pre-Burn Containment Pressure Probability Density Function	41-47
41-13	Early Reflood Hydrogen Deflagration Peak Pressure Probability	41-48
41-14	Late Reflood Hydrogen Generation Probability Density Function	41-49
41-15	Late Reflood Pre-Burn Containment Pressure Probability Density Function	41-50
41-16	Late Reflood Hydrogen Deflagration Peak Pressure Probability	41-51
41-17	Accident Class 3BE Intermediate Detonation Decomposition Event Tree – Given RFL Success	41-52
41-18	Accident Class 3BE Intermediate Detonation Decomposition Event Tree – Given RFL Failure	41-53
41-19	Accident Class 3BL Intermediate Detonation Decomposition Event Tree	41-54
41-20	Accident Class 3C/3BR Intermediate Detonation Decomposition Event Tree	41-55
41-21	Accident Class 3D/1D Intermediate Detonation Decomposition Event Tree	41-56
41-22	Accident Class 1AP Intermediate Detonation Decomposition Event Tree	41-57
41A-1	Case 3BE-1: Reactor Coolant System Pressure DVI Line Break for Containment Water Level	41A-41
41A-2	Case 3BE-1: Core-Exit Gas Temperature DVI Line Break for Containment Water Level	41A-41
41A-3	Case 3BE-1: Reactor Vessel Mixture Level DVI Line Break for Containment Water Level	41A-42
41A-4	Case 3BE-1: Hydrogen Generated In-Vessel DVI Line Break for Containment Water Level	41A-42

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-5	Case 3BE-1: Containment Pressure DVI Line Break for Containment Water Level	41A-43
41A-6	Case 3BE-1: Containment Gas Temperature DVI Line Break for Containment Water Level	41A-43
41A-7	Case 3BE-1: Containment Compartments Water Level DVI Line Break for Containment Water Level	41A-44
41A-8	Case 3BE-1: Well-Mixed Compartment Hydrogen Concentration DVI Line Break for Containment Water Level	41A-44
41A-9	Case 3BE-1: Well-Mixed Compartment Steam Concentration DVI Line Break for Containment Water Level	41A-45
41A-10	Case 3BE-1: Well-Mixed Compartment Oxygen Concentration DVI Line Break for Containment Water Level	41A-45
41A-11	Case 3BE-1: Confined Compartment Hydrogen Concentration DVI Line Break for Containment Water Level	41A-46
41A-12	Case 3BE-1: Confined Compartment Steam Concentration DVI Line Break for Containment Water Level	41A-46
41A-13	Case 3BE-1: Confined Compartment Oxygen Concentration DVI Line Break for Containment Water Level	41A-47
41A-14	Case 3BE-1: Equivalence Ratio in SG Room DVI Line Break for Containment Water Level	41A-47
41A-15	Case 3BE-1: Equivalence Ratio in CMT Room DVI Line Break for Containment Water Level	41A-48
41A-16	Case 3BE-1: Equivalence Ratio in IRWST DVI Line Break for Containment Water Level	41A-48
41A-17	Case 3BE-1: Equivalence Ratio in PXS DVI Line Break for Containment Water Level	41A-49
41A-18	Case 3BE-2: Reactor Coolant System Pressure DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-49
41A-19	Case 3BE-2: Core-Exit Gas Temperature DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-50
41A-20	Case 3BE-2: Reactor Vessel Mixture Level DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-50
41A-21	Case 3BE-2: Hydrogen Generated In-Vessel DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-51
41A-22	Case 3BE-2: Containment Pressure DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-51
41A-23	Case 3BE-2: Containment Gas Temperature DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-52
41A-24	Case 3BE-2: Containment Compartments Water Level DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-52
41A-25	Case 3BE-2: Well-Mixed Compartment Hydrogen Concentration DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-53

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-26	Case 3BE-2: Well-Mixed Compartment Steam Concentration DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-53
41A-27	Case 3BE-2: Well-Mixed Compartment Oxygen Concentration DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-54
41A-28	Case 3BE-2: Confined Compartment Hydrogen Concentration DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-54
41A-29	Case 3BE-2: Confined Compartment Steam Concentration DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-55
41A-30	Case 3BE-2: Confined Compartment Oxygen Concentration DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-55
41A-31	Case 3BE-2: Equivalence Ratio in SG Room DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-56
41A-32	Case 3BE-2: Equivalence Ratio in CMT Room DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-56
41A-33	Case 3BE-2: Equivalence Ratio in IRWST DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-57
41A-34	Case 3BE-2: Equivalence Ratio in PXS DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-57
41A-35	Case 3BE-4: Reactor Coolant System Pressure Spurious ADS, Failed Gravity Injection	41A-58
41A-36	Case 3BE-4: Core-Exit Gas Temperature Spurious ADS, Failed Gravity Injection	41A-58
41A-37	Case 3BE-4: Reactor Vessel Mixture Level Spurious ADS, Failed Gravity Injection	41A-59
41A-38	Case 3BE-4: Hydrogen Generated In-Vessel Spurious ADS, Failed Gravity Injection	41A-59
41A-39	Case 3BE-4: Containment Pressure Spurious ADS, Failed Gravity Injection	41A-60
41A-40	Case 3BE-4: Containment Gas Temperature Spurious ADS, Failed Gravity Injection	41A-60
41A-41	Case 3BE-4: Containment Compartments Water Level Spurious ADS, Failed Gravity Injection	41A-61
41A-42	Case 3BE-4: Well-Mixed Compartment Hydrogen Concentration Spurious ADS, Failed Gravity Injection	41A-61
41A-43	Case 3BE-4: Well-Mixed Compartment Steam Concentration Spurious ADS, Failed Gravity Injection	41A-62
41A-44	Case 3BE-4: Well-Mixed Compartment Oxygen Concentration Spurious ADS, Failed Gravity Injection	41A-62
41A-45	Case 3BE-4: Confined Compartment Hydrogen Concentration Spurious ADS, Failed Gravity Injection	41A-63
41A-46	Case 3BE-4: Confined Compartment Steam Concentration Spurious ADS, Failed Gravity Injection	41A-63
41A-47	Case 3BE-4: Confined Compartment Oxygen Concentration Spurious ADS, Failed Gravity Injection	41A-64

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-48	Case 3BE-4: Equivalence Ratio in SG Room Spurious ADS, Failed Gravity Injection	41A-64
41A-49	Case 3BE-4: Equivalence Ratio in CMT Room Spurious ADS, Failed Gravity Injection	41A-65
41A-50	Case 3BE-4: Equivalence Ratio in IRWST Spurious ADS, Failed Gravity Injection	41A-65
41A-51	Case 3BE-4: Equivalence Ratio in PXS Spurious ADS, Failed Gravity Injection	41A-66
41A-52	Case 3BE-5: Reactor Coolant System Pressure SBLOCA with Failed Gravity Injection	41A-66
41A-53	Case 3BE-5: Core-Exit Gas Temperature SBLOCA with Failed Gravity Injection	41A-67
41A-54	Case 3BE-5: Reactor Vessel Mixture Level SBLOCA with Failed Gravity Injection	41A-67
41A-55	Case 3BE-5: Hydrogen Generated In-Vessel SBLOCA with Failed Gravity Injection	41A-68
41A-56	Case 3BE-5: Containment Pressure SBLOCA with Failed Gravity Injection	41A-68
41A-57	Case 3BE-5: Containment Gas Temperature SBLOCA with Failed Gravity Injection	41A-69
41A-58	Case 3BE-5: Containment Compartments Water Level SBLOCA with Failed Gravity Injection	41A-69
41A-59	Case 3BE-5: Well-Mixed Compartment Hydrogen Concentration SBLOCA with Failed Gravity Injection	41A-70
41A-60	Case 3BE-5: Well-Mixed Compartment Steam Concentration SBLOCA with Failed Gravity Injection	41A-70
41A-61	Case 3BE-5: Well-Mixed Compartment Oxygen Concentration SBLOCA with Failed Gravity Injection	41A-71
41A-62	Case 3BE-5: Confined Compartment Hydrogen Concentration SBLOCA with Failed Gravity Injection	41A-71
41A-63	Case 3BE-5: Confined Compartment Steam Concentration SBLOCA with Failed Gravity Injection	41A-72
41A-64	Case 3BE-5: Confined Compartment Oxygen Concentration SBLOCA with Failed Gravity Injection	41A-72
41A-65	Case 3BE-5: Equivalence Ratio in SG Room SBLOCA with Failed Gravity Injection	41A-73
41A-66	Case 3BE-5: Equivalence Ratio in CMT Room SBLOCA with Failed Gravity Injection	41A-73
41A-67	Case 3BE-5: Equivalence Ratio in IRWST SBLOCA with Failed Gravity Injection	41A-74
41A-68	Case 3BE-5: Equivalence Ratio in PXS SBLOCA with Failed Gravity Injection	41A-74
41A-69	Case 3BE-6: Reactor Coolant System Pressure SBLOCA with Failed Gravity Injection	41A-75

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-70	Case 3BE-6: Core-Exit Gas Temperature SBLOCA with Failed Gravity Injection	41A-75
41A-71	Case 3BE-6: Reactor Vessel Mixture Level SBLOCA with Failed Gravity Injection	41A-76
41A-72	Case 3BE-6: Hydrogen Generated In-Vessel SBLOCA with Failed Gravity Injection	41A-76
41A-73	Case 3BE-6: Containment Pressure SBLOCA with Failed Gravity Injection	41A-77
41A-74	Case 3BE-6: Containment Gas Temperature SBLOCA with Failed Gravity Injection	41A-77
41A-75	Case 3BE-6: Containment Compartments Water Level SBLOCA with Failed Gravity Injection	41A-78
41A-76	Case 3BE-6: Well-Mixed Compartment Hydrogen Concentration SBLOCA with Failed Gravity Injection	41A-78
41A-77	Case 3BE-6: Well-Mixed Compartment Steam Concentration SBLOCA with Failed Gravity Injection	41A-79
41A-78	Case 3BE-6: Well-Mixed Compartment Oxygen Concentration SBLOCA with Failed Gravity Injection	41A-79
41A-79	Case 3BE-6: Confined Compartment Hydrogen Concentration SBLOCA with Failed Gravity Injection	41A-80
41A-80	Case 3BE-6: Confined Compartment Steam Concentration SBLOCA with Failed Gravity Injection	41A-80
41A-81	Case 3BE-6: Confined Compartment Oxygen Concentration SBLOCA with Failed Gravity Injection	41A-81
41A-82	Case 3BE-6: Equivalence Ratio in SG Room SBLOCA with Failed Gravity Injection	41A-81
41A-83	Case 3BE-6: Equivalence Ratio in CMT Room SBLOCA with Failed Gravity Injection	41A-82
41A-84	Case 3BE-6: Equivalence Ratio in IRWST SBLOCA with Failed Gravity Injection	41A-82
41A-85	Case 3BE-6: Equivalence Ratio in PXS SBLOCA with Failed Gravity Injection	41A-83
41A-86	Case 3BE-8: Reactor Coolant System Pressure SGTR	41A-83
41A-87	Case 3BE-8: Core-Exit Gas Temperature SGTR	41A-84
41A-88	Case 3BE-8: Reactor Vessel Mixture Level SGTR	41A-84
41A-89	Case 3BE-8: Hydrogen Generated In-Vessel SGTR	41A-85
41A-90	Case 3BE-8: Containment Pressure SGTR	41A-85
41A-91	Case 3BE-8: Containment Gas Temperature SGTR	41A-86
41A-92	Case 3BE-8: Containment Compartments Water Level SGTR	41A-86
41A-93	Case 3BE-8: Well-Mixed Compartment Hydrogen Concentration SGTR	41A-87
41A-94	Case 3BE-8: Well-Mixed Compartment Steam Concentration SGTR	41A-87
41A-95	Case 3BE-8: Well-Mixed Compartment Oxygen Concentration SGTR	41A-88
41A-96	Case 3BE-8: Confined Compartment Hydrogen Concentration SGTR	41A-88
41A-97	Case 3BE-8: Confined Compartment Steam Concentration SGTR	41A-89

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-98	Case 3BE-8: Confined Compartment Oxygen Concentration SGTR	41A-89
41A-99	Case 3BE-8: Equivalence Ratio in SG Room SGTR	41A-90
41A-100	Case 3BE-8: Equivalence Ratio in CMT Room SGTR	41A-90
41A-101	Case 3BE-8: Equivalence Ratio in IRWST SGTR	41A-91
41A-102	Case 3BE-8: Equivalence Ratio in PXS SGTR	41A-91
41A-103	Case 3BE-9: Reactor Coolant System Pressure SGTR	41A-92
41A-104	Case 3BE-9: Core-Exit Gas Temperature SGTR	41A-92
41A-105	Case 3BE-9: Reactor Vessel Mixture Level SGTR	41A-93
41A-106	Case 3BE-9: Hydrogen Generated In-Vessel SGTR	41A-93
41A-107	Case 3BE-9: Containment Pressure SGTR	41A-94
41A-108	Case 3BE-9: Containment Gas Temperature SGTR	41A-94
41A-109	Case 3BE-9: Containment Compartments Water Level SGTR	41A-95
41A-110	Case 3BE-9: Well-Mixed Compartment Hydrogen Concentration SGTR	41A-95
41A-111	Case 3BE-9: Well-Mixed Compartment Steam Concentration SGTR	41A-96
41A-112	Case 3BE-9: Well-Mixed Compartment Oxygen Concentration SGTR	41A-96
41A-113	Case 3BE-9: Confined Compartment Hydrogen Concentration SGTR	41A-97
41A-114	Case 3BE-9: Confined Compartment Steam Concentration SGTR	41A-97
41A-115	Case 3BE-9: Confined Compartment Oxygen Concentration SGTR	41A-98
41A-116	Case 3BE-9: Equivalence Ratio in SG Room SGTR	41A-98
41A-117	Case 3BE-9: Equivalence Ratio in CMT Room SGTR	41A-99
41A-118	Case 3BE-9: Equivalence Ratio in IRWST SGTR	41A-99
41A-119	Case 3BE-9: Equivalence Ratio in PXS SGTR	41A-100
41A-120	Case 3BL-1: Reactor Coolant System Pressure SBLOCA with Failed Gravity Recirculation	41A-100
41A-121	Case 3BL-1: Core-Exit Gas Temperature SBLOCA with Failed Gravity Recirculation	41A-101
41A-122	Case 3BL-1: Reactor Vessel Mixture Level SBLOCA with Failed Gravity Recirculation	41A-101
41A-123	Case 3BL-1: Hydrogen Generated In-Vessel SBLOCA with Failed Gravity Recirculation	41A-102
41A-124	Case 3BL-1: Containment Pressure SBLOCA with Failed Gravity Recirculation	41A-102
41A-125	Case 3BL-1: Containment Gas Temperature SBLOCA with Failed Gravity Recirculation	41A-103
41A-126	Case 3BL-1: Containment Compartments Water Level SBLOCA with Failed Gravity Recirculation	41A-103
41A-127	Case 3BL-1: Well-Mixed Compartment Hydrogen Concentration SBLOCA with Failed Gravity Recirculation	41A-104
41A-128	Case 3BL-1: Well-Mixed Compartment Steam Concentration SBLOCA with Failed Gravity Recirculation	41A-104
41A-129	Case 3BL-1: Well-Mixed Compartment Oxygen Concentration SBLOCA with Failed Gravity Recirculation	41A-105

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-130	Case 3BL-1: Confined Compartment Hydrogen Concentration SBLOCA with Failed Gravity Recirculation	41A-105
41A-131	Case 3BL-1: Confined Compartment Steam Concentration SBLOCA with Failed Gravity Recirculation	41A-106
41A-132	Case 3BL-1: Confined Compartment Oxygen Concentration SBLOCA with Failed Gravity Recirculation	41A-106
41A-133	Case 3BL-1: Equivalence Ratio in SG Room SBLOCA with Failed Gravity Recirculation	41A-107
41A-134	Case 3BL-1: Equivalence Ratio in CMT Room SBLOCA with Failed Gravity Recirculation	41A-107
41A-135	Case 3BL-1: Equivalence Ratio in IRWST SBLOCA with Failed Gravity Recirculation	41A-108
41A-136	Case 3BL-1: Equivalence Ratio in PXS SBLOCA with Failed Gravity Recirculation	41A-108
41A-137	Case 3BL-2: Reactor Coolant System Pressure DVI Line Break with Failed Gravity Recirculation	41A-109
41A-138	Case 3BL-2: Core-Exit Gas Temperature DVI Line Break with Failed Gravity Recirculation	41A-109
41A-139	Case 3BL-2: Reactor Vessel Mixture Level DVI Line Break with Failed Gravity Recirculation	41A-110
41A-140	Case 3BL-2: Hydrogen Generated In-Vessel DVI Line Break with Failed Gravity Recirculation	41A-110
41A-141	Case 3BL-2: Containment Pressure DVI Line Break with Failed Gravity Recirculation	41A-111
41A-142	Case 3BL-2: Containment Gas Temperature DVI Line Break with Failed Gravity Recirculation	41A-111
41A-143	Case 3BL-2: Containment Compartments Water Level DVI Line Break with Failed Gravity Recirculation	41A-112
41A-144	Case 3BL-2: Well-Mixed Compartment Hydrogen Concentration DVI Line Break with Failed Gravity Recirculation	41A-112
41A-145	Case 3BL-2: Well-Mixed Compartment Steam Concentration DVI Line Break with Failed Gravity Recirculation	41A-113
41A-146	Case 3BL-2: Well-Mixed Compartment Oxygen Concentration DVI Line Break with Failed Gravity Recirculation	41A-113
41A-147	Case 3BL-2: Confined Compartment Hydrogen Concentration DVI Line Break with Failed Gravity Recirculation	41A-114
41A-148	Case 3BL-2: Confined Compartment Steam Concentration DVI Line Break with Failed Gravity Recirculation	41A-114
41A-149	Case 3BL-2: Confined Compartment Oxygen Concentration DVI Line Break with Failed Gravity Recirculation	41A-115
41A-150	Case 3BL-2: Equivalence Ratio in SG Room DVI Line Break with Failed Gravity Recirculation	41A-115

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-151	Case 3BL-2: Equivalence Ratio in CMT Room DVI Line Break with Failed Gravity Recirculation	41A-116
41A-152	Case 3BL-2: Equivalence Ratio in IRWST DVI Line Break with Failed Gravity Recirculation	41A-116
41A-153	Case 3BL-2: Equivalence Ratio in PXS DVI Line Break with Failed Gravity Recirculation	41A-117
41A-154	Case 3BR-1: Reactor Coolant System Pressure CL LBLOCA with Accumulator Failure	41A-117
41A-155	Case 3BR-1: Core-Exit Gas Temperature CL LBLOCA with Accumulator Failure	41A-118
41A-156	Case 3BR-1: Reactor Vessel Mixture Level CL LBLOCA with Accumulator Failure	41A-118
41A-157	Case 3BR-1: Hydrogen Generated In-Vessel CL LBLOCA with Accumulator Failure	41A-119
41A-158	Case 3BR-1: Containment Pressure CL LBLOCA with Accumulator Failure	41A-119
41A-159	Case 3BR-1: Containment Gas Temperature CL LBLOCA with ccumulator Failure	41A-120
41A-160	Case 3BR-1: Containment Compartments Water Level CL LBLOCA with Accumulator Failure	41A-120
41A-161	Case 3BR-1: Well-Mixed Compartment Hydrogen Concentration CL LBLOCA with Accumulator Failure	41A-121
41A-162	Case 3BR-1: Well-Mixed Compartment Steam Concentration CL LBLOCA with Accumulator Failure	41A-121
41A-163	Case 3BR-1: Well-Mixed Compartment Oxygen Concentration CL LBLOCA with Accumulator Failure	41A-122
41A-164	Case 3BR-1: Confined Compartment Hydrogen Concentration CL LBLOCA with Accumulator Failure	41A-122
41A-165	Case 3BR-1: Confined Compartment Steam Concentration CL LBLOCA with Accumulator Failure	41A-123
41A-166	Case 3BR-1: Confined Compartment Oxygen Concentration CL LBLOCA with Accumulator Failure	41A-123
41A-167	Case 3BR-1: Equivalence Ratio in SG Room CL LBLOCA with Accumulator Failure	41A-124
41A-168	Case 3BR-1: Equivalence Ratio in CMT Room CL LBLOCA with Accumulator Failure	41A-124
41A-169	Case 3BR-1: Equivalence Ratio in IRWST CL LBLOCA with Accumulator Failure	41A-125
41A-170	Case 3BR-1: Equivalence Ratio in PXS CL LBLOCA with Accumulator Failure	41A-125
41A-171	Case 3BR-1a: Reactor Coolant System Pressure CL LBLOCA with Accumulator Failure	41A-126

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-172	Case 3BR-1a: Core-Exit Gas Temperature CL LBLOCA with Accumulator Failure	41A-126
41A-173	Case 3BR-1a: Reactor Vessel Mixture Level CL LBLOCA with Accumulator Failure	41A-127
41A-174	Case 3BR-1a: Hydrogen Generated In-Vessel CL LBLOCA with Accumulator Failure	41A-127
41A-175	Case 3BR-1a: Containment Pressure CL LBLOCA with Accumulator Failure	41A-128
41A-176	Case 3BR-1a: Containment Gas Temperature CL LBLOCA with Accumulator Failure	41A-128
41A-177	Case 3BR-1a: Containment Compartments Water Level CL LBLOCA with Accumulator Failure	41A-129
41A-178	Case 3BR-1a: Well-Mixed Compartment Hydrogen Concentration CL LBLOCA with Accumulator Failure	41A-129
41A-179	Case 3BR-1a: Well-Mixed Compartment Steam Concentration CL LBLOCA with Accumulator Failure	41A-130
41A-180	Case 3BR-1a: Well-Mixed Compartment Oxygen Concentration CL LBLOCA with Accumulator Failure	41A-130
41A-181	Case 3BR-1a: Confined Compartment Hydrogen Concentration CL LBLOCA with Accumulator Failure	41A-131
41A-182	Case 3BR-1a: Confined Compartment Steam Concentration CL LBLOCA with Accumulator Failure	41A-131
41A-183	Case 3BR-1a: Confined Compartment Oxygen Concentration CL LBLOCA with Accumulator Failure	41A-132
41A-184	Case 3BR-1a: Equivalence Ratio in SG Room CL LBLOCA with Accumulator Failure	41A-132
41A-185	Case 3BR-1a: Equivalence Ratio in CMT Room CL LBLOCA with Accumulator Failure	41A-133
41A-186	Case 3BR-1a: Equivalence Ratio in IRWST CL LBLOCA with Accumulator Failure	41A-133
41A-187	Case 3BR-1a: Equivalence Ratio in PXS CL LBLOCA with Accumulator Failure	41A-134
41A-188	Case 3C-1: Reactor Coolant System Pressure Vessel Rupture	41A-134
41A-189	Case 3C-1: Core-Exit Gas Temperature Vessel Rupture	41A-135
41A-190	Case 3C-1: Reactor Vessel Mixture Level Vessel Rupture	41A-135
41A-191	Case 3C-1: Hydrogen Generated In-Vessel Vessel Rupture	41A-136
41A-192	Case 3C-1: Containment Pressure Vessel Rupture	41A-136
41A-193	Case 3C-1: Containment Gas Temperature Vessel Rupture	41A-137
41A-194	Case 3C-1: Containment Compartments Water Level Vessel Rupture	41A-137
41A-195	Case 3C-1: Well-Mixed Compartment Hydrogen Concentration Vessel Rupture	41A-138
41A-196	Case 3C-1: Well-Mixed Compartment Steam Concentration Vessel Rupture	41A-138

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-197	Case 3C-1: Well-Mixed Compartment Oxygen Concentration Vessel Rupture	41A-139
41A-198	Case 3C-1: Confined Compartment Hydrogen Concentration Vessel Rupture	41A-139
41A-199	Case 3C-1: Confined Compartment Steam Concentration Vessel Rupture	41A-140
41A-200	Case 3C-1: Confined Compartment Oxygen Concentration Vessel Rupture	41A-140
41A-201	Case 3C-1: Equivalence Ratio in SG Room Vessel Rupture	41A-141
41A-202	Case 3C-1: Equivalence Ratio in CMT Room Vessel Rupture	41A-141
41A-203	Case 3C-1: Equivalence Ratio in IRWST Vessel Rupture	41A-142
41A-204	Case 3C-1: Equivalence Ratio in PXS Vessel Rupture	41A-142
41A-205	Case 3D-1: Reactor Coolant System Pressure Spurious ADS-4 with Failed CMTs	41A-143
41A-206	Case 3D-1: Core-Exit Gas Temperature Spurious ADS-4 with Failed CMTs	41A-143
41A-207	Case 3D-1: Reactor Vessel Mixture Level Spurious ADS-4 with Failed CMTs	41A-144
41A-208	Case 3D-1: Hydrogen Generated In-Vessel Spurious ADS-4 with Failed CMTs	41A-144
41A-209	Case 3D-1: Containment Pressure Spurious ADS-4 with Failed CMTs	41A-145
41A-210	Case 3D-1: Containment Gas Temperature Spurious ADS-4 with Failed CMTs	41A-145
41A-211	Case 3D-1: Containment Compartments Water Level Spurious ADS-4 with Failed CMTs	41A-146
41A-212	Case 3D-1: Well-Mixed Compartment Hydrogen Concentration Spurious ADS-4 with Failed CMTs	41A-146
41A-213	Case 3D-1: Well-Mixed Compartment Steam Concentration Spurious ADS-4 with Failed CMTs	41A-147
41A-214	Case 3D-1: Well-Mixed Compartment Oxygen Concentration Spurious ADS-4 with Failed CMTs	41A-147
41A-215	Case 3D-1: Confined Compartment Hydrogen Concentration Spurious ADS-4 with Failed CMTs	41A-148
41A-216	Case 3D-1: Confined Compartment Steam Concentration Spurious ADS-4 with Failed CMTs	41A-148
41A-217	Case 3D-1: Confined Compartment Oxygen Concentration Spurious ADS-4 with Failed CMTs	41A-149
41A-218	Case 3D-1: Equivalence Ratio in SG Room Spurious ADS-4 with Failed CMTs	41A-149
41A-219	Case 3D-1: Equivalence Ratio in CMT Room Spurious ADS-4 with Failed CMTs	41A-150
41A-220	Case 3D-1: Equivalence Ratio in IRWST Spurious ADS-4 with Failed CMTs	41A-150

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-221	Case 3D-1: Equivalence Ratio in PXS Spurious ADS-4 with Failed CMTs	41A-151
41A-222	Case 3D-2: Reactor Coolant System Pressure Spurious ADS-2, Failed CMTs	41A-151
41A-223	Case 3D-2: Core-Exit Gas Temperature Spurious ADS-2, Failed CMTs	41A-152
41A-224	Case 3D-2: Reactor Vessel Mixture Level Spurious ADS-2, Failed CMTs	41A-152
41A-225	Case 3D-2: Hydrogen Generated In-Vessel Spurious ADS-2, Failed CMTs	41A-153
41A-226	Case 3D-2: Containment Pressure Spurious ADS-2, Failed CMTs	41A-153
41A-227	Case 3D-2: Containment Gas Temperature Spurious ADS-2, Failed CMTs	41A-154
41A-228	Case 3D-2: Containment Compartments Water Level Spurious ADS-2, Failed CMTs	41A-154
41A-229	Case 3D-2: Well-Mixed Compartment Hydrogen Concentration Spurious ADS-2, Failed CMTs	41A-155
41A-230	Case 3D-2: Well-Mixed Compartment Steam Concentration Spurious ADS-2, Failed CMTs	41A-155
41A-231	Case 3D-2: Well-Mixed Compartment Oxygen Concentration Spurious ADS-2, Failed CMTs	41A-156
41A-232	Case 3D-2: Confined Compartment Hydrogen Concentration Spurious ADS-2, Failed CMTs	41A-156
41A-233	Case 3D-2: Confined Compartment Steam Concentration Spurious ADS-2, Failed CMTs	41A-157
41A-234	Case 3D-2: Confined Compartment Oxygen Concentration Spurious ADS-2, Failed CMTs	41A-157
41A-235	Case 3D-2: Equivalence Ratio in SG Room Spurious ADS-2, Failed CMTs	41A-158
41A-236	Case 3D-2: Equivalence Ratio in CMT Room Spurious ADS-2, Failed CMTs	41A-158
41A-237	Case 3D-2: Equivalence Ratio in IRWST Spurious ADS-2, Failed CMTs	41A-159
41A-238	Case 3D-2: Equivalence Ratio in PXS Spurious ADS-2, Failed CMTs	41A-159
41A-239	Case 3D-3: Reactor Coolant System Pressure DVI Line Break with no ADS	41A-160
41A-240	Case 3D-3: Core-Exit Gas Temperature DVI Line Break with no ADS	41A-160
41A-241	Case 3D-3: Reactor Vessel Mixture Level DVI Line Break with no ADS	41A-161
41A-242	Case 3D-3: Hydrogen Generated In-Vessel DVI Line Break with no ADS	41A-161
41A-243	Case 3D-3: Containment Pressure DVI Line Break with no ADS	41A-162

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-244	Case 3D-3: Containment Gas Temperature DVI Line Break with no ADS	41A-162
41A-245	Case 3D-3: Containment Compartments Water Level DVI Line Break with no ADS	41A-163
41A-246	Case 3D-3: Well-Mixed Compartment Hydrogen Concentration DVI Line Break with no ADS	41A-163
41A-247	Case 3D-3: Well-Mixed Compartment Steam Concentration DVI Line Break with no ADS	41A-164
41A-248	Case 3D-3: Well-Mixed Compartment Oxygen Concentration DVI Line Break with no ADS	41A-164
41A-249	Case 3D-3: Confined Compartment Hydrogen Concentration DVI Line Break with no ADS	41A-165
41A-250	Case 3D-3: Confined Compartment Steam Concentration DVI Line Break with no ADS	41A-165
41A-251	Case 3D-3: Confined Compartment Oxygen Concentration DVI Line Break with no ADS	41A-166
41A-252	Case 3D-3: Equivalence Ratio in SG Room DVI Line Break with no ADS	41A-166
41A-253	Case 3D-3: Equivalence Ratio in CMT Room DVI Line Break with no ADS	41A-167
41A-254	Case 3D-3: Equivalence Ratio in IRWST DVI Line Break with no ADS	41A-167
41A-255	Case 3D-3: Equivalence Ratio in PXS DVI Line Break with no ADS	41A-168
41A-256	Case 3D-5: Reactor Coolant System Pressure Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-168
41A-257	Case 3D-5: Core-Exit Gas Temperature Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-169
41A-258	Case 3D-5: Reactor Vessel Mixture Level Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-169
41A-259	Case 3D-5: Hydrogen Generated In-Vessel Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-170
41A-260	Case 3D-5: Containment Pressure Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-170
41A-261	Case 3D-5: Containment Gas Temperature Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-171
41A-262	Case 3D-5: Containment Compartments Water Level Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-171
41A-263	Case 3D-5: Well-Mixed Compartment Hydrogen Concentration Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-172
41A-264	Case 3D-5: Well-Mixed Compartment Steam Concentration Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-172
41A-265	Case 3D-5: Well-Mixed Compartment Oxygen Concentration Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-173

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-266	Case 3D-5: Confined Compartment Hydrogen Concentration Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-173
41A-267	Case 3D-5: Confined Compartment Steam Concentration Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-174
41A-268	Case 3D-5: Confined Compartment Oxygen Concentration Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-174
41A-269	Case 3D-5: Equivalence Ratio in SG Room Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-175
41A-270	Case 3D-5: Equivalence Ratio in CMT Room Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-175
41A-271	Case 3D-5: Equivalence Ratio in IRWST Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-176
41A-272	Case 3D-5: Equivalence Ratio in PXS Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-176
41A-273	Case 1A-3: Reactor Coolant System Pressure FW Failure with Creep of SG Tubes	41A-177
41A-274	Case 1A-3: Core-Exit Gas Temperature FW Failure with Creep of SG Tubes	41A-177
41A-275	Case 1A-3: Reactor Vessel Mixture Level FW Failure with Creep of SG Tubes	41A-178
41A-276	Case 1A-3: Hydrogen Generated In-Vessel FW Failure with Creep of SG Tubes	41A-178
41A-277	Case 1A-3: Containment Pressure FW Failure with Creep of SG Tubes	41A-179
41A-278	Case 1A-3: Containment Gas Temperature FW Failure with Creep of SG Tubes	41A-179
41A-279	Case 1A-3: Containment Compartments Water Level FW Failure with Creep of SG Tubes	41A-180
41A-280	Case 1A-3: Well-Mixed Compartment Hydrogen Concentration FW Failure with Creep of SG Tubes	41A-180
41A-281	Case 1A-3: Well-Mixed Compartment Steam Concentration FW Failure with Creep of SG Tubes	41A-181
41A-282	Case 1A-3: Well-Mixed Compartment Oxygen Concentration FW Failure with Creep of SG Tubes	41A-181
41A-283	Case 1A-3: Confined Compartment Hydrogen Concentration FW Failure with Creep of SG Tubes	41A-182
41A-284	Case 1A-3: Confined Compartment Steam Concentration FW Failure with Creep of SG Tubes	41A-182
41A-285	Case 1A-3: Confined Compartment Oxygen Concentration FW Failure with Creep of SG Tubes	41A-183
41A-286	Case 1A-3: Equivalence Ratio in SG Room FW Failure with Creep of SG Tubes	41A-183
41A-287	Case 1A-3: Equivalence Ratio in CMT Room FW Failure with Creep of SG Tubes	41A-184

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-288	Case 1A-3: Equivalence Ratio in IRWST FW Failure with Creep of SG Tubes	41A-184
41A-289	Case 1A-3: Equivalence Ratio in PXS FW Failure with Creep of SG Tubes	41A-185
41A-290	Case 1A-3a: Reactor Coolant System Pressure Transient with Creep of SG Tubes	41A-185
41A-291	Case 1A-3a: Core-Exit Gas Temperature Transient with Creep of SG Tubes	41A-186
41A-292	Case 1A-3a: Reactor Vessel Mixture Level Transient with Creep of SG Tubes	41A-186
41A-293	Case 1A-3a: Hydrogen Generated In-Vessel Transient with Creep of SG Tubes	41A-187
41A-294	Case 1A-3a: Containment Pressure Transient with Creep of SG Tubes	41A-187
41A-295	Case 1A-3a: Containment Gas Temperature Transient with Creep of SG Tubes	41A-188
41A-296	Case 1A-3a: Containment Compartments Water Level Transient with Creep of SG Tubes	41A-188
41A-297	Case 1A-3a: Well-Mixed Compartment Hydrogen Concentration Transient with Creep of SG Tubes	41A-189
41A-298	Case 1A-3a: Well-Mixed Compartment Steam Concentration Transient with Creep of SG Tubes	41A-189
41A-299	Case 1A-3a: Well-Mixed Compartment Oxygen Concentration Transient with Creep of SG Tubes	41A-190
41A-300	Case 1A-3a: Confined Compartment Hydrogen Concentration Transient with Creep of SG Tubes	41A-190
41A-301	Case 1A-3a: Confined Compartment Steam Concentration Transient with Creep of SG Tubes	41A-191
41A-302	Case 1A-3a: Confined Compartment Oxygen Concentration Transient with Creep of SG Tubes	41A-191
41A-303	Case 1A-3a: Approximate Detonation Cell Width in SG Room Transient with Creep of SG Tubes	41A-192
41A-304	Case 1A-3a: Approximate Detonation Cell Width in CMT Room Transient with Creep of SG Tubes	41A-192
41A-305	Case 1A-3a: Equivalence Ratio in IRWST Transient with Creep of SG Tubes	41A-193
41A-306	Case 1A-3a: Approximate Detonation Cell Width in PXS Transient with Creep of SG Tubes	41A-193
41A-307	Case 1A-4: Reactor Coolant System Pressure FW Failure with Creep of SG Tubes	41A-194
41A-308	Case 1A-4: Core-Exit Gas Temperature FW Failure with Creep of SG Tubes	41A-194
41A-309	Case 1A-4: Reactor Vessel Mixture Level FW Failure with Creep of SG Tubes	41A-195
41A-310	Case 1A-4: Hydrogen Generated In-Vessel FW Failure with Creep of SG Tubes	41A-195

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-311	Case 1A-4: Containment Pressure FW Failure with Creep of SG Tubes	41A-196
41A-312	Case 1A-4: Containment Gas Temperature FW Failure with Creep of SG Tubes	41A-196
41A-313	Case 1A-4: Containment Compartments Water Level FW Failure with Creep of SG Tubes	41A-197
41A-314	Case 1A-4: Well-Mixed Compartment Hydrogen Concentration FW Failure with Creep of SG Tubes	41A-197
41A-315	Case 1A-4: Well-Mixed Compartment Steam Concentration FW Failure with Creep of SG Tubes	41A-198
41A-316	Case 1A-4: Well-Mixed Compartment Oxygen Concentration FW Failure with Creep of SG Tubes	41A-198
41A-317	Case 1A-4: Confined Compartment Hydrogen Concentration FW Failure with Creep of SG Tubes	41A-199
41A-318	Case 1A-4: Confined Compartment Steam Concentration FW Failure with Creep of SG Tubes	41A-199
41A-319	Case 1A-4: Confined Compartment Oxygen Concentration FW Failure with Creep of SG Tubes	41A-200
41A-320	Case 1A-4: Equivalence Ratio in SG Room FW Failure with Creep of SG Tubes	41A-200
41A-321	Case 1A-4: Equivalence Ratio in CMT Room FW Failure with Creep of SG Tubes	41A-201
41A-322	Case 1A-4: Equivalence Ratio in IRWST FW Failure with Creep of SG Tubes	41A-201
41A-323	Case 1A-4: Equivalence Ratio in PXS FW Failure with Creep of SG Tubes	41A-202
41A-324	Case 1A-4a: Reactor Coolant System Pressure Transient with Creep of SG Tubes	41A-202
41A-325	Case 1A-4a: Core-Exit Gas Temperature Transient with Creep of SG Tubes	41A-203
41A-326	Case 1A-4a: Reactor Vessel Mixture Level Transient with Creep of SG Tubes	41A-203
41A-327	Case 1A-4a: Hydrogen Generated In-Vessel Transient with Creep of SG Tubes	41A-204
41A-328	Case 1A-4a: Containment Pressure Transient with Creep of SG Tubes	41A-204
41A-329	Case 1A-4a: Containment Gas Temperature Transient with Creep of SG Tubes	41A-205
41A-330	Case 1A-4a: Containment Compartments Water Level Transient with Creep of SG Tubes	41A-205
41A-331	Case 1A-4a: Well-Mixed Compartment Hydrogen Concentration Transient with Creep of SG Tubes	41A-206
41A-332	Case 1A-4a: Well-Mixed Compartment Steam Concentration Transient with Creep of SG Tubes	41A-206
41A-333	Case 1A-4a: Well-Mixed Compartment Oxygen Concentration Transient with Creep of SG Tubes	41A-207

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-334	Case 1A-4a: Confined Compartment Hydrogen Concentration Transient with Creep of SG Tubes	41A-207
41A-335	Case 1A-4a: Confined Compartment Steam Concentration Transient with Creep of SG Tubes	41A-208
41A-336	Case 1A-4a: Confined Compartment Oxygen Concentration Transient with Creep of SG Tubes	41A-208
41A-337	Case 1A-4a: Approximate Detonation Cell Width in SG Room Transient with Creep of SG Tubes	41A-209
41A-338	Case 1A-4a: Equivalence Ratio in CMT Room Transient with Creep of SG Tubes	41A-209
41A-339	Case 1A-4a: Equivalence Ratio in IRWST Transient with Creep of SG Tubes	41A-210
41A-340	Case 1A-4a: Equivalence Ratio in PXS Transient with Creep of SG Tubes	41A-210
41A-341	Case 1AP-3: Reactor Coolant System Pressure SBLOCA, Failed PRHR and CMTs	41A-211
41A-342	Case 1AP-3: Core-Exit Gas Temperature SBLOCA, Failed PRHR and CMTs	41A-211
41A-343	Case 1AP-3: Reactor Vessel Mixture Level SBLOCA, Failed PRHR and CMTs	41A-212
41A-344	Case 1AP-3: Hydrogen Generated In-Vessel SBLOCA, Failed PRHR and CMTs	41A-212
41A-345	Case 1AP-3: Containment Pressure SBLOCA, Failed PRHR and CMTs	41A-213
41A-346	Case 1AP-3: Containment Gas Temperature SBLOCA, Failed PRHR and CMTs	41A-213
41A-347	Case 1AP-3: Containment Compartments Water Level SBLOCA, Failed PRHR and CMTs	41A-214
41A-348	Case 1AP-3: Well-Mixed Compartment Hydrogen Concentration SBLOCA, Failed PRHR and CMTs	41A-214
41A-349	Case 1AP-3: Well-Mixed Compartment Steam Concentration SBLOCA, Failed PRHR and CMTs	41A-215
41A-350	Case 1AP-3: Well-Mixed Compartment Oxygen Concentration SBLOCA, Failed PRHR and CMTs	41A-215
41A-351	Case 1AP-3: Confined Compartment Hydrogen Concentration SBLOCA, Failed PRHR and CMTs	41A-216
41A-352	Case 1AP-3: Confined Compartment Steam Concentration SBLOCA, Failed PRHR and CMTs	41A-216
41A-353	Case 1AP-3: Confined Compartment Oxygen Concentration SBLOCA, Failed PRHR and CMTs	41A-217
41A-354	Case 1AP-3: Equivalence Ratio in SG Room SBLOCA, Failed PRHR and CMTs	41A-217
41A-355	Case 1AP-3: Equivalence Ratio in CMT Room SBLOCA, Failed PRHR and CMTs	41A-218

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-356	Case 1AP-3: Equivalence Ratio in IRWST SBLOCA, Failed PRHR and CMTs	41A-218
41A-357	Case 1AP-3: Equivalence Ratio in PXS SBLOCA, Failed PRHR and CMTs	41A-219
41A-358	Case 1AP-4: Reactor Coolant System Pressure SBLOCA with Failed PRHR and ADS	41A-219
41A-359	Case 1AP-4: Core-Exit Gas Temperature SBLOCA with Failed PRHR and ADS	41A-220
41A-360	Case 1AP-4: Reactor Vessel Mixture Level SBLOCA with Failed PRHR and ADS	41A-220
41A-361	Case 1AP-4: Hydrogen Generated In-Vessel SBLOCA with Failed PRHR and ADS	41A-221
41A-362	Case 1AP-4: Containment Pressure SBLOCA with Failed PRHR and ADS	41A-221
41A-363	Case 1AP-4: Containment Gas Temperature SBLOCA with Failed PRHR and ADS	41A-222
41A-364	Case 1AP-4: Containment Compartments Water Level SBLOCA with Failed PRHR and ADS	41A-222
41A-365	Case 1AP-4: Well-Mixed Compartment Hydrogen Concentration SBLOCA with Failed PRHR and ADS	41A-223
41A-366	Case 1AP-4: Well-Mixed Compartment Steam Concentration SBLOCA with Failed PRHR and ADS	41A-223
41A-367	Case 1AP-4: Well-Mixed Compartment Oxygen Concentration SBLOCA with Failed PRHR and ADS	41A-224
41A-368	Case 1AP-4: Confined Compartment Hydrogen Concentration SBLOCA with Failed PRHR and ADS	41A-224
41A-369	Case 1AP-4: Confined Compartment Steam Concentration SBLOCA with Failed PRHR and ADS	41A-225
41A-370	Case 1AP-4: Confined Compartment Oxygen Concentration SBLOCA with Failed PRHR and ADS	41A-225
41A-371	Case 1AP-4: Equivalence Ratio in SG Room SBLOCA with Failed PRHR and ADS	41A-226
41A-372	Case 1AP-4: Equivalence Ratio in CMT Room SBLOCA with Failed PRHR and ADS	41A-226
41A-373	Case 1AP-4: Equivalence Ratio in IRWST SBLOCA with Failed PRHR and ADS	41A-227
41A-374	Case 1AP-4: Equivalence Ratio in PXS SBLOCA with Failed PRHR and ADS	41A-227
41B-1	Case 3BR – LLOCA with Accumulator Failure Reactor Coolant System Pressure	41B-3
41B-2	Case 3BR – LLOCA with Accumulator Failure Reactor Vessel Mixture Level	41B-3

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41B-3	Case 3BR – LLOCA with Accumulator Failure Core-Exit Gas Temperature	41B-4
41B-4	Case 3BR – LLOCA with Accumulator Failure Hydrogen Generated In-Vessel	41B-4
41B-5	Case 3BR – LLOCA with Accumulator Failure Containment Pressure	41B-5
41B-6	Case 3BR – LLOCA with Accumulator Failure Containment Gas Temperature	41B-5
41B-7	Case 3BR – LLOCA with Accumulator Failure Containment Compartment Hydrogen Concentration	41B-6
41B-8	Case 3BR – LLOCA with Accumulator Failure Hydrogen Flow Rate Through Break	41B-6
41B-9	Case 3BR – LLOCA with Accumulator Failure Well-Mixed Compartment Hydrogen Concentration	41B-7
41B-10	Case 3BR – LLOCA with Accumulator Failure Well-Mixed Compartment Oxygen Concentration	41B-7
41B-11	Case 3BR – LLOCA with Accumulator Failure Well-Mixed Compartment Steam Concentration	41B-8
41B-12	Case 3BR – LLOCA with Accumulator Failure Approximate Detonation Cell Width in Steam Generator Compartment	41B-8
41B-13	Case 3BR – LLOCA with Accumulator Failure Containment Compartments Water Level	41B-9
41B-14	Case 3BR – LLOCA with Accumulator Failure Hydrogen Flow Rate Through ADS to IRWST	41B-9
41B-15	Case 3BR – LLOCA with Accumulator Failure Confined Compartment Hydrogen Concentration	41B-10
41B-16	Case 3BR – LLOCA with Accumulator Failure Confined Compartment Oxygen Concentration	41B-10
41B-17	Case 3BR – LLOCA with Accumulator Failure Confined Compartment Steam Concentration	41B-11
42-1	AP1000 Containment Fragility at Containment Temperature of 400°F	42-12
42-2	AP1000 Containment Fragility at Containment Temperature of 331°F	42-13
43-1	Plant Damage State Contributions to CDF	43-119
43-2	Containment Event Tree – CET (Sheets 1 – 3)	43-120
43-3	3BE CET (Sheets 1 – 3)	43-123
43-4	3BL CET (Sheets 1 – 3)	43-126
43-5	3BR CET (Sheets 1 – 3)	43-129
43-6	1A CET (Sheets 1 – 3)	43-132
43-7	1AP CET (Sheets 1 – 3)	43-135
43-8	3A CET (Sheets 1 – 3)	43-138
43-9	3C CET (Sheets 1 – 3)	43-141
43-10	3D CET (Sheets 1 – 3)	43-144
43-11	6 CET (Sheets 1 – 3)	43-147

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
43-12	Contribution of PDS to LRF	43-150
43-13	Summary of CET Quantification (Sheets 1 – 2)	43-151
44-1	MAAP4 AP1000 Containment Nodalization	44-12
45-1	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Noble Gases	45-7
45-2	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Cesium Iodide	45-7
45-3	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Tellurium Dioxide	45-8
45-4	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Strontium Oxide	45-8
45-5	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Molybdenum Dioxide	45-9
45-6	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Cesium Hydroxide	45-9
45-7	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Barium Oxide	45-10
45-8	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Dilanthanum Trioxide	45-10
45-9	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Cerium Dioxide	45-11
45-10	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Tin	45-11
45-11	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Tellurium	45-12
45-12	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Uranium Dioxide	45-12
45-13	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Noble Gases	45-13
45-14	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Cesium Iodide	45-13
45-15	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Tellurium Dioxide	45-14
45-16	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Strontium Oxide	45-14
45-17	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Molybdenum Dioxide	45-15
45-18	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Cesium Hydroxide	45-15
45-19	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Barium Oxide	45-16

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
45-20	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Dilanthanum Trioxide	45-16
45-21	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Cerium Dioxide	45-17
45-22	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Tin	45-17
45-23	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Tellurium	45-18
45-24	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Uranium Dioxide	45-18
45-25	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Noble Gases	45-19
45-26	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Cesium Iodide	45-19
45-27	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Tellurium Dioxide	45-20
45-28	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Strontium Oxide	45-20
45-29	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Molybdenum Dioxide	45-21
45-30	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Cesium Hydroxide	45-21
45-31	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Barium Oxide	45-22
45-32	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Dilanthanum Trioxide	45-22
45-33	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Cerium Dioxide	45-23
45-34	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Tin	45-23
45-35	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Tellurium	45-24
45-36	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Uranium Dioxide	45-24
45-37	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Noble Gases	45-25
45-38	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Cesium Iodide	45-25
45-39	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Tellurium Dioxide	45-26
45-40	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Strontium Oxide	45-26

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
45-41	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Molybdenum Dioxide	45-27
45-42	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Cesium Hydroxide	45-27
45-43	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Barium Oxide	45-28
45-44	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Dilanthanum Trioxide	45-28
45-45	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Cerium Dioxide	45-29
45-46	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Tin	45-29
45-47	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Tellurium	45-30
45-48	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Uranium Dioxide	45-30
45-49	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Noble Gases	45-31
45-50	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Cesium Iodide	45-31
45-51	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Tellurium Dioxide	45-32
45-52	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Strontium Oxide	45-32
45-53	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Molybdenum Dioxide	45-33
45-54	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Cesium Hydroxide	45-33
45-55	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Barium Oxide	45-34
45-56	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Dilanthanum Trioxide	45-34
45-57	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Cerium Dioxide	45-35
45-58	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Tin	45-35
45-59	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Tellurium	45-36
45-60	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Uranium Dioxide	45-36
45-61	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Noble Gases	45-37

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
45-62	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Cesium Iodide	45-37
45-63	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Tellurium Dioxide	45-38
45-64	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Strontium Oxide	45-38
45-65	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Molybdenum Dioxide	45-39
45-66	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Cesium Hydroxide	45-39
45-67	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Barium Oxide	45-40
45-68	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Dilanthanum Trioxide	45-40
45-69	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Cerium Dioxide	45-41
45-70	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Tin	45-41
45-71	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Tellurium	45-42
45-72	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Uranium Dioxide	45-42
45-73	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Noble Gases	45-43
45-74	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Cesium Iodide	45-43
45-75	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Tellurium Dioxide	45-44
45-76	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Strontium Oxide	45-44
45-77	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Molybdenum Dioxide	45-45
45-78	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Cesium Hydroxide	45-45
45-79	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Barium Oxide	45-46
45-80	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Dilanthanum Trioxide	45-46
45-81	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Cerium Dioxide	45-47
45-82	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Tin	45-47

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
45-83	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Tellurium	45-48
45-84	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Uranium Dioxide	45-48
45A-1	AP1000 Fission Product Release Fractions for Release Category CFE – Noble Gases	45A-3
45A-2	AP1000 Fission Product Release Fractions for Release Category CFE – CsI and RbI	45A-3
45A-3	AP1000 Fission Product Release Fractions for Release Category CFE – TeO_2	45A-4
45A-4	AP1000 Fission Product Release Fractions for Release Category CFE – SrO	45A-4
45A-5	AP1000 Fission Product Release Fractions for Release Category CFE – MoO_2	45A-5
45A-6	AP1000 Fission Product Release Fractions for Release Category CFE – CsOH and RbOH	45A-5
45A-7	AP1000 Fission Product Release Fractions for Release Category CFE – BaO	45A-6
45A-8	AP1000 Fission Product Release Fractions for Release Category CFE – La_2O_3	45A-6
45A-9	AP1000 Fission Product Release Fractions for Release Category CFE – CeO_2	45A-7
45A-10	AP1000 Fission Product Release Fractions for Release Category CFE – Sb	45A-7
45A-11	AP1000 Fission Product Release Fractions for Release Category CFE – Te_2	45A-8
45A-12	AP1000 Fission Product Release Fractions for Release Category CFE – UO_2	45A-8
45A-13	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – RCS Pressure	45A-9
45A-14	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Reactor Vessel Mixture Level	45A-9
45A-15	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Core-Exit Temperature	45A-10
45A-16	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – In-Vessel Hydrogen Generation	45A-10
45A-17	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Containment Pressure	45A-11
45A-18	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Containment Gas Temperature	45A-11
45A-19	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Containment Hydrogen Concentration	45A-12
45A-20	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Noble Gases Release Fraction	45A-12

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
45A-21	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – CsI and RbI Release Fraction	45A-13
45A-22	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – TeO_2 Release Fraction	45A-13
45A-23	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – SrO Release Fraction	45A-14
45A-24	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – MoO_2 Release Fraction	45A-14
45A-25	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – CsOH and RbOH Release Fraction	45A-15
45A-26	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – BaO Release Fraction	45A-15
45A-27	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – La_2O_3 Release Fraction	45A-16
45A-28	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – CeO_2 Release Fraction	45A-16
45A-29	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Sb Release Fraction	45A-17
45A-30	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Te_2 Release Fraction	45A-17
45A-31	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – UO_2 Release Fraction	45A-18
45A-32	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – Containment Pressure	45A-18
45A-33	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – Noble Gases Release Fraction	45A-19
45A-34	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – CsI and RbI Release Fraction	45A-19
45A-35	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – TeO_2 Release Fraction	45A-20
45A-36	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – SrO Release Fraction	45A-20
45A-37	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – MoO_2 Release Fraction	45A-21
45A-38	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – CsOH and RbOH Release Fraction	45A-21
45A-39	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – BaO Release Fraction	45A-22
45A-40	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – La_2O_3 Release Fraction	45A-22
45A-41	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – CeO_2 Release Fraction	45A-23

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
45A-42	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – Sb Release Fraction	45A-23
45A-43	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – Te_2 Release Fraction	45A-24
45A-44	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – UO_2 Release Fraction	45A-24
49-1	Population Whole Body Dose – BP Source Term, 24 Hours	49-20
49-2	Population Whole Body Dose – BP Source Term 72 Hours	49-20
49-3	Site Boundary Whole Body Dose – BP Source Term, 24 Hours	49-21
49-4	Site Boundary Whole Body Dose – BP Source Term, 72 Hours	49-21
49-5	Site Boundary Red Bone Marrow Dose – BP Source Term, 24 Hours	49-22
49-6	Site Boundary Red Bone Marrow Dose – BP Source Term, 72 Hours	49-22
49-7	Site Boundary Thyroid Dose – BP Source Term, 24 Hours	49-23
49-8	Site Boundary Thyroid Dose – BP Source Term, 72 Hours	49-23
49-9	Population Whole Body Dose – CFE Source Term, 24 Hours	49-24
49-10	Population Whole Body Dose – CFE Source Term, 72 Hours	49-24
49-11	Site Boundary Whole Body Dose – CFE Source Term, 24 Hours	49-25
49-12	Site Boundary Whole Body Dose – CFE Source Term, 72 Hours	49-25
49-13	Site Boundary Red Bone Marrow Dose – CFE Source Term, 24 Hours	49-26
49-14	Site Boundary Red Bone Marrow Dose – CFE Source Term, 72 Hours	49-26
49-15	Site Boundary Thyroid Dose – CFE Source Term, 24 Hours	49-27
49-16	Site Boundary Thyroid Dose – CFE Source Term, 72 Hours	49-27
49-17	Population Whole Body Dose – CFI Source Term, 24 Hours	49-28
49-18	Population Whole Body Dose – CFI Source Term, 72 Hours	49-28
49-19	Site Boundary Whole Body Dose – CFI Source Term, 24 Hours	49-29
49-20	Site Boundary Whole Body Dose – CFI Source Term, 72 Hours	49-29
49-21	Site Boundary Red Bone Marrow Dose – CFI Source Term, 24 Hours	49-30
49-22	Site Boundary Red Bone Marrow Dose – CFI Source Term, 72 Hours	49-30
49-23	Site Boundary Thyroid Dose – CFI Source Term, 24 Hours	49-31
49-24	Site Boundary Thyroid Dose – CFI Source Term, 72 Hours	49-31
49-25	Population Whole Body Dose – CFL Source Term, 24 Hours	49-32
49-26	Population Whole Body Dose – CFL Source Term, 72 Hours	49-32
49-27	Site Boundary Whole Body Dose – CFL Source Term, 24 Hours	49-33
49-28	Site Boundary Whole Body Dose – CFL Source Term, 72 Hours	49-33
49-29	Site Boundary Red Bone Marrow Dose – CFL Source Term, 24 Hours	49-34
49-30	Site Boundary Red Bone Marrow Dose – CFL Source Term, 72 Hours	49-34
49-31	Site Boundary Thyroid Dose – CFL Source Term, 24 Hours	49-35
49-32	Site Boundary Thyroid Dose – CFL Source Term, 72 Hours	49-35
49-33	Population Whole Body Dose – CI Source Term, 24 Hours	49-36
49-34	Population Whole Body Dose – CI Source Term, 72 Hours	49-36
49-35	Site Boundary Whole Body Dose – CI Source Term, 24 Hours	49-37
49-36	Site Boundary Whole Body Dose – CI Source Term, 72 Hours	49-37

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
49-37	Site Boundary Red Bone Marrow Dose – CI Source Term, 24 Hours	49-38
49-38	Site Boundary Red Bone Marrow Dose – CI Source Term, 72 Hours	49-38
49-39	Site Boundary Thyroid Dose – CI Source Term, 24 Hours	49-39
49-40	Site Boundary Thyroid Dose – CI Source Term, 72 Hours	49-39
49-41	Population Whole Body Dose – DIRECT Source Term, 24 Hours	49-40
49-42	Population Whole Body Dose – DIRECT Source Term, 72 Hours	49-40
49-43	Site Boundary Whole Body Dose – DIRECT Source Term, 24 Hours	49-41
49-44	Site Boundary Whole Body Dose – DIRECT Source Term, 72 Hours	49-41
49-45	Site Boundary Red Bone Marrow Dose – DIRECT Source Term, 24 Hours	49-42
49-46	Site Boundary Red Bone Marrow Dose – DIRECT Source Term, 72 Hours	49-42
49-47	Site Boundary Thyroid Dose – DIRECT Source Term, 24 Hours	49-43
49-48	Site Boundary Thyroid Dose – DIRECT Source Term, 72 Hours	49-43
49-49	Population Whole Body Dose – IC Source Term, 24 Hours	49-44
49-50	Population Whole Body Dose – IC Source Term, 72 Hours	49-44
49-51	Site Boundary Whole Body Dose – IC Source Term, 24 Hours	49-45
49-52	Site Boundary Whole Body Dose – IC Source Term, 72 Hours	49-45
49-53	Site Boundary Red Bone Marrow Dose – IC Source Term, 24 Hours	49-46
49-54	Site Boundary Red Bone Marrow Dose – IC Source Term, 72 Hours	49-46
49-55	Site Boundary Thyroid Dose – IC Source Term, 24 Hours	49-47
49-56	Site Boundary Thyroid Dose – IC Source Term, 72 Hours	49-47
49-57	Overall Dose Risk – Site Boundary Whole Body EDE Dose, 24 Hours	49-48
49-58	Overall Dose Risk – Site Boundary Red Bone Marrow Dose (Acute), 24 Hours	49-49
51-1	AP1000 Base Core Damage Frequency Uncertainty Analysis	51-11
51-2	AP1000 Sensitivity Case Uncertainty Analysis	51-11
51B-1	Distribution for Plant Core Damage Frequency	51B-2
51B-2	Safety Injection Line Break	51B-2
51B-3	Large LOCA	51B-3
51B-4	Large Spurious ADS Actuation	51B-3
51B-5	Small LOCA	51B-4
51B-6	Medium LOCA	51B-4
51B-7	Reactor Vessel Rupture	51B-5
51B-8	Steam Generator Tube Rupture	51B-5
51B-9	Safety Injection Line Break – Sequence 7	51B-6
51B-10	Large LOCA – Sequence 9	51B-6
51B-11	Spurious ADS – Sequence 8	51B-7
51B-12	Safety Injection Line Break – Sequence 8d	51B-7
51B-13	Reactor Vessel Rupture – Sequence 2	51B-8
51B-14	Small LOCA – Sequence 5	51B-8
51B-15	Medium LOCA – Sequence 5	51B-9
51B-16	Small LOCA – Sequence 12	51B-9
51B-17	Medium LOCA – Sequence 12	51B-10

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
51B-18	Spurious ADS – Sequence 9	51B-10
51B-19	Spurious ADS – Sequence 7	51B-11
51B-20	Safety Injection Line Break – Sequence 3	51B-11
51B-21	SGTR Event – Sequence 41	51B-12
51B-22	ATWS Precursor with no MFW – Sequence 23	51B-12
51B-23	Small LOCA – Sequence 9	51B-13
51B-24	Medium LOCA – Sequence 9	51B-13
51B-25	SGTR Event – Sequence 13	51B-14
51B-26	Large LOCA – Sequence 8	51B-14
51B-27	CMT Line Break – Sequence 5	51B-15
54-1	Loss of Offsite Power During Hot/Cold Shutdown (RCS Filled) Event Tree (Sheets 1 – 2)	54-138
54-2	Loss of RNS During Hot/Cold Shutdown (RCS Filled) Event Tree	54-140
54-3	Loss of CCW/SW During Hot/Cold Shutdown (RCS Filled) Event Tree	54-141
54-4	LOCA/RNS-V024 Opens During Hot/Cold Shutdown (RCS Filled) Event Tree	54-142
54-5	LOCA/RNS Pipe Rupture During Hot/Cold Shutdown (RCS Filled) Event Tree	54-143
54-6	Overdraining of Reactor Coolant System During Draindown to Mid-loop Event Tree	54-144
54-7	Loss of Offsite Power During RCS drained Condition Event Tree	54-145
54-8	Loss of RNS During RCS drained Condition Event Tree	54-146
54-9	Loss of CCW/SW During RCS drained Condition Event Tree	54-147
54-10	LOCA/RNS-V024 Opens During RCS drained Condition Event Tree	54-148
55-1	Seismic Initiating Event Hierarchy Tree	55-30
57-1	Example Event Tree Model	57-125
57-2	Contribution of Plant Areas to Fire CDF	57-126
57-3	Contribution of Fire Area to Fire CDF	57-127
57A-1	DAS-ACT Fault Tree	57A-37
57C-1	0000 AF 00 Yard Building (Including Transformer Yard)	57C-12
57C-2	1200 AF 01 RCA of Auxiliary Building (All Zones)	57C-13
57C-3	1200 AF 02 New Fuel and Used Fuel Storage, Waste Disposal Container (All Zones)	57C-14
57C-4	1200 AF 03 Corridors 100′ & 117′ 6″	57C-15
57C-5	1201 AF 02 Division B Batteries/DC Equipment Room/Instrumentation and Control	57C-16
57C-6	1201 AF 03 Division D DC Equipment/I&C	57C-17
57C-7	1201 AF 04 Division B/D VBS Equipment	57C-18
57C-8	1201 AF 05 MSIV Compartment A	57C-19
57C-9	1201 AF 06 MSIV Compartment B	57C-20

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
57C-10	1202 AF 02 Northeast Elevator Shaft	57C-21
57C-11	1202 AF 03 Division C Batteries/DC Equipment/I&C Room/ RCP Trip Switchgear Room/I&C Penetration Room	57C-22
57C-12	1202 AF 04 Division A Electrical Equipment/Battery Room/I&C Room	57C-23
57C-13	1204 AF 01 RNS Pump Room B	57C-24
57C-14	1204 AF 03 South Shield Building Elevator Shaft	57C-25
57C-15	1205 AF 02 Southeast Elevator Shaft	57C-26
57C-16	1210 AF 01 Corridor/Spare Battery Room/Spare Room/Spare Battery Charger Room	57C-27
57C-17	1220 AF 01 Division B RCP Trip Switchgear/Spare Room/Corridor 82' 6"	57C-28
57C-18	1220 AF 02 Lower Annulus Valve Area	57C-29
57C-19	1230 AF 01 Corridor Division A, B, C, D and Remote Shutdown Workstation	57C-30
57C-20	1230 AF 02 Non-Class 1E Electrical Compartment - 100'	57C-31
57C-21	1232 AF 01 Remote Shutdown Workstation	57C-32
57C-22	1240 AF 01 Non-Class 1E Electrical Compartment - 117'	57C-33
57C-23	1242 AF 02 Division A Penetration Area	57C-34
57C-24	1243 AF 01 Reactor Trip Switchgear I	57C-35
57C-25	1243 AF 02 Reactor Trip Switchgear II	57C-36
57C-26	1250 AF 01 Nonradioactive Ventilation System	57C-37
57C-27	2000 AF 01 Turbine Building Floor	57C-38
57C-28	2003 AF 01 Auxiliary Boiler Equipment Room	57C-39
57C-29	2009 AF 02 Elevator Machine Room	57C-40
57C-30	2033 AF 02 Motor-Driven Fire Pump Room	57C-41
57C-31	2040 AF 01 Clean and Dirty Lube Oil Storage	57C-42
57C-32	2043 AF 01 Chemical Laboratory	57C-43
57C-33	2050 AF 01 Lube Oil Conditioner Room	57C-44
57C-34	2052 AF 01 Southwest 6.9KV Switchgear Room	57C-45
57C-35	2053 AF 01 Electrical Equipment Room	57C-46
57C-36	2053 AF 02 Northwest 6.9KV Switchgear Room	57C-47
57C-37	4003 AF 01 Demineralized Water Deoxygenating Room/ Air Handling Equipment Rooms	57C-48
57C-38	4031 AF 01 Battery Room and Battery Charger Room 1	57C-49
57C-39	4031 AF 02 Battery Room and Battery Charger Room 2/ Computer Room B/Shift Turnover Room	57C-50
57C-40	4031 AF 05 Corridor/Spare Battery Room/Spare Room/ Spare Battery Charger Room	57C-51
57C-41	4031 AF 06 Central Alarm Station/Security Room 1	57C-52
57C-42	4032 AF 01 Decontamination Room, Non-Radiological and Radiological Controlled Area Entry/Exit Area	57C-53
57C-43	4032 AF 02 Containment Access Corridor Elevation 107' 2"	57C-54
57C-44	4033 AF 01 Hot Machine Shop	57C-55
57C-45	4034 AF 01 General Offices	57C-56
57C-46	4041 AF 01 Conference Rooms/Computer Room A/Corridor	57C-57

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
57C-47	4041 AF 02 Corridor/Restroom	57C-58
57C-48	4042 AF 01 Non-Class 1E Switchgear #1	57C-59
57C-49	4042 AF 02 Non-Class 1E Switchgear #2	57C-60
57C-50	4052 AF 01 Staging and Storage Area/Containment Air Filtration Exhaust Rooms A & B	57C-61
57C-51	5031 AF 01 Radwaste Building	57C-62
57C-52	6030 AF 01 Diesel Generator Room A	57C-63
57C-53	6030 AF 02 Diesel Generator Room B	57C-64
57C-54	6030 AF 03 Fuel Oil Day Tank Room A	57C-65
57C-55	6030 AF 04 Fuel Oil Day Take Room B	57C-66
57C-56	1100 AF 11204 Reactor Coolant Drain Tank Room	57C-67
57C-57	1100 AF 11206 Accumulator Room A	57C-68
57C-58	1100 AF 11207 Accumulator Room B	57C-69
57C-59	1100 AF 11208 RNS Valve Room	57C-70
57C-60	1100 AF 11300A Maintenance Floor (SE Quadrant Access)	57C-71
57C-61	1100 AF 11300B Maintenance Floor (NNE Quadrant) and RCDT Access	57C-72
57C-62	1100 AF 11301 SG Compartment 1	57C-73
57C-63	1100 AF 11302 SG Compartment 2	57C-74
57C-64	1100 AF 11303 Pressurizer Compartment	57C-75
57C-65	1100 AF 11303A ADS Lower Valve Area	57C-76
57C-66	1100 AF 11303B ADS Upper Valve Area	57C-77
57C-67	1100 AF 11500 Operating Deck	57C-78
57C-68	1200 AF 12341 Middle Annulus	57C-79
57C-69	1200 AF 12555 Main Control Room Emergency Habitability System Air Storage/Operating Deck Staging Area	57C-80
59-1	Contribution of Initiating Events to Core Damage	59-99
59-2	24-Hour Site Boundary Dose Cumulative Frequency Distribution	59-100

REVISION 1 CHANGE ROADMAP

Section	Page No.	Type of Change[1]
AP1000 Document Cover Sheet		Editorial
Probabilistic Risk Assessment, Title Page		Editorial
T of C	i through c	Editorial
Revision 1 Change Roadmap	ci through civ	Editorial
1	1-6	Editorial
3	3-4	Editorial
Attachment 4B	4B-24	720.027
Attachment 4B	4B-74	Editorial
6	6-9	720.025 (720.029)
6	6-12	720.025 (720.029) Editorial
6	6-16	Editorial
6	6-17	720.026
6	6-19 through 6-53	720.023 (720.024) (720.097)
6	6-62	720.031
6	6-69	720.025 (720.029)
6	6-71	720.025 (720.029)
8	8-23 and 8-25	Editorial
12	12-6	720.033
12	12-30	720.033
26	26-11 and 26-12	Editorial
28	28-10 and 28-11	Editorial
29	29-17	720.033
29	29-21	720.033

REVISION 1 CHANGE ROADMAP (Cont.)

Section	Page No.	Type of Change[1]
30	30-35 and 30-36	720.068
30	30-66 and 30-67	720.068
30	30-110	Editorial
34	34-1	720.042
34	34-4 and 34-5	720.042
34	34-6 and 34-7	720.042 Editorial
34	34-8 through 34-243	720.042
35	35-28	720.043
39	39-4	720.073 Editorial
39	39-5	720.088 (720.048, 720.074, 720.083, 720.089)
39	39-6	720.088 720.073 (720.048, 720.074, 720.083, and 720.089)
39	39-12	Editorial
39	39-19	Editorial
39	39-20	720.073
39	39-21	Editorial 720.088
Attachment 39A	39A-1 through 39A-40	720.088 (720.048, 720.074, 720.083, and 720.089)
41	41-6	720.042
41	41-15	720.093
41	41-20	720.054
41	41-31	Editorial
Attachment 41A	41A-1 through 41A-228	720.042
Attachment 41B	41B-1 through 41B-11	720.093
43	43-126 and 43-127	Editorial
Attachment 43C	43C-1 and 43C-2	720.043
44	44-7	Editorial

REVISION 1 CHANGE ROADMAP (Cont.)

Section	Page No.	Type of Change(1)
45	45-1 through 45-3	470.013 (470.012)
45	45-4	470.013 (470.012) Editorial
45	45-5 through 45-48	470.013 (470.012)
49	49-1	720.056
49	49-4 through 49-6	720.056
49	49-9 through 49-49	720.056
50	50-14	720.034
55	55-5	DSER OI 19A.2-5 (R1)
55	55-7	DSER OI 19A.2-4 (R1) DSER OI 19A.2-5 (R1) DSER OI 19A.2-6 (R1)
55	55-20	DSER OI 19A.2-6 (R1)
57	57-1 through 57-109	Letter DCP/NRC1515
Attachment 57A	57A-1 through 57A-37	Letter DCP/NRC1515
Attachment 57B	57B-1 through 57B-6	Letter DCP/NRC1515
Attachment 57C	57C-1 through 57C-80	Letter DCP/NRC1515
Attachment 57D	57D-1 through 57D-7	Letter DCP/NRC1515
59	59-20 and 59-21	Editorial
59	59-23 through 59-25	Letter DCP/NRC1515
59	59-26	720.056
59	59-28	Editorial
59	59-29 through 59-32	720.038
59	59-34 through 59-38	720.038
59	59-72	Editorial
59	59-73	Technical
59	59-83	Editorial
59	59-75 through 59-96	720.038
59	59-97	720.038 720.066
59	59-98	720.038
59	59-100	Technical

REVISION 1 CHANGE ROADMAP (Cont.)

Section	Page No.	Type of Change[1]
Appendix A	A-1 through A-166	720.007 720.010 720.011 720.012 720.013 720.015 720.016
Appendix B	B-6	720.058
Appendix B	B-13	720.076
Appendix D	D-14 and D-15	720.078
Appendix D	D-31	720.078
Appendix D	D-35 and D-36	Technical
Appendix D	D-37 through D-58	720.078

1. Changes incorporated as a result of Westinghouse responses to NRC Request for Additional Information (RAI) identified by RAI number. RAI number in parenthesis contains a reference to RAI response listed above.

REVISION 2 CHANGE ROADMAP

Section	Page No.	Type of Change[1]
AP1000 Document Cover Sheet		Editorial
Probabilistic Risk Assessment, Title Page		Editorial
T of C	i through c	Editorial
Revision 2 Change Roadmap	cv through cvii	Editorial
6	6-17	720.026 (R1)
6	6-28	720.024 (R1)
6	6-32 and 6-33	720.024 (R1)
6	6-37 through 6-39	720.024 (R1)
6	6-41	720.024 (R1)
6	6-50 through 6-53	720.024 (R1)
6	6-69	720.029 (R1)
24	24-17	720.046 (R1)
24	24-22 and 24-23	720.046 (R1)
24	24-27	720.046 (R1)
30	30-26a through 30-28	720.029 (R1)
35	35-28	720.043 (R1)
43	43-9 and 43-9a	720.039 (R2)
43	43-9b	Editorial
43	43-10a	720.039 (R2)
43	43-10b	Editorial
43	43-93a through 43-93w	720.039 (R2)
43	93-93x	Editorial
Attachment 43C	43C-2	720.043 (R1)
50	50-1	
50	50-1a and 50-1b	Editorial
50	50-14	720.039 (R2)
50	50-14a	720.039 (R2)
50	50-14b	Editorial
54	54-1 through 54-131	720.038 (R2)

REVISION 2 CHANGE ROADMAP (Cont.)

Section	Page No.	Type of Change[1]
56	56-1	720.038 (R1) Editorial
56	56-9	Editorial
56	56-17 and 56-18	Editorial
56	56-20	Editorial
56	56-36 and 56-37	Editorial
56	56-38	Editorial 720.038 (R1)
56	56-38a through 56-38k	720.038 (R1)
56	56-381	Editorial
56	56-47 through 56-49	Editorial
56	56-51	Editorial
56	56-54 and 56-55	720.038 (R1)
57	57-14 and 57-15	280.011 (R1)
57	57-15a and 57-15b	Editorial
59	59-23 and 59-23a	720.038 (R1)
59	59-23b	Editorial
59	59-34	720.038 (R1)
59	59-72	720.038 (R1)
Appendix A	A-12	Editorial
Appendix A	A-24 through A-26	440.014 (R1)
Appendix A	A-26a	440.014 (R1) 720.024 (R1)
Appendix A	A-26b	Editorial
Appendix A	A-27	720.012 (R1)
Appendix A	A-31	720.012 (R1)
Appendix A	A-33	720.010 (R1)
Appendix A	A-33a and A-33b	Editorial
Appendix A	A-44	Editorial
Appendix A	A-57 through A-61	720.012 (R1)
Appendix A	A-63	720.012 (R1)
Appendix A	A-66	720.012 (R1)
Appendix A	A-103a through A-103b	440.014 (R1)
Appendix A	A-103c and A-103d	720.012 (R1)
Appendix A	A-151 and A-152	720.013 (R1)
Appendix A	A-165 and A-166	720.013 (R1)

REVISION 2 CHANGE ROADMAP (Cont.)

Section	Page No.	Type of Change[(1)]
Appendix D	D-13 and D-14	720.080 (R1)
Appendix D	D-35 and D-36	720.080 (R1)

1. Changes incorporated as a result of Westinghouse responses to NRC Request for Additional Information (RAI) identified by RAI number.

REVISION 3 CHANGE ROADMAP

Section	Page No.	Type of Change[1]
AP1000 Document Cover Sheet		Editorial
Probabilistic Risk Assessment, Title Page		Editorial
T of C	i through cii	Editorial
Revision 3 Change Roadmap	cx	Editorial
Attachment 45A	45A-1 through 45A-24	Technical
57	57-1 and 57-2	Editorial
57	57-4	Editorial
57	57-11 and 57-12	Editorial
57	57-17	Editorial
57	57-22 and 57-23	Editorial
57	57-30 through 57-39	720.038 (R1)
57	57-40	720.038 (R1) Editorial
57	57-41 and 57-42	720.038 (R1)
57	57-78	Editorial
57	57-117 through 57-124	720.038 (R1)
Appendix A	A-23 through A-25	720.009 (R2)
Appendix A	A-105 through A-111	720.009 (R2)

1. Changes incorporated as a result of Westinghouse responses to NRC Request for Additional Information (RAI) identified by RAI number.

REVISION 4 CHANGE ROADMAP

Section	Page No.	Type of Change[1]
AP1000 Document Cover Sheet		Editorial
Probabilistic Risk Assessment, Title Page		Editorial
T of C	i through ciii	Editorial
Revision 4 Change Roadmap	cxii and cxiii	Editorial
34	34-4	Editorial
34	34-16	DSER OI 19.1.10.3-1 (R1)
34	34-19 through 34-21	DSER OI 19.1.10.3-1 (R1)
34	34-50 and 34-51	DSER OI 19.1.10.3-1 (R1)
34	34-247 through 34-264	DSER OI 19.1.10.3-1 (R1)
42	42-3	DSER OI 19.2.6-1 (R1)
42	42-6	DSER OI 19.2.6-3
42	42-7 and 42-8	Editorial
43	43-10	Editorial
43	43-13	Editorial
Attachment 43D	43D-1	DSER OI 19.1.3.2-1
Attachment 43E	43E-1 and 43E-2	DSER OI 19.1.3.2-2
45	45-2	DSER OI 19.1.10.3-1 (R1)
45	45-5 and 45-6	DSER OI 19.1.10.3-1 (R1)
45	45-13 through 45-18	DSER OI 19.1.10.3-1 (R1)
45	45-31 through 45-42	DSER OI 19.1.10.3-1 (R1)
Attachment 45A	45A-1 through 45A-24	Deleted per DSER OI 19.1.10.3-1 (R1)
49	49-6	DSER OI 19.1.10.3-1 (R1)
49	49-9 through 49-49	DSER OI 19.1.10.3-1 (R1)
50	50-1	Editorial
54	54-9	DSER OI 19.1.10.2-3
54	54-12	DSER OI 19.1.10.2-3
54	54-13	Editorial
54	54-22 through 54-71	Editorial
54	54-76 through 54-80	DSER OI 19.1.10.2-5 Editorial

REVISION 4 CHANGE ROADMAP (Cont.)

Section	Page No.	Type of Change[(1)]
54	54-83 through 54-110	DSER OI 19.1.10.2-5 Editorial
54	54-112 through 54-118	DSER OI 19.1.10.2-5 Editorial
54	54-121 through 54-137	DSER OI 19.1.10.2-3
55	55-5	DSER OI 19A.2-5 (R1)
55	55-7	DSER OI 19A.2-4 (R1) DSER OI 19A.2-5 (R1) DSER OI 19A.2-6 (R1) Editorial
55	55-16 through 55-18	Editorial
55	55-20	DSER OI 19A.2-6 (R1)
55	55-25 through 55-29	Editorial
56	56-46	DSER OI 19.3.10-1
59	59-26	DSER OI 19.1.10.3-1 (R1)
59	59-37	DSER OI 19A.3-2 (R1)
59	59-45 through 59-70	Editorial
59	59-73	DSER OI 19.1.10.3-1 (R1)
59	59-74	Editorial
59	59-100	DSER OI 19.1.10.3-1 (R1)

1. Changes incorporated as a result of Draft Safety Evaluation Report (DSER) Open Item (OI) Response identified by DSER OI number.

Volume 2

TABLE OF CONTENTS

Section	Title	Page
	LIST OF TABLES	xxxv
	LIST OF FIGURES	liii
	REVISION 1 CHANGE ROADMAP	civ
	REVISION 2 CHANGE ROADMAP	cviii
	REVISION 3 CHANGE ROADMAP	cxi
	REVISION 4 CHANGE ROADMAP	cxii
CHAPTER 1	INTRODUCTION	
1.1	Introduction	1-1
	1.1.1 Background and Overview	1-1
	1.1.2 Objectives	1-1
	1.1.3 Technical Scope	1-2
	1.1.4 Project Methodology Overview	1-3
	1.1.5 Results	1-4
	1.1.6 Plant Definition	1-6
	1.1.7 References	1-6
CHAPTER 2	INTERNAL INITIATING EVENTS	
2.1	Introduction	2-1
2.2	Internal Initiating Event Identification and Categorization	2-1
	2.2.1 Logic Diagram for Internal Initiating Events	2-2
	2.2.2 Loss-of-Coolant Accidents	2-3
	2.2.3 Transients	2-6
	2.2.4 Anticipated Transient without Scram	2-8
	2.2.5 AP1000 Specific Initiating Event Analysis	2-10
	2.2.6 Consequential Events	2-19
	2.2.7 Summary of Internal Initiating Event Categories	2-19
2.3	Internal Initiating Event Frequency Quantification	2-20
	2.3.1 Quantification of LOCA Initiating Event Frequencies	2-20
	2.3.2 Quantification of Transient Initiating Event Frequencies	2-24
	2.3.3 ATWS Precursor Initiating Event Frequency	2-27
	2.3.4 Summary of Internal Initiating Event Frequencies	2-27
2.4	References	2-27
ATTACHMENT 2A	QUANTIFICATION OF LOCA INITIATING EVENT FREQUENCIES	
2A-1	Primary System Pipe Break Frequencies	2A-1
2A-2	Reactor Cooling System Leakage Initiating Event Frequency	2A-1
2A-3	Steam Generator Tube Rupture Initiating Event Frequency	2A-1
2A-4	Quantification of Stuck-Open Pressurizer Safety Valve, Accumulator Interface Break, and IRWST Interface Break	2A-1
2A-5	Initiating Events Review Data Summary and INPO Data	2A-1

TABLE OF CONTENTS (Cont.)

Section	Title	Page
ATTACHMENT 2B	QUANTIFICATION OF TRANSIENT INITIATING EVENT FREQUENCIES	
2B-1	Secondary Side Line Breaks & Stuck-open Main Steam Line Safety Valve Frequencies	2B-1
CHAPTER 3	MODELING OF SPECIAL INITIATORS	
3.1	Introduction	3-1
3.2	Ground Rules for Special Initiating Event Analysis	3-1
3.3	Loss of Component Cooling Water System/Service Water System Initiating Event	3-1
3.4	Loss of Compressed and Instrument Air System Initiating Event	3-2
3.5	Spurious Actuation of Automatic Depressurization System	3-2
	3.5.1 Evaluation of Automatic Depressurization System Spurious Actuation	3-3
CHAPTER 4	EVENT TREE MODELS	
4.1	Introduction	4-1
4.2	Large LOCA Event Tree Model	4-1
	4.2.1 Event Description	4-1
	4.2.2 Event Tree Model and its Nodes	4-2
	4.2.3 Event Tree Success Criteria and Core Damage Categories	4-4
	4.2.4 Operator Actions	4-4
	4.2.5 Transfers and Consequential Events	4-4
4.3	Large Spurious ADS Event Tree Model	4-4
	4.3.1 Event Description	4-4
	4.3.2 Event Tree Model and its Nodes	4-4
	4.3.3 Event Tree Success Criteria and Core Damage Categories	4-6
	4.3.4 Operator Actions	4-6
	4.3.5 Transfers and Consequential Events	4-6
4.4	Medium LOCA Event Tree Model	4-6
	4.4.1 Event Description	4-6
	4.4.2 Event Tree Model and its Nodes	4-7
	4.4.3 Event Tree Success Criteria and Core Damage Categories	4-9
	4.4.4 Operator Actions	4-9
	4.4.5 Transfers and Consequential Events	4-10
4.5	Core Makeup Tank Line Break Event Tree Model	4-10
	4.5.1 Event Description	4-10
	4.5.2 Event Tree Model and its Nodes	4-10
	4.5.3 Event Tree Success Criteria and Core Damage Categories	4-13
	4.5.4 Operator Actions	4-13
	4.5.5 Transfers and Consequential Events	4-13
4.6	Safety Injection Line Break Event Tree Model	4-13
	4.6.1 Event Description	4-13
	4.6.2 Event Tree Model and its Nodes	4-14
	4.6.3 Event Tree Success Criteria and Core Damage Categories	4-16

TABLE OF CONTENTS (Cont.)

Section		Title	Page
	4.6.4	Operator Actions	4-16
	4.6.5	Transfers and Consequential Events	4-17
4.7	Small LOCA Event Tree Model		4-17
	4.7.1	Event Description	4-17
	4.7.2	Event Tree Model and its Nodes	4-17
	4.7.3	Event Tree Success Criteria and Core Damage Categories	4-20
	4.7.4	Operator Actions	4-20
	4.7.5	Transfers and Consequential Events	4-21
4.8	RCS Leak Event Tree Model		4-21
	4.8.1	Event Description	4-21
	4.8.2	Event Tree Model and its Nodes	4-21
	4.8.3	Event Tree Success Criteria	4-22
	4.8.4	Operator Actions	4-22
	4.8.5	Transfers and Consequential Events	4-22
	4.8.6	Core Damage Categories	4-23
4.9	PRHR Tube Rupture Event Tree Model		4-23
	4.9.1	Event Description	4-23
	4.9.2	Event Tree Model and its Nodes	4-23
	4.9.3	Event Tree Success Criteria	4-24
	4.9.4	Operator Actions	4-24
	4.9.5	Transfers and Consequential Events	4-24
	4.9.6	Core Damage Categories	4-24
4.10	Steam Generator Tube Rupture Event Tree Model		4-25
	4.10.1	Event Description	4-25
	4.10.2	Event Tree Model and its Nodes	4-27
	4.10.3	Event Tree Success Criteria and Core Damage Categories	4-33
	4.10.4	Operator Actions	4-33
	4.10.5	Transfers and Consequential Events	4-33
4.11	Reactor Vessel Rupture Event Tree Model		4-34
	4.11.1	Event Description	4-34
	4.11.2	Event Tree Model and its Nodes	4-34
	4.11.3	Event Tree Success Criteria	4-34
	4.11.4	Operator Actions	4-34
	4.11.5	Transfers and Consequential Events	4-34
	4.11.6	Core Damage Categories	4-34
4.12	Interfacing System LOCA Event Tree Model		4-34
	4.12.1	Event Description	4-34
	4.12.2	Event Tree Model and its Nodes	4-35
	4.12.3	Event Tree Success Criteria	4-35
	4.12.4	Operator Actions	4-35
	4.12.5	Transfers and Consequential Events	4-35
	4.12.6	Core Damage Categories	4-35

TABLE OF CONTENTS (Cont.)

Section	Title	Page
4.13	Transients With MFW Event Tree Model	4-35
4.13.1	Event Description	4-35
4.13.2	Event Tree Model and its Nodes	4-37
4.13.3	Event Tree Success Criteria and Core Damage Categories	4-41
4.13.4	Operator Actions	4-41
4.13.5	Transfers and Consequential Events	4-42
4.14	Transients With Loss of RCS Flow Event Tree Model	4-42
4.14.1	Event Description	4-42
4.14.2	Event Tree Model and its Nodes	4-42
4.14.3	Event Tree Success Criteria and Core Damage Categories	4-46
4.14.4	Operator Actions	4-46
4.14.5	Transfers and Consequential Events	4-46
4.15	Transients With Loss of MFW to One Steam Generator Event Tree Model	4-46
4.15.1	Event Description	4-46
4.15.2	Event Tree Model and its Nodes	4-47
4.15.3	Event Tree Success Criteria and Core Damage Categories	4-50
4.15.4	Operator Actions	4-50
4.15.5	Transfers and Consequential Events	4-51
4.16	Transients With Core Power Excursion Event Tree Model	4-51
4.16.1	Event Description	4-51
4.16.2	Event Tree Model and its Nodes	4-51
4.16.3	Event Tree Success Criteria and Core Damage Categories	4-55
4.16.4	Operator Actions	4-55
4.16.5	Transfers and Consequential Events	4-55
4.17	Transients With Loss of CCW/SW Event Tree Model	4-56
4.17.1	Event Description	4-56
4.17.2	Event Tree Model and its Nodes	4-56
4.17.3	Event Tree Success Criteria and Core Damage Categories	4-59
4.17.4	Operator Actions	4-59
4.17.5	Transfers and Consequential Events	4-60
4.18	Loss of Main Feedwater Event Tree Model	4-60
4.18.1	Event Description	4-60
4.18.2	Event Tree Model and its Nodes	4-62
4.18.3	Event Tree Success Criteria and Core Damage Categories	4-65
4.18.4	Operator Actions	4-65
4.18.5	Transfers and Consequential Events	4-66
4.19	Loss of Condenser Event Tree Model	4-66
4.19.1	Event Description	4-66
4.19.2	Event Tree Model and its Nodes	4-66
4.19.3	Event Tree Success Criteria and Core Damage Categories	4-70
4.19.4	Operator Actions	4-70
4.19.5	Transfers and Consequential Events	4-70

TABLE OF CONTENTS (Cont.)

Section	Title	Page
4.20	Loss of Compressed Air Event Tree Model	4-70
4.20.1	Event Description	4-70
4.20.2	Event Tree Model and its Nodes	4-71
4.20.3	Event Tree Success Criteria and Core Damage Categories	4-74
4.20.4	Operator Actions	4-74
4.20.5	Transfers and Consequential Events	4-75
4.21	Loss of Offsite Power Event Tree Model	4-75
4.21.1	Event Description	4-75
4.21.2	Event Tree Model and its Nodes	4-75
4.21.3	Event Tree Success Criteria and Core Damage Categories	4-79
4.21.4	Operator Actions	4-79
4.21.5	Transfers and Consequential Events	4-80
4.22	Main Steam Line Break Downstream of MSIVs Event Tree Model	4-80
4.22.1	Event Description	4-80
4.22.2	Event Tree Model and its Nodes	4-81
4.22.3	Event Tree Success Criteria and Core Damage Categories	4-84
4.22.4	Operator Actions	4-84
4.22.5	Transfers and Consequential Events	4-85
4.23	Main Steam Line Break Upstream of MSIVs Event Tree Model	4-85
4.23.1	Event Description	4-85
4.23.2	Event Tree Model and its Nodes	4-85
4.23.3	Event Tree Success Criteria and Core Damage Categories	4-89
4.23.4	Operator Actions	4-89
4.23.5	Transfers and Consequential Events	4-90
4.24	Stuck-Open Secondary Side Safety Valve Event Tree Model	4-90
4.24.1	Event Description	4-90
4.24.2	Event Tree Model and its Nodes	4-91
4.24.3	Event Tree Success Criteria and Core Damage Categories	4-94
4.24.4	Operator Actions	4-94
4.24.5	Transfers and Consequential Events	4-94
4.25	ATWS Precursors Without MFW Event Tree Model	4-95
4.25.1	Event Description	4-95
4.25.2	Event Tree Model and its Nodes	4-96
4.25.3	Event Tree Success Criteria and Core Damage Categories	4-101
4.25.4	Operator Actions	4-101
4.25.5	Transfers and Consequential Events	4-101
4.26	ATWS Precursor with SI Event Tree Model	4-101
4.26.1	Event Description	4-101
4.26.2	Event Tree Model and its Nodes	4-102
4.26.3	Event Tree Success Criteria and Core Damage Categories	4-106
4.26.4	Operator Actions	4-106
4.26.5	Transfers and Consequential Events	4-106

TABLE OF CONTENTS (Cont.)

Section	Title	Page
4.27	ATWS Precursor Transients with MFW Event Tree Model	4-106
4.27.1	Event Description	4-106
4.27.2	Event Tree Model and its Nodes	4-107
4.27.3	Event Tree Success Criteria and Core Damage Categories	4-110
4.27.4	Operator Actions	4-111
4.27.5	Transfers and Consequential Events	4-111
ATTACHMENT 4A	EVENT TREE GUIDELINES	
4A.1	Event Tree Analysis Methodology	4A-1
4A.2	Event Tree Guidelines for Core Damage	4A-3
4A.2.1	Event Trees	4A-3
4A.2.2	Success Criteria	4A-6
4A.2.3	Definition of End States	4A-7
4A.2.4	Plant Response Functions	4A-9
4A.2.5	Event Tree Node Notation	4A-13
4A.2.6	Consequential Events	4A-13
4A.2.7	Transient Template	4A-14
4A.2.8	Small LOCA Template	4A-15
ATTACHMENT 4B	EVENT TREE PICTURES	4B-1
CHAPTER 5	SUPPORT SYSTEMS	
5.1	Introduction	5-1
5.2	Support Systems and Their Interdependencies	5-1
5.3	Front Line Systems and Their Dependencies	5-1
CHAPTER 6	SUCCESS CRITERIA ANALYSIS	
6.1	Introduction	6-1
6.2	Acceptance Criteria and Critical Functions for Success Criteria	6-1
6.3	Event Sequences and Timing, Passive/Active System Interactions	6-3
6.3.1	General Sequence Success Criteria	6-3
6.3.2	Timing of Events and Key Operator Actions	6-9
6.3.3	Passive/Active System Interactions	6-15
6.3.4	Sequence Success Criteria Summary	6-18
6.4	Event Tree Top Events Success Criteria	6-18
6.5	References	6-19
CHAPTER 7	FAULT TREE GUIDELINES	
7.1	Purpose	7-1
7.2	Fault Tree Development	7-1
7.2.1	Procedural Steps for Fault Tree Preparation	7-1
7.2.2	Procedural Steps for Fault Tree Construction	7-2

TABLE OF CONTENTS (Cont.)

Section		Title	Page
7.3		Primary Events to be Considered in Fault Trees	7-3
	7.3.1	Random Component Failure	7-3
	7.3.2	Outage for Maintenance and Testing	7-5
	7.3.3	Common Cause Failures	7-6
	7.3.4	Human Errors	7-6
	7.3.5	Power and Control Model	7-9
7.4		Data Base	7-10
7.5		Fault Tree Model: Identification Codes	7-10
	7.5.1	Identification Code for Fault Tree Names	7-10
	7.5.2	Identification Code for Support Systems	7-10
	7.5.3	Identification Code for Primary Event Names	7-11
	7.5.4	Identification Code for Common Cause Failures	7-11
	7.5.5	Identification Code for Undeveloped Events (Modules)	7-12
	7.5.6	Identification Code for Operator Errors	7-13
7.6		Fault Tree Quantification	7-13
7.7		References	7-14
CHAPTER 8		PASSIVE CORE COOLING SYSTEM – PASSIVE RESIDUAL HEAT REMOVAL	
8.1		System Function	8-1
8.2		System Description	8-1
	8.2.1	Support Systems	8-1
	8.2.2	Instrumentation and Control	8-2
	8.2.3	Test and Maintenance	8-2
8.3		System Operation	8-3
8.4		Performance During Accident Conditions	8-3
	8.4.1	Plant Shutdown	8-3
	8.4.2	Loss of Coolant Accidents	8-3
	8.4.3	Passive Residual Heat Removal Heat Exchanger Tube Rupture	8-3
8.5		Initiating Events Review	8-4
	8.5.1	Initiating Events Impacting the PRHR System	8-4
	8.5.2	Initiating Events Caused by PRHR System Malfunction	8-4
8.6		System Logic Models	8-4
	8.6.1	Assumptions and Boundary Conditions	8-5
	8.6.2	Fault Tree Models	8-6
	8.6.3	Human Interactions	8-6
	8.6.4	Common Cause Failures	8-6
8.7		Quantification and Results	8-6

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 9	PASSIVE CORE COOLING SYSTEM – CORE MAKEUP TANK	
9.1	System Description	9-1
	9.1.1 Support Systems	9-1
	9.1.2 Instrumentation and Control	9-1
	9.1.3 Test and Maintenance Assumptions	9-2
9.2	System Operation	9-2
9.3	Performance During Accident Conditions	9-3
	9.3.1 Inadvertent Opening of a Steam Generator Relief or Safety Valve	9-3
	9.3.2 Steam Line Break	9-3
	9.3.3 Steam Generator Tube Rupture	9-3
	9.3.4 Reactor Coolant System Heatup Transients	9-4
	9.3.5 Loss-of-Coolant Accidents	9-4
	9.3.6 Loss of Offsite Power	9-4
	9.3.7 Anticipated Transient without Trip	9-4
9.4	Initiating Event Review	9-4
	9.4.1 Initiating Events Impacting the Core Makeup Tank Subsystem	9-5
	9.4.2 Initiating Events Due to Loss of the Core Makeup Tank Subsystem	9-5
9.5	System Logic Models	9-5
	9.5.1 Assumptions and Boundary Conditions	9-5
	9.5.2 Fault Tree Models	9-7
	9.5.3 Human Interactions	9-7
	9.5.4 Common Cause Failures	9-8
CHAPTER 10	PASSIVE CORE COOLING SYSTEM – ACCUMULATOR	
10.1	System Description	10-1
	10.1.1 Support Systems	10-1
	10.1.2 Instrumentation and Control	10-1
	10.1.3 Test and Maintenance Assumptions	10-1
10.2	System Operation	10-1
10.3	Performance During Accident Conditions	10-2
	10.3.1 Steam Line Break	10-2
	10.3.2 Loss-of-Coolant Accidents or Non-Loss-of-Coolant Accidents with Automatic Depressurization System	10-2
10.4	Initiating Event Review	10-3
	10.4.1 Initiating Events Impacting the Accumulator Subsystem	10-3
	10.4.2 Initiating Events Due to Loss of the Accumulator Subsystem	10-3
10.5	System Logic Models	10-3
	10.5.1 Assumptions and Boundary Conditions	10-3
	10.5.2 Fault Tree Models	10-4
	10.5.3 Human Interactions	10-4
	10.5.4 Common Cause Failures	10-4

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 11	PASSIVE COOLING SYSTEM – AUTOMATIC DEPRESSURIZATION SYSTEM	
11.1	System Function	11-1
11.2	System Description	11-1
	11.2.1 Support Systems	11-1
	11.2.2 Instrumentation and Control	11-2
	11.2.3 Test and Maintenance	11-2
11.3	System Operation	11-2
11.4	Performance During Accident Conditions	11-3
	11.4.1 Loss of Coolant Accidents	11-3
	11.4.2 Transients	11-3
11.5	Initiating Events Review	11-3
	11.5.1 Initiating Events Impacting the Automatic Depressurization System	11-3
	11.5.2 Initiating Events Caused by the ADS Malfunction	11-4
11.6	System Logic Model	11-4
	11.6.1 Assumptions and Boundary Conditions	11-4
	11.6.2 Fault Tree Models	11-5
	11.6.3 Human Interactions	11-6
	11.6.4 Common Cause Failures	11-7
11.7	Quantification and Results	11-7
CHAPTER 12	PASSIVE CORE COOLING SYSTEM – IN-CONTAINMENT REFUELING WATER STORAGE TANK	
12.1	System Function	12-1
12.2	System Description	12-1
	12.2.1 Support Systems	12-1
	12.2.2 Instrumentation and Control	12-1
	12.2.3 Test and Maintenance	12-2
12.3	System Operation	12-2
12.4	Performance During Accident Conditions	12-2
	12.4.1 Transients	12-3
	12.4.2 Loss of Coolant Accidents	12-4
	12.4.3 In-Vessel Core Damage Mitigation	12-5
	12.4.4 Containment Isolation System Failure	12-5
12.5	Initiating Event	12-5
	12.5.1 Initiating Event Impacting IRWST/Gravity Injection Subsystem	12-5
	12.5.2 Initiating Event due to Loss of IRWST/Gravity Injection Subsystem	12-5
12.6	System Logic Models	12-6
	12.6.1 Assumptions and Boundary Conditions	12-6
	12.6.2 Fault Tree Models	12-8
	12.6.3 Human Interactions	12-8
	12.6.4 Common Cause Failures	12-8
12.7	Quantification and Results	12-9

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 13	PASSIVE CONTAINMENT COOLING SYSTEM	
13.1	System Description	13-1
	13.1.1 Support Systems	13-1
	13.1.2 Instrumentation and Control	13-1
	13.1.3 Test and Maintenance Assumptions	13-2
13.2	System Operation	13-2
13.3	Performance During Accident Conditions	13-2
	13.3.1 Post-Reactor Trip with Loss of All ac Power	13-2
	13.3.2 Automatic Depressurization System Actuation	13-2
	13.3.3 Post-Loss-of-Coolant Accident	13-3
	13.3.4 Post-Main Steam Line Break	13-3
13.4	Initiating Event Review	13-3
	13.4.1 Initiating Events Impacting the Passive Containment Cooling System	13-3
	13.4.2 Initiating Events due to Loss of the Passive Containment Cooling System	13-3
13.5	System Logic Model	13-3
	13.5.1 Assumptions and Boundary Conditions	13-4
	13.5.2 Fault Tree Model	13-5
	13.5.3 Human Interactions	13-6
	13.5.4 Common Cause Failures	13-6
CHAPTER 14	MAIN AND STARTUP FEEDWATER SYSTEM	
14.1	System Description	14-1
	14.1.1 Support Systems	14-1
	14.1.2 Instrumentation and Control	14-2
	14.1.3 Test and Maintenance	14-2
14.2	System Operation	14-2
14.3	Performance During Accident Conditions	14-2
14.4	Initiating Event Review	14-4
	14.4.1 Initiating Event Impacting Main and Startup Feedwater/ Condensate System	14-4
	14.4.2 Initiating Event due to Loss of Main and Startup Feedwater/ Condensate System	14-4
14.5	System Logic Models	14-4
	14.5.1 Assumptions and Boundary Conditions	14-5
	14.5.2 Fault Tree Models	14-7
	14.5.3 Human Interactions	14-7
	14.5.4 Common Cause Failures	14-7
14.6	Quantification and Results	14-7

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 15	CHEMICAL AND VOLUME CONTROL SYSTEM	
15.1	System Description	15-1
	15.1.1 Support Systems	15-1
	15.1.2 Instrumentation and Control Assumptions	15-1
	15.1.3 Test and Maintenance Assumptions	15-2
15.2	System Operation	15-3
15.3	Performance During Accident Conditions	15-3
15.4	Initiating Event Review	15-4
	15.4.1 Initiating Events Impacting the Chemical and Volume Control System	15-5
	15.4.2 Initiating Events Due to Loss of the Chemical and Volume Control System	15-5
15.5	System Logic Models	15-5
	15.5.1 Assumptions and Boundary Conditions	15-5
	15.5.2 Fault Tree Models	15-7
	15.5.3 Human Interactions	15-7
	15.5.4 Common Cause Failures	15-8
CHAPTER 16	CONTAINMENT HYDROGEN CONTROL SYSTEM	
16.1	System Description	16-1
	16.1.1 Support Systems	16-1
	16.1.2 Instrumentation and Control	16-1
	16.1.3 Test and Maintenance	16-1
16.2	System Operation	16-2
16.3	Performance During Accident Conditions	16-2
16.4	Initiating Event Review	16-2
16.5	System Logic Model	16-2
	16.5.1 Assumptions and Boundary Conditions	16-2
	16.5.2 Fault Tree Model	16-3
	16.5.3 Human Interactions	16-3
	16.5.4 Common Cause Failures	16-4
CHAPTER 17	NORMAL RESIDUAL HEAT REMOVAL SYSTEM	
17.1	System Description	17-1
	17.1.1 Support Systems	17-1
	17.1.2 Instrumentation and Control	17-1
	17.1.3 Test and Maintenance Assumptions	17-1
17.2	System Operation	17-1
17.3	Performance During Accident Conditions	17-2
17.4	Initiating Event Review	17-3
	17.4.1 Initiating Events Impacting the Normal Residual Heat Removal System	17-3
	17.4.2 Initiating Events Due to Loss of the Normal Residual Heat Removal System	17-4

TABLE OF CONTENTS (Cont.)

Section	Title	Page
17.5	System Logic Models	17-4
	17.5.1 Assumptions and Boundary Conditions	17-4
	17.5.2 Fault Tree Models	17-6
	17.5.3 Human Interactions	17-6
	17.5.4 Common Cause Failures	17-6
17.6	References	17-6
CHAPTER 18	COMPONENT COOLING WATER SYSTEM	
18.1	System Description	18-1
	18.1.1 Support Systems	18-1
	18.1.2 Instrumentation and Control	18-1
	18.1.3 Test and Maintenance Assumptions	18-1
18.2	System Operation	18-2
18.3	Performance During Accident Conditions	18-2
18.4	Initiating Event Review	18-2
	18.4.1 Initiating Events Impacting the Component Cooling Water System	18-2
	18.4.2 Initiating Events Due to Loss of the Component Cooling Water System	18-3
18.5	System Logic Models	18-3
	18.5.1 Assumptions and Boundary Conditions	18-3
	18.5.2 Fault Tree Models	18-4
	18.5.3 Human Interactions	18-4
	18.5.4 Common Cause Failures	18-5
CHAPTER 19	SERVICE WATER SYSTEM	
19.1	System Description	19-1
	19.1.1 Support Systems	19-1
	19.1.2 Instrumentation and Control	19-1
	19.1.3 Test and Maintenance Assumptions	19-1
19.2	System Operation	19-2
19.3	Performance During Accident Conditions	19-2
19.4	Initiating Event Review	19-2
	19.4.1 Initiating Events Impacting the Service Water System	19-2
	19.4.2 Initiating Events Due to Loss of the Service Water System	19-2
19.5	System Logic Models	19-3
	19.5.1 Assumptions and Boundary Conditions	19-3
	19.5.2 Fault Tree Models	19-4
	19.5.3 Human Interactions	19-5
	19.5.4 Common Cause Failures	19-5

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 20	CENTRAL CHILLED WATER SYSTEM	
20.1	System Description	20-1
	20.1.1 Support Systems	20-1
	20.1.2 Instrumentation and Control	20-1
	20.1.3 Test and Maintenance Assumptions	20-1
20.2	System Operation	20-2
20.3	Performance During Accident Conditions	20-2
20.4	Initiating Event Review	20-2
	20.4.1 Initiating Events Impacting the Central Chilled Water System	20-2
	20.4.2 Initiating Events Due to Loss of the Central Chilled Water System	20-3
20.5	System Logic Model	20-3
	20.5.1 Assumptions and Boundary Conditions	20-3
	20.5.2 Fault Tree Model	20-4
	20.5.3 Human Interactions	20-4
	20.5.4 Common Cause Failures	20-4
CHAPTER 21	AC POWER SYSTEM	
21.1	System Description	21-1
	21.1.1 Support Systems	21-1
	21.1.2 Instrumentation and Control	21-2
	21.1.3 Test and Maintenance Assumptions	21-2
21.2	System Operation	21-2
21.3	Performance During Accident Conditions	21-3
	21.3.1 Automatic Load Shedding	21-3
	21.3.2 Manual Transfer	21-3
	21.3.3 Electric Circuit Protection	21-3
21.4	Initiating Event Review	21-3
	21.4.1 Loss of the Main Generator	21-4
	21.4.2 Loss of Offsite Power	21-4
	21.4.3 Loss of 6900-vac and 480-vac Busses	21-4
21.5	System Logic Models	21-4
	21.5.1 Assumptions and Boundary Conditions	21-5
	21.5.2 Fault Tree Models	21-7
	21.5.3 Human Interactions	21-8
	21.5.4 Common Cause Failures	21-8
CHAPTER 22	CLASS 1E DC AND UNINTERRUPTIBLE POWER SUPPLY SYSTEM	
22.1	System Description	22-1
	22.1.1 Support Systems	22-1
	22.1.2 Instrumentation and Control	22-1
	22.1.3 Test and Maintenance Assumptions	22-1
22.2	System Operation	22-2
22.3	Performance During Accident Conditions	22-2

TABLE OF CONTENTS (Cont.)

Section	Title	Page
22.4	Initiating Event Review	22-2
	22.4.1 Initiating Events Impacting the Class 1E dc and UPS System	22-3
	22.4.2 Initiating Events Due to Loss of the Class 1E dc and UPS System	22-3
22.5	System Logic Models	22-3
	22.5.1 Assumptions and Boundary Conditions	22-3
	22.5.2 Fault Tree Models	22-4
	22.5.3 Human Interactions	22-4
	22.5.4 Common Cause Failures	22-4
22.6	References	22-5
CHAPTER 23	NON-CLASS 1E DC AND UPS SYSTEM	
23.1	System Description	23-1
	23.1.1 Support Systems	23-1
	23.1.2 Instrumentation and Control	23-1
	23.1.3 Test and Maintenance Assumptions	23-1
23.2	System Operation	23-2
23.3	Performance During Accident Conditions	23-2
23.4	Initiating Event Review	23-2
	23.4.1 Initiating Events Impacting the Non-Class 1E dc and UPS System	23-2
	23.4.2 Initiating Events Due to Loss of the Non-Class 1E dc and UPS Power System	23-3
23.5	System Logic Models	23-3
	23.5.1 Assumptions and Boundary Conditions	23-3
	23.5.2 Fault Tree Models	23-4
	23.5.3 Human Interactions	23-5
	23.5.4 Common Cause Failures	23-5
23.6	References	23-5
CHAPTER 24	CONTAINMENT ISOLATION	
24.1	System Description	24-1
	24.1.1 Support Systems	24-1
	24.1.2 Instrumentation and Control	24-1
	24.1.3 Test and Maintenance Assumptions	24-2
24.2	System Operation	24-2
24.3	Performance During Accident Conditions	24-2
24.4	Initiating Event Review	24-2
	24.4.1 Initiating Events Impacting Containment Isolation	24-2
	24.4.2 Initiating Events Due to Loss of the Containment Isolation System	24-2
24.5	System Logic Models	24-3
	24.5.1 Assumptions and Boundary Conditions	24-4
	24.5.2 Fault Tree Models	24-5
	24.5.3 Human Interactions	24-6
	24.5.4 Common Cause Failures	24-6
24.6	References	24-6

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 25	COMPRESSED AND INSTRUMENT AIR SYSTEM	
25.1	System Description	25-1
	25.1.1 Support Systems	25-2
	25.1.2 Instrumentation and Control	25-2
	25.1.3 Test and Maintenance Assumptions	25-3
25.2	System Operation	25-3
25.3	Performance During Accident Conditions	25-3
25.4	Initiating Event Review	25-4
	25.4.1 Initiating Events Impacting the Instrument Air Subsystem	25-4
	25.4.2 Initiating Events Due to Loss of the Instrument Air Subsystem	25-4
25.5	System Logic Models	25-4
	25.5.1 Assumptions and Boundary Conditions	25-4
	25.5.2 Fault Tree Models	25-6
	25.5.3 Human Interactions	25-7
	25.5.4 Common Cause Failures	25-7
CHAPTER 26	PROTECTION AND SAFETY MONITORING SYSTEM	
26.1	System Analysis Description	26-1
	26.1.1 Analysis of Support Systems	26-4
	26.1.2 Analysis of Instrumentation	26-5
	26.1.3 Test and Maintenance Assumptions	26-6
26.2	Performance During Accident Conditions	26-7
26.3	Initiating Event Review	26-7
	26.3.1 Initiating Event Impacting PMS	26-7
	26.3.2 Initiating Event due to Loss of PMS	26-8
26.4	System Logic Model Development	26-8
	26.4.1 Assumptions and Boundary Conditions	26-8
	26.4.2 Fault Tree Models	26-12
	26.4.3 Description of I&C Subtree Development	26-12
	26.4.4 Human Interactions	26-19
26.5	Discussion of Methodology	26-19
	26.5.1 Fault Tree Analysis	26-20
	26.5.2 Unavailability	26-20
	26.5.3 Spurious Failure Rate Per Year	26-20
	26.5.4 Common Cause Failures	26-22
	26.5.5 Data Manipulation	26-23
26.6	References	26-24
CHAPTER 27	DIVERSE ACTUATION SYSTEM	
27.1	System Analysis Description	27-1
	27.1.1 Support Systems Analysis	27-2
	27.1.2 Analysis of Instrumentation and Control	27-2
	27.1.3 Test and Maintenance	27-2

TABLE OF CONTENTS (Cont.)

Section	Title	Page
27.2	Analysis of System Operation	27-2
27.3	Performance During Accident Conditions	27-6
27.4	Initiating Event Review	27-6
27.4.1	Initiating Events Impacting the Diverse Actuation System	27-6
27.4.2	Initiating Events Due to Loss of the Diverse Actuation System	27-6
27.5	System Logic Model	27-6
27.5.1	Assumptions and Boundary Conditions	27-7
27.5.2	Fault Tree Model	27-7
27.5.3	Human Interactions	27-7
27.5.4	Common Cause Failures	27-8
CHAPTER 28	PLANT CONTROL SYSTEM	
28.1	System Analysis Description	28-1
28.1.1	Analysis of Support Systems	28-3
28.1.2	Analysis of Instrumentation	28-4
28.1.3	Test and Maintenance Assumptions	28-4
28.2	Performance During Accident Conditions	28-6
28.3	Initiating Event Review	28-6
28.3.1	Initiating Events Impacting the Plant Control System	28-6
28.3.2	Initiating Event due to Loss of the Plant Control System	28-6
28.4	System Logic Model Development	28-7
28.4.1	Assumptions and Boundary Conditions	28-7
28.4.2	Fault Tree Models	28-9
28.4.3	Description of I&C Subtree Development	28-10
28.4.4	Human Interactions	28-16
28.5	Discussion of Methodology	28-17
28.5.1	Fault Tree Analysis	28-17
28.5.2	Unavailability	28-17
28.5.3	Common Cause Failures	28-17
28.5.4	Data Manipulation	28-18
CHAPTER 29	COMMON-CAUSE ANALYSIS	
29.1	Introduction	29-1
29.2	Dependent Failures	29-1
29.3	Common-Cause Analysis	29-4
29.3.1	Assumptions	29-4
29.3.2	Analysis of Potential Common-Cause Failures within the Systems	29-6
29.3.3	Analysis of Potential Common-Cause Failures among Several Systems	29-6
29.4	Calculations For Component Groups	29-6
29.4.1	DC Batteries	29-7
29.4.2	Reactor Trip Breakers	29-8
29.4.3	Automatic Depressurization System Explosive Valves	29-9

TABLE OF CONTENTS (Cont.)

Section	Title	Page
29.4.4	Air-Operated Valves in Core Makeup Tanks	29-10
29.4.5	Automatic Depressurization System Motor-Operated Valves	29-11
29.4.6	Common-Cause Failure for IRWST Valves	29-14
29.5	Results	29-17
29.6	References	29-17
ATTACHMENT 29A	COMMON-CAUSE ANALYSIS GUIDELINES	29A-1
29A.1	Introduction	29A-1
29A.2	Types of Dependencies	29A-1
29A.3	Common Cause Failures Definition	29A-2
29A.4	Methodology	29A-3
29A.5	Common Cause Failures Calculation Procedure	29A-4
29A.5.1	Procedure for Treatment of Common Cause Failures Within a System	29A-5
29A.5.2	Procedure for Treatment of Common Cause Failures Among More Systems	29A-7
29A.6	Common Cause Failure Numerical Evaluation	29A-8
29A.6.1	Evaluation through Beta Factor Method	29A-8
29A.6.2	Evaluation through Multiple-Greek Letter (MGL) Method	29A-8
29A.7	References	29A-10
CHAPTER 30	HUMAN RELIABILITY ANALYSIS	
30.1	Introduction	30-1
30.2	Summary of Results	30-1
30.3	Methodology	30-2
30.4	Major Assumptions	30-4
30.5	Types of Human Interactions	30-10
30.5.1	Quantification Model	30-11
30.6	Quantification	30-12
30.6.1	ZON-MAN01 (Start the Onsite Standby Diesel Generator)	30-12
30.6.2	LPM-MAN01 (Recognize the Need for Reactor Coolant System Depressurization)	30-13
30.6.3	LPM-MAN02 (Recognize the Need for Reactor Coolant System Depressurization)	30-15
30.6.4	LPM-MAN05 (Recognize the Need for Reactor Coolant System Depressurization)	30-16
30.6.5	LPM-REC01 (Recognize the Need for Reactor Coolant System Depressurization)	30-17
30.6.6	ADN-MAN01 (Actuate the Automatic Depressurization System)	30-17
30.6.7	ADN-REC01 (Actuate the Automatic Depressurization System)	30-19
30.6.8	CCB-MAN01 (Start the Standby Component Cooling Water Pump)	30-19
30.6.9	CCN-MAN02 (Inadvertent Misalignment of Heat Exchanger)	30-20
30.6.10	CIB-MAN00 (Diagnose Steam Generator Tube Rupture)	30-21
30.6.11	DUMP-MAN01 (Operate Steam Dump Valves)	30-22

TABLE OF CONTENTS (Cont.)

Section	Title	Page
30.6.12	CIC-MAN01 (Isolate Containment)	30-23
30.6.13	ADS-MANTEST (Recognize the Need and Reclose ADS Stage MOV)	30-24
30.6.14	CAN-MAN0S (Locally Close Manual Valve CAS-V204 to Isolate Containment)	30-25
30.6.15	CIT-MAN0S (Isolate Containment)	30-26
30.6.16	CMN-MAN01 (Actuate Core Makeup Tank)	30-27
30.6.17	CMN-REC01 (Actuate the Core Makeup Tanks)	30-28
30.6.18	CVN-MAN00 (Align Chemical and Volume Control System)	30-29
30.6.19	CVN-MAN02 (Align Chemical and Volume Control System)	30-30
30.6.20	CVN-MAN03 (Start Chemical and Volume Control System Pump B)	30-30
30.6.21	ADF-MAN01 (Depressurize the RCS to Refill the Pressurizer)	30-31
30.6.22	SGHL-MAN01 (Isolate Feedwater to Failed Steam Generator)	30-32
30.6.23	CAN-MAN01 (Start Standby Compressor)	30-33
30.6.24	REN-MAN02 (Initiate Recirculation)	30-33
30.6.25	REN-MAN03 (Initiate Recirculation)	30-34
30.6.26	IWN-MAN00 (Operate In-Containment Refueling Water Storage Tank Motor-Operated Valves)	30-35
30.6.27	RHN-MAN01 (Align Normal Residual Heat Removal System)	30-36
30.6.28	RHN-MANDIV (Align Normal Residual Heat Removal System)	30-37
30.6.29	RHN-MAN02/RHN-MAN03 (Align Normal Residual Heat Removal System)	30-38
30.6.30	PCN-MAN01 (Actuate Passive Containment Cooling System)	30-40
30.6.31	HPM-MAN01 (Diagnose Need for High Pressure Heat Removal)	30-40
30.6.32	PRN-MAN01 (Align Passive Residual Heat Removal System)	30-41
30.6.33	PRN-MAN02 (Align Passive Residual Heat Removal System)	30-42
30.6.34	PRN-MAN03 (Align Passive Residual Heat Removal System)	30-43
30.6.35	PRI-MAN01 (Isolate Failed Passive Residual Heat Removal Heat Exchanger)	30-44
30.6.36	REN-MAN04 (Initiate Recirculation)	30-45
30.6.37	RCN-MAN01 (Trip Reactor Coolant Pumps)	30-46
30.6.38	ATW-MAN01 (Manually Insert Control Rods)	30-47
30.6.39	ATW-MAN03 (Manually Trip the Reactor through Protection and Safety Monitoring System in One Minute)	30-48
30.6.40	ATW-MAN04 (Manually Trip the Reactor through Diverse Actuation System in One Minute)	30-49
30.6.41	ATW-MAN05 (Manually Trip the Reactor through Protection and Safety Monitoring System in Seven Minutes)	30-49
30.6.42	ATW-MAN06 (Manually Trip the Reactor through Diverse Actuation System In Seven Minutes)	30-50
30.6.43	RTN-MAN01 (Perform Controlled Reactor Shutdown)	30-51
30.6.44	FWN-MAN02 (Start the Startup Feedwater Pumps)	30-52
30.6.45	FWN-MAN03 (Start the Startup Feedwater Pumps)	30-53
30.6.46	REG-MAN00 (Regulate Startup Feedwater)	30-54

TABLE OF CONTENTS (Cont.)

Section		Title	Page
	30.6.47	CIA-MAN01 (Isolate Failed Steam Generator)	30-55
	30.6.48	CIB-MAN01 (Close Main Steam Isolation Valve)	30-56
	30.6.49	SGA-MAN01 (Inadvertent Opening of Steam Generator Power-Operated Relief Valve)	30-57
	30.6.50	SWN-MAN01N (Open Air-Operated Valve on Motor Strainer Line)	30-58
	30.6.51	SWB-MAN02 (Start Standby Service Water Pump)	30-58
	30.6.52	SWB-MAN02N (Start Standby Service Water Pump)	30-59
	30.6.53	TCB-MAN01 (Start Standby Turbine Closed Cooling Water Pump)	30-60
	30.6.54	TCB-MAN02 (Locally Align Standby Turbine Closed Cooling Water Heat Exchanger)	30-61
	30.6.55	VLN-MAN01 (Actuate Hydrogen Control System)	30-62
	30.6.56	VWN-MAN01 (Align Standby Chiller)	30-63
	30.6.57	ATW-MAN11 (Recognize the Need for Manual Boration)	30-64
	30.6.58	REC-MANDAS (Diagnosis of an Event Through DAS Signals or Perform an Activity by Operating DAS Controls)	30-65
	30.6.59	RHN-MAN04 (Isolate the RNS During Shutdown Conditions)	30-65
	30.6.60	RHN-MAN05 (Initiate Gravity Injection from IRWST via RNS Suction Line)	30-66
	30.6.61	RHN-MAN06 (Recognize the Need and Throttle RNS Valve V011)	30-68
	30.6.62	RCS-MANODS1 (Close AOVs CVS-V045 or -V047, Given Failure of HL Level Instruments)	30-68
	30.6.63	RCS-MANODS2 (Close AOVs CVS-V045 or -V047, Given Failure of Valves to Close Automatically)	30-70
	30.6.64	SWN-MAN03 (Recognize the Need and Locally Refill Service Water Basin)	30-70
30.7	Conditional Probability Evaluation		30-71
	30.7.1	Application	30-72
	30.7.2	Process Used to Determine Dependencies	30-72
	30.7.3	Calculation of Dependent Human Error Probabilities	30-72
30.8	References		30-74
ATTACHMENT 30A HUMAN RELIABILITY ANALYSIS GUIDELINES			30A-1
30A.1	Introduction		30A-1
30A.2	Schedule for Human Reliability Analysis		30A-1
30A.3	Methodology		30A-1
30A.4	Responsibility		30A-2
30A.5	Procedure for Human Interaction Evaluation		30A-2
	30A.5.1	Type A	30A-3
	30A.5.2	Type B	30A-3
	30A.5.3	Type C	30A-4
	30A.5.4	Commission Errors That Have Detrimental Effects	30A-6

TABLE OF CONTENTS (Cont.)

Section	Title	Page

30A.6	Procedure for Human Error Probabilities Quantification	30A-8
30A.6.1	Basic Assumptions for Human Interaction Analysis	30A-8
30A.7	References	30A-9
CHAPTER 31	OTHER EVENT TREE NODE PROBABILITIES	
31.1	Introduction	31-1
31.2	Identification of Cases Requiring Calculations	31-1
31.2.1	BL – Main Steam Line Break Occurs Inside Containment	31-1
31.2.2	CNB – Containment Isolation Fails Due to Reactor Coolant System Vessel Rupture	31-1
31.2.3	MGSET – Control Rods Motor-Generator Set Trip	31-1
31.2.4	NSGTR – Consequential Steam Generator Tube Rupture	31-2
31.2.5	PO – Pre-existing Containment Opening Allowing Bypass	31-2
31.2.6	PRES – Reactor Coolant System Pressure Relief via Pressurizer Safety Valves	31-2
31.2.7	PRSOV – Pressurizer Safety Valves Reclose	31-2
31.2.8	R05 – Offsite Power Recovered within One-Half Hour	31-2
31.2.9	SLSOV – Main Steam Line Relief Valves Reclose	31-2
31.3	Case-Specific Calculations	31-3
31.3.1	BL – Main Steam Line Break Occurs Inside Containment	31-3
31.3.2	CNB – Containment Isolation Fails Due to RCS Vessel Rupture	31-3
31.3.3	MGSET – Control Rods Motor-Generator Set Trip	31-3
31.3.4	PO – Pre-existing Containment Opening Allowing Bypass	31-4
31.3.5	PRES – Reactor Coolant System Pressure Relief via Pressurizer Safety Valves	31-4
31.3.6	PRSOV – Pressurizer Safety Valves Reclose	31-5
31.3.7	R05 – Offsite Power Recovered within One-Half Hour	31-6
31.3.8	SGTR1 – Single Consequential Steam Generator Tube Rupture	31-6
31.3.9	SGTR – Multiple Consequential Steam Generator Tube Rupture	31-8
31.3.10	SLSOV – Main Steam Line Relief and Safety Valves Reclose	31-8
31.3.11	SLSOV1 – Main Steam Line Relief and Safety Valves Reclose	31-9
31.3.12	SLSOV2 – Main Steam Line Safety Valves Reclose	31-10
31.3.13	SLSOV3 – Main Steamline Relief and Safety Valves Reclose, SGTR	31-10
31.4	References	31-11
CHAPTER 32	DATA ANALYSIS AND MASTER DATA BANK	
32.1	Data Analysis	32-1
32.1.1	Random Component Failure Data	32-1
32.1.2	Test and Maintenance Unavailability	32-2
32.1.3	Common Cause Failure Data	32-2
32.1.4	Human Reliability Data	32-2
32.1.5	Initiating Event Frequency Data	32-2

TABLE OF CONTENTS (Cont.)

Section	Title	Page
32.2	Master Data Bank	32-2
	32.2.1 Initiating Event Frequencies	32-3
	32.2.2 Random Component Failures	32-3
	32.2.3 Common Cause Failure Probabilities	32-3
	32.2.4 Human Error Probabilities	32-3
	32.2.5 System-Specific Calculations	32-3
	32.2.6 Other Event Tree Node Probabilities	32-3
	32.2.7 Master Data Bank	32-4
32.3	References	32-4
CHAPTER 33	FAULT TREE AND CORE DAMAGE QUANTIFICATION	
33.1	Introduction	33-1
33.2	Fault Tree Model Quantification	33-1
33.3	Event Tree Model Calculation	33-1
	33.3.1 Core Damage Quantification Method	33-2
	33.3.2 Core Damage Quantification Input Files and Data	33-4
	33.3.3 Definition of Consequential Event Categories	33-4
	33.3.4 Incorporate Operator Action Dependencies Into Plant Core Damage Frequency Quantification	33-6
	33.3.5 Core Damage Frequency Results	33-6
CHAPTER 34	SEVERE ACCIDENT PHENOMENA TREATMENT	
34.1	Introduction	34-1
34.2	Treatment of Physical Processes	34-1
	34.2.1 In-Vessel Retention of Molten Core Debris	34-1
	34.2.2 Fuel-Coolant Interaction (Steam Explosions)	34-2
	34.2.3 Hydrogen Combustion and Detonation	34-4
	34.2.4 High-Pressure Melt Ejection	34-5
	34.2.5 Core Debris Coolability	34-5
	34.2.6 Containment Pressurization from Decay Heat	34-6
	34.2.7 Elevated Temperature (Equipment Survivability)	34-7
	34.2.8 Summary	34-7
34.3	Analysis Method	34-7
34.4	Severe Accident Analyses	34-8
	34.4.1 Accident Class 3BE – Intact Containment	34-8
	34.4.2 Accident Class 3BE – Failed Containment	34-10
	34.4.3 Accident Class 3BL – Intact Containment	34-11
	34.4.4 Accident Class 3BR – Intact Containment	34-12
	34.4.5 Accident Class 3C – Intact Containment	34-13
	34.4.6 Accident Class 3C – Failed Containment	34-14
	34.4.7 Accident Class 3D – Intact Containment	34-14
	34.4.8 Accident Class 3D – Failed Containment	34-16

TABLE OF CONTENTS (Cont.)

Section	Title	Page
	34.4.9 Accident Class 6E – Bypass Containment	34-16
	34.4.10 Accident Class 6L – Bypass Containment	34-17
	34.4.11 Accident Class 1AP	34-17
	34.4.12 Accident Class 1A	34-18
	34.4.13 Intermediate and Late Containment Failure Cases	34-19
34.5	Insights and Conclusions	34-21
34.6	References	34-21
CHAPTER 35	CONTAINMENT EVENT TREE ANALYSIS	
35.1	Introduction	35-1
35.2	Containment Event Tree – General Discussion	35-1
35.3	Event Tree Construction	35-2
35.4	Level 1/Level 2 Interface	35-3
35.5	Containment Event Tree Top Events	35-3
	35.5.1 Severe Accident Phenomena Considerations	35-3
	35.5.2 Operator Action and Systems Top-Event Considerations	35-5
35.6	Release Category Definitions	35-7
	35.6.1 Release Category BP – Containment Bypass	35-8
	35.6.2 Release Category CI – Containment Isolation Failure	35-9
	35.6.3 Release Category CFE – Early Containment Failure	35-9
	35.6.4 Release Category CFI – Intermediate Containment Failure	35-9
	35.6.5 Release Category CFL – Late Containment Failure	35-9
	35.6.6 Release Category CFV – Containment Venting	35-10
	35.6.7 Release Category IC – Intact Containment	35-10
35.7	Top-Event Nodal Questions and Success Criteria	35-10
	35.7.1 Top Event DP – RCS Depressurization After Core Uncovery	35-11
	35.7.2 Top Event IS – Containment Isolation	35-12
	35.7.3 Top Event IR – Reactor Cavity Flooding	35-13
	35.7.4 Top Event RFL – Reflooding of a Degraded Core	35-14
	35.7.5 Top Event VF – Debris Relocation to the Reactor Cavity	35-14
	35.7.6 Top Event PC – Passive Containment Cooling	35-15
	35.7.7 Top Event VNT – Containment Venting	35-16
	35.7.8 Top Event IF – Intermediate Containment Failure	35-16
	35.7.9 Top Event IG – Hydrogen Control System	35-17
	35.7.10 Top Event DF – Diffusion Flame	35-17
	35.7.11 Top Event DTE – Early Hydrogen Detonation	35-18
	35.7.12 Top Event DFG – Hydrogen Deflagration	35-19
	35.7.13 Top Event DTI – Intermediate Hydrogen Detonation	35-19
35.8	Summary	35-20
35.9	References	35-20

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 36	REACTOR COOLANT SYSTEM DEPRESSURIZATION	
36.1	Introduction	36-1
36.2	Definition of High Pressure	36-1
36.3	Node DP	36-2
36.4	Success Criteria	36-2
	36.4.1 Accident Classes 3BE, 3BL, 3BR, 3C	36-2
	36.4.2 Accident Class 3D/1D	36-3
	36.4.3 Accident Classes 1A and 1AP	36-3
	36.4.4 Steam Generator Tube Rupture – Accident Class 6	36-4
	36.4.5 Anticipated Transient Without Scram – Accident Class 3A	36-5
36.6	References	36-5
CHAPTER 37	CONTAINMENT ISOLATION	
37.1	Introduction	37-1
37.2	Definition of Containment Isolation	37-1
37.3	Success Criteria	37-1
	37.3.1 Accident Classes 1A and 1AP	37-2
	37.3.2 Accident Class 3A	37-2
	37.3.3 Accident Class 3BR	37-2
	37.3.4 Accident Class 3BE	37-2
	37.3.5 Accident Class 3BL	37-2
	37.3.6 Accident Class 3C	37-2
	37.3.7 Accident Class 3D/1D	37-3
	37.3.8 Accident Class 6	37-3
37.4	Summary	37-3
CHAPTER 38	REACTOR VESSEL REFLOODING	
38.1	Introduction	38-1
38.2	Definition of Reflooding Success	38-1
38.3	Success Criteria	38-1
	38.3.1 Accident Classes 1A and 1AP	38-1
	38.3.2 Accident Class 3BR	38-2
	38.3.3 Accident Class 3BE	38-2
	38.3.4 Accident Class 3BL	38-3
	38.3.5 Accident Class 3D/1D	38-3
	38.3.6 Accident Class 6	38-3
	38.3.7 Accident Class 3C	38-3
	38.3.8 Accident Class 3A	38-4
38.4	Summary	38-4

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 39	IN-VESSEL RETENTION OF MOLTEN CORE DEBRIS	
39.1	Introduction	39-1
39.2	Background on the Application of IVR to the Passive Plant	39-1
39.3	Application of IVR to the AP1000 Passive Plant	39-2
39.4	Reactor Vessel Failure Criteria	39-3
39.5	In-Vessel Melt Progression and Relocation	39-4
39.6	Application of Heat Transfer Correlations to the AP1000	39-6
	39.6.1 Debris Pool to Vessel Wall Heat Transfer	39-6
	39.6.2 Vessel Wall to External Cooling Water Heat Transfer	39-7
39.7	Quantification of Margin to Failure of the Reactor Vessel Wall	39-8
	39.7.1 Zirconium Oxidation Fraction Input Probability Distribution	39-9
	39.7.2 Steel Mass Input Probability Distribution	39-9
	39.7.3 Final Bounding State Timing Input Probability Distribution	39-10
	39.7.4 Critical Heat Flux	39-10
	39.7.5 Results and Conclusions of Heat Flux Quantification	39-10
39.8	Reactor Coolant System Depressurization	39-11
39.9	Reactor Cavity Flooding (Node IR)	39-11
	39.9.1 Node IR Success Criteria	39-12
	39.9.2 Cavity Flooding Scenario Dependencies	39-13
39.10	Reactor Vessel Insulation Design Concept	39-15
	39.10.1 Description of Reactor Vessel Insulation and Venting	39-15
	39.10.2 Design Analysis of the Insulation and Support Frame	39-17
39.11	Reactor Vessel External Surface Treatment	39-18
39.12	Reactor Vessel Failure (Node VF)	39-18
	39.12.1 Node VF Success Criteria	39-18
39.13	Summary	39-19
39.14	References	39-19
ATTACHMENT 39A	AP1000 IN-VESSEL CORE MELTING RELOCATION	39A-1
39A.1	Introduction	39A-1
39A.2	Phenomenological Issues	39A-1
	39A.2.1 Focusing Effect	39A-1
	39A.2.2 Material Interaction	39A-1
39A.3	AP1000 Reactor Vessel Lower Internals Geometry	39A-1
39A.4	Modeling of Core and Reactor Vessel Lower Internals Heatup	39A-2
	39A.4.1 MAAP4 Model	39A-2
	39A.4.2 Finite Difference Modeling	39A-3
	39A.4.3 Relocation of In-Core Debris to Lower Plenum	39A-3
39A-5	Base Core Damage Sequence for In-Vessel Retention	39A-3
	39A.5.1 Core Heatup and Formation of In-Core Molten Debris Layers	39A-4
	39A.5.2 Melting of Core Shroud and Core Barrel	39A-6
	39A.5.3 Initial Relocation of Molten Core Debris to Lower Plenum	39A-7
	39A.5.4 Lower Plenum Debris Pool Formation	39A-8

TABLE OF CONTENTS (Cont.)

Section	Title	Page
39A.6	Potential for Debris Interaction	39A-12
39A.7	Conclusions from Analysis of AP1000 In-Vessel Core Melting and Relocation	39A-12
39A.8	References	39A-13
CHAPTER 40	PASSIVE CONTAINMENT COOLING, LONG TERM CONTAINMENT INTEGRITY AND CONTAINMENT VENTING	
40.1	Passive Containment Cooling System	40-1
40.2	Passive Containment Cooling Water – Node PC	40-2
	40.2.1 Node PC Success Criteria	40-2
	40.2.2 Operator Action	40-2
	40.2.3 Node PC Failure Probability	40-3
40.3	Containment Venting – Node VT	40-3
	40.3.1 Venting Success Criteria	40-3
	40.3.2 Venting Failure Probability	40-4
40.4	Intermediate Containment Failure – Node IF	40-4
	40.4.1 Success Criterion	40-5
	40.4.2 Intermediate Containment Failure Probability	40-5
40.5	References	40-5
CHAPTER 41	HYDROGEN MIXING AND COMBUSTION ANALYSIS	
41.1	Discussion of the Issue	41-1
41.2	Controlling Phenomena	41-2
41.3	Major Assumptions and Phenomenological Uncertainties	41-3
	41.3.1 Hydrogen Generation	41-3
	41.3.2 Containment Pressure	41-3
	41.3.3 Flammability Limits	41-3
	41.3.4 Detonation Limits and Loads	41-4
	41.3.5 Igniter System	41-4
	41.3.6 Other Ignition Sources	41-5
	41.3.7 Severe Accident Management Actions	41-5
41.4	Hydrogen Generation and Mixing	41-5
	41.4.1 Accident Class 3BE – Failure of Gravity Injection	41-6
	41.4.2 Accident Class 3BL – Failure of Gravity Recirculation	41-9
	41.4.3 Accident Class 3BR – Large LOCA with Accumulator Failure	41-10
	41.4.4 Accident Class 3C	41-11
	41.4.5 Accident Classes 3D and 1D	41-12
	41.4.6 Accident Class 1AP	41-12
	41.4.7 Accident Class 1A	41-13
	41.4.8 Accident Class 3A	41-13
	41.4.9 Accident Class 6	41-13
	41.4.10 Overall Mixing Insights	41-14

TABLE OF CONTENTS (Cont.)

Section	Title	Page
41.5	Hydrogen Burning at Igniters	41-15
41.6	Early Hydrogen Combustion	41-15
	41.6.1 Hydrogen Generation Rates	41-15
	41.6.2 Hydrogen Release Locations	41-17
	41.6.3 Early Hydrogen Combustion Ignition Sources	41-18
41.7	Diffusion Flame Analysis – CET Node DF	41-18
	41.7.1 AP1000 Diffusion Flame Mitigation Strategy	41-19
	41.7.2 Node DF Containment Failure Probability Assignment	41-20
41.8	Early Hydrogen Detonation – Containment Event Tree Node DTE	41-21
	41.8.1 Containment Success Criteria at Node DTE	41-21
	41.8.2 Early Hydrogen Detonation Decomposition Event Tree	41-22
41.9	Deflagration in Time Frame 3	41-23
	41.9.1 Containment Success Criterion at Node DFL	41-23
	41.9.2 AICC Peak Pressure	41-24
	41.9.3 Conditional Containment Failure Probability from Deflagration	41-25
41.10	Detonation in Intermediate Time Frame	41-29
	41.10.1 Containment Success Criterion at Node DTI	41-29
	41.10.2 Mixing and Stratification	41-29
	41.10.3 Quantification of DTI Failure Probabilities	41-30
41.11	Safety Margin Basis Containment Performance Requirement	41-30
41.12	Summary	41-31
41.13	References	41-31
ATTACHMENT 41A	AP1000 SPECIFIC MAAP4.04 ANALYSES	41A-1
ATTACHMENT 41B	ANALYSIS OF HYDROGEN BURNING AT IGNITERS	41B-1
CHAPTER 42	CONDITIONAL CONTAINMENT FAILURE PROBABILITY DISTRIBUTION	
42.1	Introduction	42-1
42.2	Probabilistic Model	42-1
42.3	Containment Failure Characteristics	42-2
	42.3.1 Median Values for Containment Failure	42-2
	42.3.2 Uncertainties in Containment Failure	42-3
42.4	Containment Failure Predictions	42-4
	42.4.1 Containment Cylindrical Shell	42-4
	42.4.2 Ellipsoidal Upper Head	42-5
	42.4.3 Equipment Hatches	42-5
	42.4.4 Personnel Airlock	42-6
42.5	Overall Failure Distribution	42-6
42.6	Summary and Conclusions	42-7
42.7	References	42-7

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 43	RELEASE FREQUENCY QUANTIFICATION	
43.1	Introduction	43-1
43.2	Plant Damage State Frequency Calculations	43-2
43.3	Containment Event Tree Node Frequencies	43-2
43.3.1	CET Nodes	43-2
43.3.2	CET Node Probabilities From Boolean Expressions	43-3
43.3.3	Probabilities for Hydrogen-Related CET Nodes	43-6
43.3.4	Other CET Node Probabilities	43-6
43.4	Containment Event Tree Quantification	43-7
43.4.1	Containment Event Tree	43-7
43.4.2	Dominant CET Sequences	43-7
43.4.3	LRF Cutsets for Dominant Sequences	43-7
43.5	Summary of Results	43-7
43.6	Importance and Sensitivity Analyses	43-8
43.6.1	CET Event Node Importance Analysis	43-8
43.6.2	No Credit Taken for DP Node for PDS-6	43-8
43.6.3	Lesser Reliability for Containment Isolation	43-8
43.6.4	Lesser Reliability for Hydrogen Igniters	43-8
43.6.5	Lesser Reliability for PCS	43-9
43.6.6	No Credit for Depressurization for High Pressure PDS	43-9
43.6.7	Set PDS-3C Vessel Failure Probability to 1.0	43-9
43.6.8	Set 3D and 1AP Diffusion Flame and Detonation Failure Probability to 1.0	43-9
43.7	Other Importance and Sensitivity Analyses	43-9
43.7.1	Initiating Event Importances	43-9
43.7.2	Sensitivity to Standby Systems	43-10
43.7.3	Sensitivity to Standby Systems With Credit for Manual DAS	43-10
43.8	Conclusions and Insights	43-10
ATTACHMENT 43A	PDS CALCULATIONS	43A-1
ATTACHMENT 43B	DP NODE PROBABILITY FOR PDS	43B-1
ATTACHMENT 43C	EVALUATION OF OPERATOR ACTIONS	43C-1
ATTACHMENT 43D	EFFECT OF "PRE-EXISTING CONTAINMENT OPENING" ON LRF	43D-1
ATTACHMENT 43E	EFFECT OF CONTAINMENT AIR-COOLING FAILURE ON PLANT RISK	43E-1

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 44	MAAP4 CODE DESCRIPTION AND AP1000 MODELING	
44.0	MAAP Background	44-1
44.1	MAAP4	44-1
44.2	The AP1000 MAAP4 Modeling	44-3
44.3	Benchmarking	44-5
44.4	Summary and Conclusions	44-6
44.5	References	44-7
CHAPTER 45	FISSION-PRODUCT SOURCE TERMS	
45.1	Summary of AP1000 Release Categories	45-1
45.2	Release Category Source Terms	45-2
45.2.1	Release Category IC	45-2
45.2.2	Release Category BP	45-2
45.2.3	Release Category CI	45-2
45.2.4	Release Category CFE	45-2
45.2.5	Release Category CFI	45-3
45.2.6	Release Category CFL	45-3
45.2.7	Release Category CFV	45-3
45.3	Direct-Release Sensitivity Case	45-4
45.4	Summary	45-4
45.5	References	45-4
CHAPTERS 46 THROUGH 48 NOT USED		
CHAPTER 49	OFFSITE DOSE RISK QUANTIFICATION	
49.1	Introduction	49-1
49.2	Conformance with Regulatory Requirements	49-2
49.3	Assumptions	49-2
49.4	Methodology	49-2
49.5	Dose Evaluation Results and Discussion	49-5
49.6	Quantification of Site Risk	49-6
49.7	Risk Quantification Results	49-7
49.8	References	49-7
CHAPTER 50	IMPORTANCE AND SENSITIVITY ANALYSES	
50.1	Introduction	50-1
50.2	Importance Analyses for Core Damage	50-1
50.2.1	Initiating Event Importances	50-2
50.2.2	Accident Sequence Importances	50-3
50.2.3	End State Importances	50-4
50.2.4	Common Cause Failure Importances	50-4
50.2.5	Human Error Importances	50-5
50.2.6	Component Importances	50-6

TABLE OF CONTENTS (Cont.)

Section	Title	Page
50.3	System Importances for Core Damage	50-7
50.4	Human Error Sensitivity Analyses	50-8
	50.4.1 Set HEPs to 1.0 (Failure) in Core Damage Output File	50-9
	50.4.2 Set HEPs to 0.0 (Success) in Core Damage Output File	50-10
	50.4.3 Set HEPs to 0.1 in Core Damage Output File	50-10
50.5	Other Sensitivity Analyses for Core Damage	50-10
	50.5.1 Impact of Passive System Check Valves on Core Damage Frequency	50-10
	50.5.2 Sensitivity to Squib Valve Failure Probability	50-11
	50.5.3 Sensitivity to Circuit Breaker Failure Probability	50-11
	50.5.4 Sensitivity to Standby Systems	50-12
	50.5.5 Sensitivity to Standby Systems; Manual DAS Credited	50-14
50.6	Results	50-15
CHAPTER 51	UNCERTAINTY ANALYSIS	
51.1	Introduction	51-1
51.2	Input Data/Error Factors	51-2
51.3	Input Files	51-3
51.4	Output Files	51-3
51.5	Sensitivity Analyses	51-3
	51.5.1 Sensitivity to Simulation Parameters	51-3
	51.5.2 Sensitivity to Key Basic Events	51-3
	51.5.3 Sensitivity to Operator Actions	51-4
51.6	Summary of Results	51-6
51.7	References	51-8
ATTACHMENT 51A	ASSIGNMENT OF ERROR FACTORS TO BASIC EVENT PROBABILITIES	51A-1
ATTACHMENT 51B	@RISK UNCERTAINTY ANALYSIS RESULTS	51B-1
CHAPTERS 52 AND 53 NOT USED		
CHAPTER 54	LOW-POWER AND SHUTDOWN RISK ASSESSMENT	
54.1	Introduction	54-1
54.2	Data Analysis	54-2
54.3	Initiating Event Analysis	54-3
54.4	Event Tree/Mitigation System Evaluation	54-3
54.5	Common Cause Analysis Update for AP1000	54-3
54.6	Human Reliability Assessment for AP1000	54-5
54.7	Core Damage Quantification	54-6
	54.7.1 Discussion of Results	54-9
54.8	Estimation of Shutdown Large Release Frequency	54-9

TABLE OF CONTENTS (Cont.)

Section	Title	Page
54.9	Sensitivity Analyses	54-10
54.9.1	Case 1 – Minimum Equipment per Tech Specs During Drained Conditions	54-10
54.9.2	Case 2 – No Credit for Standby Nonsafety Systems	54-11
54.9.3	Case 3 – HEP's Set Equal to 0.5	54-12
54.9.4	Case 4 – No Credit for Standby Nonsafety Systems – Credit for Manual DAS	54-12
54.9.5	Case 5 – Assessment of Containment Closure Failure Probability	54-13
54.10	Conclusions	54-17
54.11	References	54-17
CHAPTER 55	AP1000 SEISMIC MARGINS EVALUATION	
55.1	Seismic Margin HCLPF Methodology	55-1
55.2	Calculation of HCLPF Values	55-1
55.2.1	Seismic Margin HCLPF Methodology	55-1
55.2.2	Calculation of HCLPF Values	55-2
55.3	Seismic Margin Model	55-11
55.3.1	Major SMA Model Assumptions	55-11
55.3.2	Seismic Initiating Events	55-12
55.3.3	Initiating Event Category HCLPFs	55-13
55.4	Calculation of Plant HCLPF	55-16
55.4.1	HCLPFs for Basic Events	55-16
55.4.2	Calculation of Initiating Event HCLPFs	55-17
55.5	Results and Insights	55-17
55.5.1	AP1000 SMA Results	55-17
55.5.2	AP1000 SMA Insights	55-18
55.6	References	55-20
CHAPTER 56	INTERNAL FLOODING ANALYSIS	
56.1	Introduction	56-1
56.1.1	Definitions	56-1
56.2	Methodology	56-1
56.2.1	Summary of Methodology	56-1
56.2.2	Information Collection	56-2
56.2.3	Initial Screening Assessment	56-2
56.2.4	Detailed Screening Assessment	56-4
56.2.5	Identification of Flood-Induced Initiating Events	56-5
56.2.6	Initiating Event Frequencies	56-6
56.3	Assumptions	56-6
56.3.1	General Flooding Analysis Assumptions and Engineering Judgments	56-6
56.3.2	AP1000-Specific Assumptions	56-8

TABLE OF CONTENTS (Cont.)

Section	Title	Page
56.4	Information Collection	56-10
56.4.1	PRA-Modeled Equipment and Locations	56-10
56.4.2	Identification of Areas for Flooding Evaluation	56-10
56.5	At-Power Operations	56-10
56.5.1	Initial Screening Assessment	56-11
56.5.2	Detailed Screening Assessment	56-11
56.5.3	Identification of Flood-Induced Initiating Events	56-26
56.5.4	Calculation of Flood-Induced Initiating Event Frequencies	56-29
56.5.5	Quantification of At-Power Flood-Induced Events	56-36
56.6	Internal Flooding During Low-Power and Shutdown Conditions	56-38
56.6.1	Detailed Screening Assessment	56-38
56.6.2	Identification of Flood-Induced Initiating Events	56-39
56.6.3	Calculation of Flood-Induced Initiating Event Frequencies	56-40
56.6.4	Quantification of Shutdown Internal Flooding Scenario CDFs	56-45
56.6.5	Total Shutdown Flooding Core Damage Frequency	56-47
56.6.6	Seismically Induced Flooding	56-47
56.6.7	Flooding Hazards During Refueling Outages	56-47
56.6.8	Summary of Results	56-47
56.7	Large Release Frequency Estimates for Internal Flooding	56-48
56.8	Results of AP1000 Internal Flooding Analysis	56-49
CHAPTER 57	FIRE RISK ASSESSMENT	
57.1	Introduction	57-1
57.2	Qualitative Analysis	57-1
57.2.1	AP600 Qualitative Analysis	57-1
57.2.2	AP1000 Qualitative Analysis	57-5
57.2.3	AP1000 Fire Areas	57-6
57.3	Initiating Event Frequencies	57-6
57.3.1	Introduction	57-6
57.3.2	Methodology	57-7
57.3.3	Results for Plant Except Containment and the Main Control Room	57-7
57.3.4	Results for the Containment	57-7
57.3.5	Results for the Main Control Room	57-7
57.4	Development of Fire Scenarios	57-10
57.4.1	Spurious Actuation Model	57-11
57.4.2	Propagation Model	57-14
57.4.3	Fire Suppression Model	57-15
57.4.4	Operation Actions	57-15
57.4.5	Development of Fire Scenarios	57-16
57.5	Calculation of Conditional Core Damage Probabilities (CCDP)	57-22
57.6	Calculation of CDF from Fire Events	57-23
57.6.1	Calculation of Plant Fire CDF	57-23
57.6.2	Comments on Plant Areas	57-23

TABLE OF CONTENTS (Cont.)

Section		Title	Page
	57.6.3	Importances of Fire Areas	57-25
	57.6.4	Conclusion	57-27
57.7		Sensitivity Studies	57-27
	57.7.1	Manual Fire Suppression Systems	57-27
	57.7.2	Sensitivity Analysis of the Probability of a Spurious Actuation of ADS Valves	57-27
	57.7.3	Sensitivity of Human Action on Fire	57-28
	57.7.4	Sensitivity Analysis on Ignition Frequencies	57-28
	57.7.5	Sensitivity Analysis on ADS Actuation by DAS	57-29
	57.7.6	Sensitivity Analysis on 1E to Non-1E Separation in the Containment	57-29
	57.7.7	Sensitivity Analysis to Area to Area Propagation	57-30
	57.7.8	Importance of Hot Shorts	57-30
57.8		Shutdown Fire Analysis	57-30
	57.8.1	Introduction	57-30
	57.8.2	Evaluation of AP1000 Shutdown Risk (Non-Drained Conditions)	57-33
	57.8.3	Evaluation for Drained Shutdown Operations	57-37
	57.8.4	Evaluation of Main Control Room	57-40
57.9		Conclusion and Insights	57-40
	57.9.1	At-Power Analysis	57-40
	57.9.2	Shutdown Fire Analysis	57-41
	57.9.3	Conclusions	57-42
57.10		References	57-42
ATTACHMENT 57A		CALCULATION OF SCENARIO CCDPs	57A-1
57A.1		Calculation of Scenario CCDPs	57A-1
57A.2		Calculation of Scenario CCDPs for Overly Conservative Cases	57A-3
ATTACHMENT 57B		MODELING OF OPERATOR ACTIONS IN FIRE SCENARIOS	57B-1
57B.1		Calculation of Failure Probability of OPA-01	57B-1
57B.2		Calculation of Failure Probability of OPA-02	57B-3
57B.3		Operator Actions at Remote Shutdown Panel	57B-6
57B.4		More Reliable REC-MANDAS	57B-6
ATTACHMENT 57C		FIRE AREA EVENT TREES DEFINING SCENARIOS	57C-1
ATTACHMENT 57D		AP1000 POTENTIAL FOR FIRE-INDUCED SPURIOUS ACTUATION OF FUNCTIONS THAT RESULT IN A BREACH OF HIGH/LOW PRESSURE BOUNDARY	57D-1

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 58	WINDS, FLOODS, AND OTHER EXTERNAL EVENTS	
58.1	Introduction	58-1
58.2	External Events Analysis	58-1
	58.2.1 Severe Winds and Tornadoes	58-1
	58.2.2 External Floods	58-2
	58.2.3 Transportation and Nearby Facility Accidents	58-2
58.3	Conclusion	58-2
58.4	References	58-3
CHAPTER 59	PRA RESULTS AND INSIGHTS	
59.1	Introduction	59-1
59.2	Use of PRA in the Design Process	59-3
59.3	Core Damage Frequency from Internal Initiating Events at Power	59-4
	59.3.1 Dominant Core Damage Sequences	59-6
	59.3.2 Component Importances for At-Power Core Damage Frequency	59-7
	59.3.3 System Importances for At-Power Core Damage	59-8
	59.3.4 System Failure Probabilities for At-Power Core Damage	59-9
	59.3.5 Common Cause Failure Importances for At-Power Core Damage	59-9
	59.3.6 Human Error Importances for At-Power Core Damage	59-9
	59.3.7 Accident Class Importances	59-10
	59.3.8 Sensitivity Analyses Summary for At-Power Core Damage	59-11
	59.3.9 Summary of Important Level 1 At-Power Results	59-12
59.4	Large Release Frequency for Internal Initiating Events at Power	59-15
	59.4.1 Dominant Large Release Frequency Sequences	59-15
	59.4.2 Summary of Important Level 2 At-Power Results	59-16
59.5	Core Damage and Severe Release Frequency from Events at Shutdown	59-19
	59.5.1 Summary of Shutdown Level 1 Results	59-19
	59.5.2 Large Release Frequency for Shutdown and Low-Power Events	59-22
	59.5.3 Shutdown Results Summary	59-22
59.6	Results from Internal Flooding, Internal Fire, and Seismic Margin Analyses	59-23
	59.6.1 Results of Internal Flooding Assessment	59-23
	59.6.2 Results of Internal Fire Assessment	59-24
	59.6.3 Results of Seismic Margin Analysis	59-25
59.7	Plant Dose Risk From Release of Fission-Products	59-26
59.8	Overall Plant Risk Results	59-26
59.9	Plant Features Important to Reducing Risk	59-27
	59.9.1 Reactor Design	59-28
	59.9.2 Systems Design	59-28
	59.9.3 Instrumentation and Control Design	59-31
	59.9.4 Plant Layout	59-32
	59.9.5 Containment Design	59-32

TABLE OF CONTENTS (Cont.)

Section	Title	Page
59.10	PRA Input to Design Certification Process	59-36
	59.10.1 PRA Input to Reliability Assurance Program	59-36
	59.10.2 PRA Input to Tier 1 Information	59-36
	59.10.3 PRA Input to MMI/Human Factors/Emergency Response Guidelines	59-36
	59.10.4 Summary of PRA Based Insights	59-37
	59.10.5 Combined License Information	59-37
59.11	References	59-38
APPENDIX A	THERMAL HYDRAULIC ANALYSIS TO SUPPORT SUCCESS CRITERIA	A-1
APPENDIX B	EX-VESSEL SEVERE ACCIDENT PHENOMENA	B-1
APPENDIX C	ADDITIONAL ASSESSMENT OF AP1000 DESIGN FEATURES	C-1
APPENDIX D	EQUIPMENT SURVIVABILITY ASSESSMENT	D-1
APPENDIX E	AP1000 PRA FAULT TREE PICTURES FOR LEVEL 1 ANALYSIS FOR EVENTS AT POWER OPERATION	E-1

LIST OF TABLES

Table No.	Title	Page
2-1	Internal Initiating Event Grouping Plant Systems and Equipment Available for Transient/Accident Conditions (Sheets 1 – 10)	2-28
2-2	NUREG/CR 3862 Initiator Categories (Sheets 1 – 4)	2-38
2-3	NUREG/CR 3862 Initiator Categories not Considered in the AP1000 PRA Analysis	2-42
2-4	AP1000 Internal Initiating Event Frequencies (Sheets 1 – 3)	2-43
2-5	Initiating Event Frequencies Used in Event Trees Quantification	2-46
2A-1	Summary of Primary System Piping Data	2A-2
2A-2	Summary of Primary System Pipe Break Frequency Quantification	2A-3
2A-3	Summary of Steam Generator Tube Rupture Events	2A-4
2A-4	Spurious Stuck-Open Pressurizer Safety Valve	2A-5
2A-5	Interface Break on Accumulator Lines	2A-6
2A-6	Interface Break on IRWST Injection Lines	2A-7
2A-7	Initiating Events Review Data Summary (Sheets 1 – 8)	2A-8
2B-1	Summary of Main Steam Line and Feedwater Line Piping Data for Secondary Side Break Frequency Quantification	2B-2
2B-2	Secondary Side Line Break Frequency Quantification	2B-3
2B-3	Stuck-Open Main Steam Line Safety Valve Frequency Quantification (Sheets 1 – 2)	2B-4
3-1	Loss of CCS/SWS Initiating Event Fault Tree CSWF Success Criteria Summary	3-8
3-2	Spurious Actuation of Automatic Depressurization Failure Criteria Summary	3-9
3-3	Evaluation of Spurious Automatic Depressurization System Frequencies (Sheets 1 – 6)	3-10
4-1	AP1000 Large LOCA Event End State Summary	4-112
4-2	AP1000 Spurious ADS Actuation Event End State Summary	4-112
4-3	AP1000 Medium LOCA Event End State Summary	4-113
4-4	AP1000 CMT Line Break LOCA Event End State Summary	4-114
4-5	AP1000 SI Line Break Event End State Summary	4-115
4-6	AP1000 Small LOCA Event End State Summary	4-116
4-7	AP1000 RCS Leak Event End State Summary	4-117
4-8	AP1000 PRHR Tube Rupture Event End State Summary	4-117
4-9	AP1000 SGTR Event End State Summary	4-118
4-10	AP1000 Vessel Rupture Event End State Summary	4-119
4-11	AP1000 Interfacing Systems LOCA Event End State Summary	4-119
4-12	AP1000 Transients with MFW Event End State Summary	4-120
4-13	AP1000 Transients with Loss of RCS Flow Event End State Summary	4-121

LIST OF TABLES (Cont.)

Table No.	Title	Page
4-14	AP1000 Transients with Loss of MFW to One SG Event End State Summary	4-122
4-15	AP1000 Transients with Core Power Excursion Event End State Summary	4-123
4-16	AP1000 Transients with Loss of CCW/SW Event End State Summary	4-124
4-17	AP1000 Transients without Main Feedwater Event End State Summary	4-125
4-18	AP1000 Transients with Loss of Condenser Event End State Summary	4-126
4-19	AP1000 Transients with Loss of Compressed Air Event End State Summary	4-127
4-20	AP1000 Loss of Offsite Power Event End State Summary	4-128
4-21	AP1000 SLB Downstream of MSIVs Event End State Summary	4-129
4-22	AP1000 SLB Downstream of MSIVs Event End State Summary	4-130
4-23	AP1000 Stuck Open Secondary Side Safety Valve Event End State Summary	4-131
4-24	AP1000 ATWS Precursor without MFW Event End State Summary	4-132
4-25	AP1000 ATWS Precursor with SI Event End State Summary	4-133
4-26	AP1000 ATWS Precursor Transients with MFW Event End State Summary	4-134
4A-1	End States (Plant Damage States)	4A-17
4A-2	Summary of Systems Associated with Mitigating Functions for AP1000	4A-18
5-1	AP1000 Safety-Related Plant Support Systems with Letter Designators	5-3
5-2	AP1000 Non Safety-Related Plant Support Systems with Letter Designators	5-3
5-3	AP1000 Support Systems Interdependency Matrix (Sheets 1 – 14)	5-4
5-4	AP1000 Safety-Related Front Line Plant Systems Letter Designators	5-18
5-5	AP1000 Non Safety-Related Front Line Plant Systems Letter Designators	5-18
5-6	AP1000 Front Line System Dependencies Matrix (Sheets 1 – 18)	5-19
6-1	Summary of Event Tree Top Events Success Criteria (Internal Initiating Events at Power Cases) (Sheets 1 – 34)	6-20
6-2	Summary of Success Criteria for the Mitigating Systems (Sheets 1 – 9)	6-54
6-3	Summary of Success Criteria for Operator Actions and Mission Times (Sheets 1 – 4)	6-68
7-1	Example for Fault Tree XXX Success Criteria Summary	7-15
7-2	Example for System Dependency Matrix	7-15
7-3	Example for Component Test Assumptions	7-16
7-4	Example for Component Maintenance Assumptions	7-16
7-5	Example for Operator Actions and Misposition Analysis Summary	7-16
7-6	Fault Tree Identification Codes (Sheets 1 – 3)	7-17
7-7	System Identification Codes for Basic Events (Sheets 1 – 3)	7-20
7-8	Component Identification Codes (Sheets 1 – 7)	7-23
7-9	Failure Mode Identification Codes (Sheets 1 – 3)	7-30
8-1	List of Passive Residual Heat Removal System Fault Trees	8-7
8-2a	Fault Tree "PRT" Success Criteria	8-8
8-2b	Fault Tree "PRTA" Success Criteria	8-9

LIST OF TABLES (Cont.)

Table No.	Title	Page
8-2c	Fault Tree "PRL" Success Criteria	8-10
8-2d	Fault Tree "PRP" Success Criteria	8-11
8-2e	Fault Tree "PRS" Success Criteria	8-12
8-2f	Fault Tree "PRW" Success Criteria	8-13
8-2g	Fault Tree "PRI" Success Criteria	8-14
8-3	System Dependency Matrix	8-15
8-4	Component Test Assumptions	8-16
8-5	Component Maintenance Assumptions	8-17
8-6	Operator Actions and Misposition Analysis Summary	8-18
8-7	Common Cause Failures Summary	8-19
8-8	Basic Events Database for the PRHR System Fault Trees (Sheets 1 – 3)	8-20
9-1	List of System Fault Trees	9-9
9-2a	Fault Tree CM2AB Success Criteria Summary	9-10
9-2b	Fault Tree CM2SL Success Criteria Summary	9-11
9-2c	Fault Tree CM2L Success Criteria Summary	9-12
9-2d	Fault Tree CM2P Success Criteria Summary	9-13
9-2e	Fault Tree CM1A Success Criteria Summary	9-14
9-2f	Fault Tree CM2LLT Success Criteria Summary	9-15
9-2g	Fault Tree CMBOTH Success Criteria Summary	9-16
9-2h	Fault Tree CM2LA Success Criteria Summary	9-17
9-3	Notes Related to System Fault Tree Assumptions	9-18
9-4	System Dependency Matrix	9-18
9-5	Component Test Assumptions	9-19
9-6	Component Maintenance Assumptions	9-19
9-7	Operator Actions and Misposition Analysis Summary	9-20
9-8	Common Cause Failure Analysis Summary	9-20
9-9	Fault Tree Basic Events for Core Makeup Tank Subsystem (Sheets 1 – 3)	9-21
10-1	List of System Fault Trees	10-5
10-2a	Fault Tree AC2AB Success Criteria Summary	10-6
10-2b	Fault Tree AC1A Success Criteria Summary	10-7
10-2c	Fault Tree ACBOTH Success Criteria Summary	10-8
10-3	Notes Related to System Fault Tree Assumptions	10-9
10-4	System Dependency Matrix	10-9
10-5	Component Test Assumptions	10-9
10-6	Component Maintenance Assumptions	10-10
10-7	Operator Actions and Misposition Analysis Summary	10-10
10-8	Common Cause Failure Analysis Summary	10-10
10-9	Fault Tree Basic Events for Accumulator Subsystem	10-11

LIST OF TABLES (Cont.)

Table No.	Title	Page
11-1a	List of ADS System Fault Trees (Sheets 1 – 2)	11-8
11-1b	List of ADS System Fault Trees (for Plant Damage States Analysis)	11-10
11-2a	ADS Success Criteria Versus Accident Conditions (Full Depressurization)	11-11
11-2b	ADS Success Criteria Versus Accident Conditions (Partial Depressurization)	11-12
11-2c	Automatic Depressurization System Fault Tree Summary (For Plant Damage States)	11-13
11-2d	Fault Tree "ADA" Success Criteria	11-13
11-2e	Fault Tree "ADAB" Success Criteria	11-14
11-2f	Fault Tree "ADAL" Success Criteria	11-15
11-2g	Fault Tree "ADB" Success Criteria	11-15
11-2h	Fault Tree "ADL" Success Criteria	11-16
11-2i	Fault Tree "ADM" Success Criteria	11-16
11-2j	Fault Tree "ADMA" Success Criteria	11-17
11-2k	Fault Tree "ADQ" Success Criteria	11-17
11-2l	Fault Tree "ADS" Success Criteria	11-18
11-2m	Fault Tree "ADT" Success Criteria	11-18
11-2n	Fault Tree "ADW" Success Criteria	11-19
11-2o	Fault Tree "AD1" Success Criteria	11-19
11-2p	Fault Tree "AD1A" Success Criteria	11-20
11-2q	Fault Tree "ADF" Success Criteria	11-20
11-2r	Fault Tree "ADR" Success Criteria	11-21
11-2s	Fault Tree "ADRA" Success Criteria	11-21
11-2t	Fault Tree "ADU" Success Criteria	11-22
11-2u	Fault Tree "ADUM" Success Criteria	11-22
11-2v	Fault Tree "ADV" Success Criteria	11-23
11-2w	Fault Tree "ADZ" Success Criteria	11-23
11-2x	Fault Tree "ADQLT" Data Summary	11-24
11-2y	Fault Tree "ADTLT" Success Criteria	11-24
11-3	Notes Related to ADS System Fault Tree Assumptions	11-25
11-4	System Dependencies Matrix	11-26
11-5	Component Test Assumptions	11-27
11-6	Component Maintenance Assumptions	11-27
11-7	Failure Probabilities Calculated	11-27
11-8	Operator Action Analysis Summary	11-28
11-9	Common Cause Failures Summary	11-28
11-10	Basic Events Data Base for the ADA System Fault Tree (Sheets 1 – 20)	11-29
12-1	List of System Fault Trees (FT)	12-10
12-2a	Fault Tree "IW2AB" Success Criteria Summary	12-11
12-2b	Fault Tree "IW2ABM" Success Criteria Summary	12-12
12-2c	Fault Tree "IW2ABA" Success Criteria Summary	12-13
12-2d	Fault Tree "IW2ABP" Success Criteria Summary	12-14
12-2e	Fault Tree "IW2ABPM" Success Criteria Summary	12-15

LIST OF TABLES (Cont.)

Table No.	Title	Page
12-2f	Fault Tree "IW2ABB" Success Criteria Summary	12-16
12-2g	Fault Tree "IW2ABBM" Success Criteria Summary	12-17
12-2h	Fault Tree "IW1A" Success Criteria Summary	12-18
12-2i	Fault Tree "IW1AM" Success Criteria Summary	12-19
12-2j	Fault Tree "IWF" Success Criteria Summary	12-20
12-2k	Fault Tree "RECIRC" Success Criteria Summary	12-21
12-2l	Fault Tree "RECIRCP" Success Criteria Summary	12-22
12-2m	Fault Tree "RECIRCB" Success Criteria Summary	12-23
12-2n	Fault Tree "RECIRC1" Success Criteria Summary	12-24
12-2o	Fault Tree "RECIRC1P" Success Criteria Summary	12-25
12-2p	Fault Tree "RECIRC1B" Success Criteria Summary	12-26
12-3	System Dependency Matrix	12-27
12-4	Component Test Assumptions	12-28
12-5	Component Maintenance Assumptions	12-28
12-6	Failure Probabilities Calculated	12-29
12-7	Operator Actions and Misposition Analysis Summary	12-29
12-8	Common Cause Failure Analysis Summary	12-30
12-9	Fault Tree Basic Events (Sheets 1 – 11)	12-31
13-1	List of System Fault Trees	13-7
13-2	Fault Tree PCT Success Criteria Summary	13-7
13-3	Notes Related to System Fault Trees Assumptions	13-7
13-4	System Dependency Matrix	13-8
13-5	Component Test Assumptions	13-8
13-6	Component Maintenance Assumptions	13-9
13-7	Operator Actions and Misposition Analysis Summary	13-9
13-8	Common Cause Failure Analysis Summary	13-9
13-9	Fault Tree Basic Events for Passive Containment Cooling System	13-10
14-1	List of System Fault Trees (At-Power)	14-8
14-2.a	Success Criteria Summary Fault Tree "FWT"	14-9
14-2.b	Success Criteria Summary Fault Tree "FWF"	14-10
14-2.c	Success Criteria Summary Fault Tree "SFWT"	14-11
14-2.d	Success Criteria Summary Fault Tree "SFW"	14-12
14-2.e	Success Criteria Summary Fault Tree "SFW1"	14-13
14-2.f	Success Criteria Summary Fault Tree "SFWP"	14-14
14-2.g	Success Criteria Summary Fault Tree "SFWM"	14-15
14-2.h	Success Criteria Summary Fault Tree "SFWA"	14-16
14-2.i	Success Criteria Summary Fault Tree "COND"	14-17
14-2.j	Success Criteria Summary Fault Tree "COND1"	14-18
14-2.k	Success Criteria Summary Fault Tree "CDS"	14-19
14-2.l	Success Criteria Summary Fault Tree "TCCW"	14-20
14-3	Notes to System Fault Tree Assumptions	14-21

LIST OF TABLES (Cont.)

Table No.	Title	Page
14-4	System Dependency Matrix (Sheets 1 – 2)	14-22
14-5	Component Test Assumptions	14-24
14-6	Component Maintenance Assumptions	14-25
14-7	Failure Probabilities Calculated in this Section	14-25
14-8	Operator Action Analysis Summary	14-26
14-9	Common Cause Failure (CCF) Summary	14-27
14-10	Fault Tree Basic Event for Main and Startup Feedwater System (Sheets 1 – 9)	14-28
15-1	List of System Fault Trees	15-9
15-2a	Fault Tree CSBOR1 Success Criteria Summary	15-10
15-2b	Fault Tree CVS1 Success Criteria Summary	15-11
15-2c	Fault Tree CSAX Success Criteria Summary	15-12
15-2d	Fault Tree SGHL Success Criteria Summary	15-13
15-2e	Fault Tree CSP Success Criteria Summary	15-14
15-3	Notes Related to System Fault Tree Assumptions	15-15
15-4	System Dependency Matrix	15-16
15-5	Component Test Assumptions	15-17
15-6	Component Maintenance Assumptions	15-18
15-7	Operator Actions and Misposition Analysis Summary	15-19
15-8	Common Cause Failure Analysis Summary	15-20
15-9	Fault Tree Basic Events for Chemical and Volume Control System (Sheets 1 – 4)	15-21
16-1	List of System Fault Trees	16-5
16-2	Fault Tree VLH Success Criteria Summary	16-5
16-3	Notes Related to System Fault Tree Assumptions	16-5
16-4	System Dependency Matrix	16-6
16-5	Component Test Assumptions	16-6
16-6	Component Maintenance Assumptions	16-6
16-7	Operator Actions and Misposition Analysis Summary	16-7
16-8	Common Cause Failure Analysis Summary	16-7
16-9	Fault Tree Basic Events for Containment Hydrogen Control System	16-8
17-1	List of System Fault Trees	17-7
17-2	Fault Tree Success Criteria Summary (Sheets 1 – 2)	17-8
17-3	Notes Related to System Fault Tree Assumptions	17-10
17-4	System Dependencies Matrix	17-11
17-5	Component Test Assumptions	17-12
17-6	Component Maintenance Assumptions	17-12
17-7	Operator Actions and System Misposition Analysis Summary	17-13
17-8	Common Cause Failure Summary	17-13
17-9	Fault Tree Basic Events for Normal Residual Heat Removal System (Sheets 1 – 5)	17-14

LIST OF TABLES (Cont.)

Table No.	Title	Page
18-1	List of System Fault Trees	18-6
18-2a	Fault Tree CCN Success Criteria Summary	18-6
18-2b	Fault Tree CCT Success Criteria Summary	18-7
18-2c	Fault Tree CCP Success Criteria Summary	18-7
18-3	Notes Related to System Fault Tree Assumptions	18-8
18-4	System Dependency Matrix	18-8
18-5	Component Test Assumptions	18-9
18-6	Component Maintenance Assumptions	18-9
18-7	Operator Actions and Misposition Analysis Summary	18-10
18-8	Common Cause Failure Analysis Summary	18-10
18-9	Fault Tree Basic Events for Component Cooling Water System (Sheets 1 – 2)	18-11
19-1	List of System Fault Trees	19-6
19-2a	Fault Tree SWN Success Criteria Summary	19-6
19-2b	Fault Tree SWT Success Criteria Summary	19-7
19-2c	Fault Tree SWP Success Criteria Summary	19-7
19-3	Notes Related to System Fault Tree Assumptions	19-8
19-4	System Dependency Matrix	19-9
19-5	Component Test Assumptions	19-10
19-6	Component Maintenance Assumptions	19-10
19-7	Operator Actions and Misposition Analysis Summary	19-11
19-8	Common Cause Failure Analysis Summary	19-11
19-9	Fault Tree Basic Events for Service Water System (Sheets 1 – 4)	19-12
20-1	List of System Fault Trees	20-5
20-2	Fault Tree VWH Success Criteria Summary	20-5
20-3	Notes Related to System Fault Tree Assumptions	20-5
20-4	System Dependency Matrix	20-6
20-5	Component Test Assumptions	20-7
20-6	Component Maintenance Assumptions	20-7
20-7	Operator Actions and Misposition Analysis Summary	20-8
20-8	Common Cause Failure Analysis Summary	20-8
20-9	Fault Tree Basic Events for Central Chilled Water System (Sheets 1 – 2)	20-9
21-1	List of System Fault Trees (Sheets 1 – 3)	21-9
21-2	Fault Tree Success Criteria Summary (Sheets 1 – 16)	21-12
21-3	Notes Related to System Fault Tree Assumptions (Sheets 1 – 3)	21-28
21-4	System Dependency Matrix	21-31
21-5	Component Test Assumptions	21-31
21-6	Component Maintenance Assumptions	21-32
21-7	Operator Actions and Misposition Analysis Summary	21-32
21-8	Common Cause Failure Analysis Summary	21-32
21-9	Fault Tree Basic Events for AC Power System (Sheets 1 – 22)	21-33

LIST OF TABLES (Cont.)

Table No.	Title	Page
22-1	List of System Fault Trees (Sheets 1 – 4)	22-6
22-2	Fault Tree Success Criteria Summary (Sheets 1 – 16)	22-10
22-3	Notes Related to System Fault Tree Assumptions	22-26
22-4	Systems Dependency Matrix	22-26
22-5	Component Test Assumptions	22-27
22-6	Component Maintenance Assumptions	22-27
22-7	Operator Actions and Misposition Analysis Summary	22-27
22-8	Common Cause Failure Analysis Summary	22-28
22-9	Fault Tree Basic Events for Class 1E DC and UPS System (Sheets 1 – 12)	22-29
22-10	System Power Requirements/Dependencies (Sheets 1 – 11)	22-41
23-1	List of System Fault Trees (Sheets 1 – 3)	23-6
23-2	Fault Tree Success Criteria Summary (Sheets 1 – 10)	23-9
23-3	Notes Related to System Fault Tree Assumptions	23-19
23-4	System Dependency Matrix	23-19
23-5	Component Test Assumptions	23-20
23-6	Component Maintenance Assumptions	23-20
23-7	Operator Actions and Misposition Analysis Summary	23-20
23-8	Common Cause Failure Analysis Summary	23-21
23-9	Fault Tree Basic Events for Non-Class 1E DC and UPS Power System (Sheets 1 – 20)	23-22
24-1	AP1000 Containment Penetration List (Sheets 1 – 4)	24-7
24-2	Screening Analysis Evaluation (Sheets 1 – 5)	24-16
24-3	Containment Penetrations Not Screened Out for Normal Operation at Power Analysis	24-21
24-4	List of System Fault Trees	24-21
24-5a	Fault Tree CIC Success Criteria Summary	24-22
24-5b	Fault Tree CIA Success Criteria Summary	24-22
24-5c	Fault Tree CIB Success Criteria Summary	24-23
24-6	Notes Related to System Fault Tree Assumptions	24-23
24-7	System Dependency Matrix (Sheets 1 – 3)	24-24
24-8	Component Test Assumptions	24-27
24-9	Component Maintenance Assumptions	24-27
24-10	Operator Actions and Misposition Analysis Summary	24-28
24-11	Common Cause Failure Analysis Summary	24-28
24-12	Fault Tree Basic Events for Containment Isolation System (Sheets 1 – 3)	24-29
25-1	List of System Fault Trees	25-8
25-2a	Fault Tree CAIAIR Success Criteria Summary	25-9
25-2b	Fault Tree CAIR Success Criteria Summary	25-9
25-2c	Fault Tree CAIAIRP Success Criteria Summary	25-10
25-2d	Fault Tree ENDCAIAI Success Criteria Summary	25-10

LIST OF TABLES (Cont.)

Table No.	Title	Page
25-2e	Fault Tree ENDCAIAP Success Criteria Summary	25-11
25-2f	Fault Tree CASF Success Criteria Summary	25-11
25-3	Notes Related to System Fault Tree Assumptions	25-12
25-4	System Dependency Matrix	25-12
25-5	Component Test Assumptions	25-12
25-6	Component Maintenance Assumptions	25-13
25-7	Operator Actions and Misposition Analysis Summary	25-13
25-8	Common Cause Failure Analysis Summary	25-13
25-9	Fault Tree Basic Events for Instrument Air Subsystem (Sheets 1 – 4)	25-14
26-1	List of System Fault Trees	26-25
26-2a	Fault Tree RTPMS, and RTPMS1 Success Criteria Summary	26-26
26-2b	Fault Tree RTSTP Success Criteria Summary	26-26
26-2c	Fault Tree RCL Success Criteria Summary	26-27
26-2d.1	Fault Tree RCT Success Criteria Summary	26-27
26-2d.2	Fault Tree RCN Success Criteria Summary	26-28
26-2e	I&C Subtree Success Criteria Summary (Sheets 1 – 98)	26-29
26-3a	PMS I&C Subtree Constructions (Sheets 1 – 19)	26-127
26-3b	Representative PMS I&C Subtree Plot Listing (Sheets 1 – 14)	26-146
26-4	PMS Dependency Matrix (Sheets 1 – 3)	26-160
26-5	PMS Components Test Assumptions	26-163
26-6	Component Maintenance Assumptions	26-163
26-7	Failure Probabilities Calculated in this Section (Sheets 1 – 5)	26-164
26-8	Operator Actions and System Misposition Analysis Summary (Sheets 1 – 3)	26-169
26-9	Common Cause Failure Analysis Summary (Sheets 1 – 2)	26-172
26-10a	Fault Tree Basic Events for Reactor Trip System (Sheets 1 – 4)	26-174
26-10b	Fault Tree Basic Events for the I&C Subsystem (Sheets 1 – 49)	26-178
26-11	Assumed List of I&C Instrumentation (Sheets 1 – 3)	26-227
27-1	List of System Fault Trees	27-9
27-2a	Fault Tree DAS Success Criteria Summary	27-9
27-2b	Fault Tree DAS1 Success Criteria Summary	27-9
27-3	Notes Related to System Fault Tree Assumptions	27-10
27-4	System Dependency Matrix	27-10
27-5	Component Test Assumptions	27-10
27-6	Component Maintenance Assumptions	27-10
27-7	Operator Actions and Misposition Analysis Summary	27-10
27-8	Common Cause Failure Analysis Summary	27-11
27-9	Fault Tree Basic Events for Diverse Actuation System	27-12
28-1	List of System Fault Trees	28-20
28-2	Fault Tree Success Criteria Summary (Sheets 1 – 22)	28-21
28-3	PLS I&C Subtree Constructions (Sheets 1 – 9)	28-43

LIST OF TABLES (Cont.)

Table No.	Title	Page
28-4	PLS Dependency Matrix (Sheets 1 – 2)	28-52
28-5	PLS Components Test Assumptions	28-54
28-6	Component Maintenance Assumptions	28-54
28-7	Failure Probabilities Calculated in this Section (Sheets 1 – 3)	28-55
28-8	Operator Actions and System Misposition Analysis Summary (Sheets 1 – 2)	28-58
28-9	Common Cause Failure Analysis Summary (Sheets 1 – 2)	28-60
28-10	Fault Tree Basic Events for I&C Subsystem (Sheets 1 – 68)	28-62
28-11	Assumed List of I&C Instrumentation (Sheets 1 – 3)	28-130
28-12	Assignments of Plant Systems to Logic Cabinets	28-133
28-13	Assignments of Plant Systems to the Control Group Cabinets	28-134
29-1	Electrical Components with Low CCF Rate	29-18
29-2	Common-Cause Failure Calculations (Sheets 1 – 5)	29-19
29-3	Simplification of Q_K/Q_T Equations	29-24
29A-1	Extreme Environmental Conditions (Generic Causes of Dependent Failures) Excerpted from the ANS/IEEE PRA Procedures Guide (NUREG-2300)	29A-11
29A-2	Common-Cause Failures Among Systems	29A-12
29A-3	Common-Cause Failure Equations for MGL Method	29A-13
30-1	AP1000 Human Error Probability Summary Results (Sheets 1 – 16)	30-75
30-2	Manual DAS Actuation (Sheets 1 – 2)	30-91
30-3	Dependency Level Evaluation Summary (Sheets 1 – 14)	30-93
30-4	Dependency Level Evaluation (Sheets 1 – 3)	30-107
30-5	List of Acronyms	30-110
30A-1	Analyst Responsibility Based on Sharp Steps	30A-10
30A-2	Summary of Screening Values	30A-11
30A-3	Example of Operator Action Definition	30A-12
30A-4	HEP Data Bank (Sheets 1 – 5)	30A-13
31-1	Summary of Event Tree Scalar Probabilities	31-12
32-1	Generic Data Base (Sheets 1 – 13)	32-5
32-2	Test and Maintenance Outage Generic Data	32-21
32-3	Test and Maintenance Unavailabilities Used in AP1000 Core Damage Quantification	32-22
32-4	Common Cause Factors (Sheets 1 – 5)	32-23
32-5	SIMON.OUT File (Sheets 1 – 21)	32-29
33-1	Summary of AP1000 System Fault Tree Failure Probabilities (Sheets 1 – 13)	33-7
33-2	Example Accident Sequence Definitions for Large LOCA	33-20
33-3	AP1000 PRA Dominant CDF Cutsets (Sheets 1 – 10)	33-21

LIST OF TABLES (Cont.)

Table No.	Title	Page
33-4	AP1000 PRA Dominant CDF Sequences (Sheets 1 – 18)	33-31
33-5	Contribution of Initiating Events to Plant Core Damage Frequency	33-49
33-6	List of Basic Events and Their Descriptions (Sheets 1 – 33)	33-50
34-1	Post-Accident Monitoring Equipment (Sheets 1 – 2)	34-23
34-2	Level 1 Accident Class	34-25
34-3	Summary of Release Categories	34-26
34-4	3BE-1 Event Summary	34-27
34-5	3BE-2 Event Summary	34-28
34-6	3BE-4 Event Summary	34-29
34-7	3BE-5 Event Summary	34-30
34-8	3BE-6 Event Summary	34-31
34-9	3BE-7 Event Summary	34-32
34-10	3BE-3 Event Summary	34-33
34-11	3BL-1 Event Summary	34-34
34-12	3BL-2 Event Summary	34-35
34-13	3BR-1 Event Summary	34-36
34-14	3BR-1a Event Summary	34-37
34-15	3C-1 Event Summary	34-38
34-16	3C-2 Event Summary	34-39
34-17	3D-1 Event Summary	34-40
34-18	3D-2 Event Summary	34-41
34-19	3D-3 Event Summary	34-42
34-20	3D-4 Event Summary	34-43
34-21	6E-1 Event Summary	34-44
34-22	6L-1 Event Summary	34-45
34-23	1AP-1 Event Summary	34-46
34-24	1AP-2 Event Summary	34-47
34-25	1A-1 Event Summary	34-48
34-26	1A-2 Event Summary	34-49
34-27	CFI Event Summary	34-50
34-28	CFL Event Summary	34-51
35-1	Functional Definitions of Level 1 Accident Classes	35-21
35-2	CET Initial Conditions for Level 1 Accident Classes	35-22
35-3	Containment Event Tree Nodal Questions	35-23
35-4	Summary of Release Category Definitions	35-24
35-5	Summary of Containment Event Tree Success Criteria (Sheets 1 – 3)	35-25
35-6	Summary of Operator Actions Credited on Containment Event Tree	35-28
36-1	Summary Table for RCS Depressurization (CET Node DP)	36-6
37-1	Summary Table for Containment Isolation (CET Node IS)	37-4

LIST OF TABLES (Cont.)

Table No.	Title	Page
38-1	Summary Table for Reflooding (CET Node RFL)	38-5
39-1	Material Inventories in AP1000 Reactor Vessel	39-21
39-2	Summary Table for Reactor Cavity Flooding (CET Node IR)	39-22
39-3	Summary Table for Debris Relocation to Cavity (CET Node VF)	39-22
39A-1	Core and Lower Internals Material Inventories in AP1000 Reactor Vessel	39A-14
39A-2a	Mass and Power Distributions of Debris Layers in Top-Skewed Power Shape Case	39A-15
39A-2b	Mass and Power Distributions of Debris Layers in Chopped Cosine Power Shape Case	39A-16
39A-3a	Results of Top-Skewed Power Shape Case	39A-17
39A-3b	Relocation Results of the Chopped Cosine Power Shape Case	39A-18
39A-4	Material Properties Used in In-Vessel Melting and Relocation Calculation	39A-19
39A-5	Debris Relocation Time Line	39A-20
40-1	Summary of Nodal Failure Probabilities	40-6
40-2	Nominal and Bounding Containment Failure Probability at 24 and 72 Hours	40-6
41-1	Containment Event Tree IG Nodal Failure Probability	41-33
41-2	Containment Event Tree Nodal Failure Probabilities	41-33
41-3	AP600 Scenario Dependencies for Early Detonation Analysis	41-34
41-4	Safety Margin Basis Containment Performance Requirement	41-35
41A-1	Summary of System Assumptions for AP1000 MAAP4.04 Hydrogen Analyses (Sheets 1 – 7)	41A-2
41A-2	Summary of Hydrogen Generation Results MAAP4 Hydrogen Mixing Analyses	41A-10
41A-3	Summary of Early Compartment Gas Composition Results For MAAP4 Hydrogen Mixing Analyses	41A-10
41A-4	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-11
41A-5	Summary of Hydrogen Generation Results MAAP4 Hydrogen Mixing Analyses	41A-11
41A-6	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-12
41A-7	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-12
41A-8	Summary of Hydrogen Generation Results MAAP4 Hydrogen Mixing Analyses	41A-13
41A-9	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-14
41A-10	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-15
41A-11	Summary of Hydrogen Generation Results MAAP4 Hydrogen Mixing Analyses	41A-15

LIST OF TABLES (Cont.)

Table No.	Title	Page
41A-12	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-16
41A-13	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-16
41A-14	Summary of Hydrogen Generation Results MAAP4 Hydrogen Mixing Analyses	41A-17
41A-15	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-17
41A-16	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-18
41A-17	Summary of Hydrogen Generation Results MAAP4 Hydrogen Mixing Analyses	41A-18
41A-18	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-19
41A-19	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-19
41A-20	Summary of Hydrogen Generation Results MAAP4 Hydrogen Mixing Analyses	41A-20
41A-21	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-20
41A-22	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-21
41A-23	Sequence 1A-3a	41A-22
41A-24	Sequence 1A-4a	41A-23
41A-25	Sequence 1AP-3	41A-24
41A-26	Sequence 1AP-4	41A-25
41A-27	Sequence 3D-1	41A-26
41A-28	Sequence 3D-2	41A-27
41A-29	Sequence 3D-3	41A-28
41A-30	Sequence 3D-5	41A-29
41A-31	Sequence 3BL-1	41A-30
41A-32	Sequence 3BL-2	41A-31
41A-33	Sequence 3C-1	41A-32
41A-34	Sequence 3BR-1a	41A-33
41A-35	Sequence 3BE-1	41A-34
41A-36	Sequence 3BE-2	41A-35
41A-37	Sequence 3BE-4	41A-36
41A-38	Sequence 3BE-5	41A-37
41A-39	Sequence 3BE-6	41A-38
41A-40	Sequence 3BE-8	41A-39
41A-41	Sequence 3BE-9	41A-40
42-1	Parameters Used in the Construction of the AP1000 Conditional Containment Failure Probability Distribution for Containment Temperature = 400°F	42-9
42-2	Parameters Used in the Construction of the AP1000 Conditional Containment Failure Probability Distribution for Containment Temperature = 331°F	42-9

LIST OF TABLES (Cont.)

Table No.	Title	Page
42-3	Cumulative Containment Failure Probability, Temperature = 400°F	42-10
42-4	Cumulative Containment Failure Probability, Temperature = 331°F	42-11
43-1	Accident Class Frequencies	43-13
43-2	Boolean Expressions to Calculate Q1-Q29	43-14
43-3	CET Node Probabilities (Sheets 1 – 3)	43-15
43-4	Boolean Expressions for P1-P15	43-18
43-5	Contribution of PDS to LRF (Sheets 1 – 3)	43-19
43-6	Dominant CET Sequences Contributing to LRF (Sheets 1 – 69)	43-22
43-7	Summary of Release Frequency Calculations (Sheets 1 – 2)	43-91
43-8	LRF and Containment Effectiveness by Accident Class	43-93
43-9	Summary of AP1000 LRF Quantification for Internal Events At-Power	43-94
43-10	CET Event Tree Node Importances	43-95
43-11	Contribution of Initiating Events to Large Release	43-96
43-12	LRF Sensitivity Case – Non Credit for Standby Non-Safety Systems (Sheets 1 – 9)	43-97
43-13	LRF Cutsets for the Case – Sensitivity to Standby Systems With Credit for Manual DAS (Sheets 1 – 13)	43-106
43A-1	AP1000 PRA Dominant CDF Sequences for At-Power Events (Sheets 1 – 6)	43A-2
43A-2	AP1000 PRA PDS Frequencies for At-Power Events	43A-8
43B-1	Calculation of Failure Probability of DP for PDS 6 (Sheets 1 – 7)	43B-2
43C-1	Evaluation of CET-Related Operator Actions	43C-2
44-1	MAAP Model Benchmarks (Sheets 1 – 4)	44-8
45-1	Environmental Release Fractions at 24 Hours After Core Damage Per Release Category	45-5
45-2	Environmental Release Fractions at 72 Hours After Core Damage Per Release Category	45-6
49-1	AP1000 Source Terms from Level 2 Analysis (MAAP)	49-9
49-2	AP1000 Source Terms for Dose Evaluation (MACCS2)	49-10
49-3	Site Boundary Whole Body Dose [Effective Dose Equivalent (EDE)], Sieverts	49-11
49-4	Site Boundary Thyroid Dose, Sieverts	49-12
49-5	Population Whole Body Dose [Effective Dose Equivalent (EDE)], 0-80.5 km Person-Sieverts	49-13
49-6	Site Boundary Red Marrow Dose (Total Acute), Sieverts	49-14
49-7	Dose Summary	49-15
49-8	Site Boundary Whole Body EDE Dose Risk – 24 Hours	49-16

LIST OF TABLES (Cont.)

Table No.	Title	Page
49-9	Site Boundary Whole Body EDE Dose Risk – 72 Hours	49-17
49-10	Population Whole Body EDE Dose Risk – 24 Hours	49-18
49-11	Population Whole Body EDE Dose Risk – 72 Hours	49-19
50-1	Core Damage for At-Power Events Contribution of Initiating Events to Plant Core Damage Frequency	50-16
50-2	Core Damage for At-Power Events Conditional Core Damage Probability of Initiating Events	50-17
50-3	AP1000 PRA Core Damage for At-Power Events Accident Sequence Importances (Sheets 1 – 5)	50-18
50-4	Core Damage for At-Power Events End State Importances	50-23
50-5	Common Cause Importances – Risk Decrease (Sheets 1 – 2)	50-24
50-6	Common Cause Importances – Risk Increase (Sheets 1 – 3)	50-26
50-7	Human Error Risk Importances – Risk Decrease (Sheets 1 – 2)	50-29
50-8	Human Error Risk Importances – Risk Increase (Sheets 1 – 2)	50-31
50-9	Component Importances – Risk Decrease (Sheets 1 – 2)	50-33
50-10	Component Importances – Risk Increase (Sheets 1 – 4)	50-35
50-11	List of Systems for System Importance Analyses (Sheets 1 – 4)	50-39
50-12	System Importance Calculation Results (Sheets 1 – 2)	50-43
50-13	Systems Grouped by PRA System Importance	50-45
50-14	Operator Actions in "CMTOT.OUT" File	50-46
50-15	Contribution of IEVs to Core Damage Frequency	50-47
50-16	Case 29 – Top 50 Dominant Cutsets (Sheets 1 – 2)	50-48
50-17	Case 30 – Top 50 Dominant Cutsets (Sheets 1 – 2)	50-50
50-18	Case 31 – Top 50 Dominant Cutsets (Sheets 1 – 3)	50-52
50-19	Passive System Check Valves in "CMTOT.OUT" File	50-55
50-20	Sensitivity Case 36 – Contribution of Initiating Events to CDF	50-56
50-21	Sensitivity Case 36 – Top 50 CDF Cutsets (Sheets 1 – 8)	50-57
50-22	Risk Importances Sorted by Basic Event Identification (Sheets 1 – 13)	50-65
50-23	Risk Importances Sorted by Risk Increase (Sheets 1 – 15)	50-78
50-24	Risk Importances Sorted by Risk Decrease (Sheets 1 – 15)	50-93
50-25	Risk Increases Sorted by Slope (Birnbaum) Importance (Sheets 1 – 13)	50-108
51-1	Summary of Results of AP1000 PRA Uncertainty Analysis for Internal Initiating Events at Power	51-9
51-2	List of Input Cutset Files	51-10
51A-1	Basic Event Uncertainties (Sheets 1 – 32)	51A-3
54-1	AP1000 Initiating Event Frequencies During Shutdown Conditions	54-18
54-2	AP1000 Design Impact on AP600 Shutdown Model	54-19
54-3	Times for Loss of RNS at Mid-loop Without IRWST Injection	54-20
54-4	AP1000 & AP600 Initiating Event CDF Contributions	54-21

LIST OF TABLES (Cont.)

Table No.	Title	Page
54-5	AP600 Shutdown Level 1 PRA Top 200 Cutsets (Sheets 1 – 25)	54-22
54-6	AP1000 Shutdown Level 1 PRA Top 200 Cutsets (Sheets 1 – 25)	54-47
54-7	Basic Event Probabilities Revised in Case 1	54-72
54-8	Revised CCF Basic Event Probabilities (Sheets 1 – 2)	54-73
54-9	Contribution of Initiating Events to Plant CDF – Shutdown Sensitivity Case 1	54-75
54-10	AP1000 Shutdown PRA Sensitivity Case 2 CDF Cutsets (Sheets 1 – 5)	54-76
54-11	List of Basic Events "Dropped" to Make the Sensitivity Case 2	54-81
54-12	Contribution of Initiating Events to Plant CDF – Shutdown Sensitivity Case 2	54-82
54-13	Shutdown PRA Sensitivity Case 3 (Sheets 1 – 28)	54-83
54-14	Basic Events Whose Probabilities are Changed in Case 3	54-111
54-15	AP1000 Shutdown PRA Sensitivity Case 4 CDF Cutsets (Sheets 1 – 7)	54-112
54-16	List of Basic Events "Dropped" to Make the Sensitivity Case 4	54-119
54-17	Contribution of Initiating Events to Plant CDF – Shutdown Sensitivity Case 4	54-120
54-18	AP1000 Shutdown PRA Basic Event Risk Importances – RAW (Sheets 1 – 8)	54-121
54-19	AP1000 Shutdown PRA Basic Event Risk Importances – RRW (Sheets 1 – 3)	54-129
54-20	AP1000 Shutdown PRA Case 2 Basic Event Risk Importances – RAW (Sheets 1 – 4)	54-132
54-21	AP1000 Shutdown PRA Case 2 Basic Event Risk Importances – RRW (Sheets 1 – 2)	54-136
55-1	Seismic Margin HCLPF Values (Sheets 1 – 4)	55-21
55-2	Basic Event HCLPF Values (Sheets 1 – 3)	55-25
55-3	EQ-IEV-STRUC HCLPF	55-28
55-4	EQ-IEV-RVFA HCLPF	55-28
55-5	EQ-IEV-LLOCA HCLPF	55-29
55-6	EQ-IEV-SLOCA HCLPF	55-29
55-7	EQ-IEV-ATWS HCLPF	55-29
56-1	Flooding Analysis Initial Screening Results (Sheets 1 – 3)	56-50
56-2	At-Power Detailed Screening Results (Sheets 1 – 5)	56-53
56-3	At-Power Flooding-Induced Core Damage Frequency Quantification Summary Results (Sheets 1 – 6)	56-58
56-4	Power Upgrade Difference Between AP1000 and AP600	56-64
56-5	Shutdown Flooding PRA	56-65
56-6	Shutdown Initiating Event CCDPs	56-66
57-1	AP1000 Fire Areas Excluding the Containment (Sheets 1 – 6)	57-43
57-2	AP1000 Fire Areas in the Containment (Sheets 1 – 2)	57-49
57-3	Fire Ignition Frequencies for AP1000 Fire Areas (Sheets 1 – 4)	57-51
57-4	Fire Ignition Frequencies for AP1000 Containment Fire Area	57-58
57-5	Fire Barrier Failure Probabilities	57-61
57-6	Automatic Suppression System Reliability	57-62

LIST OF TABLES (Cont.)

Table No.	Title	Page
57-7	Summary of Qualitative Evaluation Results – Power Operation – Plant except Containment and Main Control Room (Sheets 1 – 15)	57-63
57-8	Summary of Qualitative Evaluation Results for Containment at Power Operation (Sheets 1 – 4)	57-82
57-9	Summary of Results (Sheets 1 – 5)	57-88
57-10	Distribution of Fire CDF Frequency by Three Major Plant Areas	57-93
57-11	Distribution of Fire CDF Frequency by Eight Plant Areas	57-94
57-12	Fire Areas Sorted by CDF (Sheets 1 – 5)	57-95
57-13	Fire Areas Sorted by CDF/FIEV (Sheets 1 – 5)	57-100
57-14	Credit for Manual Fire Suppression	57-105
57-15	Reduction of Hot Short Probability	57-106
57-16	Increase of Hot Short Probability	57-107
57-17	Sensitivity to Human Actions	57-108
57-18	Sensitivity to Fire Ignition Frequencies	57-109
57-19	Sensitivity to Actuation by DAS	57-110
57-20	Plant Fire CDF Without Hot Shorts	57-111
57-21	Contribution of the Plant Areas to CDF	57-112
57-22	Dominant Fire Scenarios (Sheets 1 – 4)	57-113
57-23	AP1000 Shutdown CCDPs	57-117
57-24	AP1000 Dominant Fire Sequences (Sheets 1 – 4)	57-118
57-25	Dominant Fire Scenarios from AP600 Shutdown Fire PRA	57-122
57-26	Summary of AP1000 Shutdown Fire Evaluation	57-123
57-27	Main Contributors for Shutdown Fire Risk	57-124
57A-1	Summary of Scenario CCDPs (Sheets 1 – 5)	57A-7
57A-2	AP1000 Base Case CCDPs for Initiating Events	57A-12
57A-3	DAS-ACT Fault Tree Cutsets Before Subtree Reduction	57A-13
57A-4	DAS-ACT Fault Tree Cutsets After Subtree Reduction (Sheets 1 – 10)	57A-14
57A-5	DAS-ACT Fault Tree Cutsets After Subtree Reduction (Sheets 1 – 9)	57A-24
57A-6	AP1000 Fire PRA Scenario CCDPs for Over-Conservative Cases (Sheets 1 – 3)	57A-33
57C-1	Data Used in Event Tree Scenario Frequency Calculations (Sheets 1 – 5)	57C-2
57C-2	CCDPs Used in Fire Event Trees (Sheets 1 – 5)	57C-7
59-1	Contribution of Initiating Events to Core Damage	59-39
59-2	Conditional Core Damage Probability of Initiating Events	59-40
59-3	Internal Initiating Events at Power Dominant Core Damage Sequences (Sheets 1 – 4)	59-41
59-4	Sequence 1 – Safety Injection Line Break Dominant Cutsets (SI-LB-07) (Sheets 1 – 3)	59-45
59-5	Sequence 2 – Large LOCA Dominant Cutsets (LLOCA-09)	59-48

LIST OF TABLES (Cont.)

Table No.	Title	Page
59-6	Sequence 3 – Spurious ADS Actuation Dominant Cutsets (SPADS-08) (Sheets 1 – 3)	59-49
59-7	Sequence 4 – Safety Injection Line Break Dominant Cutsets (SI-LB-08) (Sheets 1 – 3)	59-52
59-8	Sequence 5 – Reactor Vessel Rupture Cutset (RV-RP-02)	59-55
59-9	Sequence 6 – Small LOCA Dominant Cutsets (SLOCA-05) (Sheets 1 – 3)	59-56
59-10	Sequence 7 – Medium LOCA Dominant Cutsets (MLOCA-05) (Sheets 1 – 3)	59-59
59-11	Sequence 8 – Small LOCA Dominant Cutsets (SLOCA-12) (Sheets 1 – 3)	59-62
59-12	Sequence 9 – Medium LOCA Dominant Cutsets (MLOCA-12) (Sheets 1 – 3)	59-65
59-13	Sequence 10 – Spurious ADS Actuation Dominant Cutsets (SPADS-09) (Sheets 1 – 3)	59-68
59-14	Typical System Failure Probabilities, Showing Higher Reliabilities for Safety Systems	59-71
59-15	Summary of AP1000 PRA Results	59-72
59-16	Site Boundary Whole Body EDE Dose Risk – 24 Hours	59-73
59-17	Comparison of AP1000 PRA Results to Risk Goals	59-74
59-18	AP1000 PRA-Based Insights (Sheets 1 –24)	59-75

LIST OF FIGURES

Figure No.	Title	Page
2-1	Core Damage Logic Diagram for Internal Initiators (Sheets 1 – 4)	2-47
4A-1	Example Event Tree for Illustration of Terminology	4A-19
4A-2	Functional Event Tree	4A-20
4A-3	Illustration of A/B and A&B Notation	4A-21
4A-4	Illustration of Consequential Event and ATWS End States	4A-22
4A-5	AP1000 PRA Transients Template Event Tree (Sheets 1 – 3)	4A-23
4A-6	AP1000 PRA Small LOCA Template Event Tree (Sheets 1 – 2)	4A-26
4B-1	AP1000 Large LOCA Event Tree (Sheets 1 – 2)	4B-2
4B-2	AP1000 Large Spurious ADS Actuation Event Tree (Sheets 1 – 2)	4B-4
4B-3	AP1000 Medium LOCA Event Tree (Sheets 1 – 4)	4B-6
4B-4	AP1000 CMT Line Break Event Tree (Sheets 1 – 4)	4B-10
4B-5	AP1000 SI Line Break Event Tree (Sheets 1 – 3)	4B-14
4B-6	AP1000 Small LOCA Event Tree (Sheets 1 – 6)	4B-17
4B-7	AP1000 RCS Leak Event Tree	4B-23
4B-8	AP1000 Passive RHR Tube Rupture Event Tree	4B-24
4B-9a	AP1000 Steam Generator Tube Rupture Event Tree (Sheets 1 – 3)	4B-25
4B-9b	AP1000 SGTR Continues Event Tree (Sheets 1 – 6)	4B-28
4B-10	AP1000 Reactor Vessel Rupture Event Tree	4B-34
4B-11	AP1000 Interfacing Systems LOCA Event Tree	4B-35
4B-12	AP1000 Transients With Main Feedwater Event Tree (Sheets 1 – 4)	4B-36
4B-13	AP1000 Loss of Reactor Coolant Flow Event Tree (Sheets 1 – 4)	4B-40
4B-14	AP1000 Loss of Feedwater to One SG Tree (Sheets 1 – 4)	4B-44
4B-15	AP1000 Transients With Core Power Excursion Event Tree (Sheets 1 – 4)	4B-48
4B-16	AP1000 Transients With Loss of CCW/SW Event Tree (Sheets 1 – 4)	4B-52
4B-17	AP1000 Loss of MFW Event Tree (Sheets 1 – 4)	4B-56
4B-18	AP1000 Loss of Condenser Event Tree (Sheets 1 – 4)	4B-60
4B-19	AP1000 Loss of Main Compressed Air Event Tree (Sheets 1 – 4)	4B-64
4B-20	AP1000 Loss of Offsite Power Event Tree (Sheets 1 – 7)	4B-68
4B-21	Main Steam Line Break Downstream of MSIVs Event Tree (Sheets 1 – 5)	4B-75
4B-22	Main Steam Line Break Upstream of MSIVs Event Tree (Sheets 1 – 9)	4B-80
4B-23	Stuck Open Secondary Side Safety Valve Event Tree (Sheets 1 – 5)	4B-89
4B-24a	ATWS Precursor Without Main Feedwater	4B-94
4B-24b	AP1000 ATWS Precursor Without Main Feedwater Continues Event Tree (Sheets 1 – 6)	4B-95
4B-25	ATWS Precursor With SI (Sheets 1 – 6)	4B-101
4B-26	ATWS Precursor With MFW (Sheets 1 – 4)	4B-107
7-1	Power/Control Model for Large Loads (6900-vac/480-vac Pumps, Fans, and Motors)	7-33
7-2	Power/Control Model for Motor-Operated Valves	7-35
7-3	Power/Control Model for Air-Operated Valves	7-37

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
7-4	Power/Control Model for Variable Speed Motor	7-39
7-5	An Illustration of Fault Tree Basic Events for a Pump Following the Model Given in Figure 7-1	7-41
8-1	PRHR – Simplified Piping and Instrumentation Diagram	8-23
8-2	PRHR – Simplified Valve Control Diagram	8-25
9-1	Passive Core Cooling System Simplified Sketch	9-24
9-2	Passive Core Cooling System Piping and Instrumentation Diagram	9-25
10-1	Passive Core Cooling System – Accumulator Subsystem	10-12
11-1	Automatic Depressurization System Simplified Piping and Instrumentation Diagram	11-49
12-1	Simplified Piping & Instrumentation Diagram of the IRWST/Gravity Injection Subsystem	12-42
13-1	Passive Containment Cooling System Sketch	13-11
15-1	Chemical and Volume Control System Piping and Instrumentation Diagram (Sheets 1 – 2)	15-25
17-1	Normal Residual Heat Removal System Sketch	17-19
18-1	Component Cooling Water System Piping and Instrumentation Diagram	18-13
19-1	Service Water System Piping and Instrumentation Diagram	19-17
20-1	Central Chilled Water Low-Capacity Subsystem Piping and Instrumentation Diagram (Sheets 1 – 2)	20-11
21-1	AC Power System One-Line Diagram	21-55
22-1	Class 1E DC System One-Line Diagram (Sheets 1 – 2)	22-53
22-2	Class 1E UPS One-Line Diagram	22-57
25-1	Compressed & Instrument Air System Piping and Instrumentation Diagram	25-19
29-1	IRWST Valve Configuration	29-25
30-1	Human Reliability Analysis Quantification Model	30-111
30A-1	Links Between SHARP Steps	30A-18

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-1	Case 3BE-1: Reactor Coolant System and Steam Generator Pressure DVI Line Break, Containment Water Level	34-52
34-2	Case 3BE-1: ADS Stage 4 Flow Rates DVI Line Break, Containment Water Level	34-52
34-3	Case 3BE-1: Accumulator/CMT Water Mass DVI Line Break, Containment Water Level	34-53
34-4	Case 3BE-1: IRWST Injection Flow Rate DVI Line Break, Containment Water Level	34-53
34-5	Case 3BE-1: Break Flow Rate DVI Line Break, Containment Water Level	34-54
34-6	Case 3BE-1: Reactor Vessel Water Level DVI Line Break, Containment Water Level	34-54
34-7	Case 3BE-1: Core Temperatures DVI Line Break, Containment Water Level	34-55
34-8	Case 3BE-1: Containment Water Pool Elevations DVI Line Break, Containment Water Level	34-55
34-9	Case 3BE-1: Containment Pressure DVI Line Break, Containment Water Level	34-56
34-10	Case 3BE-1: Containment Gas Temperatures DVI Line Break, Containment Water Level	34-56
34-11	Case 3BE-1: Core Mass DVI Line Break, Containment Water Level	34-57
34-12	Case 3BE-1: Reactor Pressure Vessel to Cavity Water Heat Transfer DVI Line Break, Containment Water Level	34-57
34-13	Case 3BE-1: In-Vessel Hydrogen Generation DVI Line Break, Containment Water Level	34-58
34-14	Case 3BE-1: Mass Fraction of CsI Released to Containment DVI Line Break, Containment Water Level	34-58
34-15	Case 3BE-1: Mass Fraction of Noble Gases Released to Environment DVI Line Break, Containment Water Level	34-59
34-16	Case 3BE-1: Mass Fraction of Fission Products Released to Environment DVI Line Break, Containment Water Level	34-59
34-17	Case 3BE-1: Mass Fraction of SrO Released to Environment DVI Line Break, Containment Water Level	34-60
34-18	Case 3BE-2: Reactor Coolant System and Steam Generator Pressure DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-60
34-19	Case 3BE-2: ADS Stage 4 Flow Rates DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-61
34-20	Case 3BE-2: Accumulator/CMT Water Mass DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-61
34-21	Case 3BE-2: IRWST Injection Flow Rate DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-62
34-22	Case 3BE-2: Break Flow Rate DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-62

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-23	Case 3BE-2: Reactor Vessel Water Level DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-63
34-24	Case 3BE-2: Core Temperatures DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-63
34-25	Case 3BE-2: Containment Water Pool Elevations DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-64
34-26	Case 3BE-2: Containment Pressure DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-64
34-27	Case 3BE-2: Containment Gas Temperatures DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-65
34-28	Case 3BE-2: Core Mass DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-65
34-29	Case 3BE-2: Reactor Pressure Vessel to Cavity Water Heat Transfer DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-66
34-30	Case 3BE-2: In-Vessel Hydrogen Generation DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-66
34-31	Case 3BE-2: Mass Fraction of CsI Released to Containment DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-67
34-32	Case 3BE-2: Mass Fraction of Noble Gases Released to Environment DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-67
34-33	Case 3BE-2: Mass Fraction of Fission Products Released to Environment DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-68
34-34	Case 3BE-2: Mass Fraction of SrO Released to Environment DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-68
34-35	Case 3BE-4: Reactor Coolant System and Steam Generator Pressure Spurious ADS, Failed Gravity Injection	34-69
34-36	Case 3BE-4: ADS Stage 4 Flow Rates Spurious ADS, Failed Gravity Injection	34-69
34-37	Case 3BE-4: Accumulator/CMT Water Mass Spurious ADS, Failed Gravity Injection	34-70
34-38	Case 3BE-4: IRWST Injection Flow Rate Spurious ADS, Failed Gravity Injection	34-70
34-39	Case 3BE-4: Break Flow Rate Spurious ADS, Failed Gravity Injection	34-71
34-40	Case 3BE-4: Reactor Vessel Water Level Spurious ADS, Failed Gravity Injection	34-71
34-41	Case 3BE-4: Core Temperatures Spurious ADS, Failed Gravity Injection	34-72
34-42	Case 3BE-4: Containment Water Pool Elevations Spurious ADS, Failed Gravity Injection	34-72
34-43	Case 3BE-4: Containment Pressure Spurious ADS, Failed Gravity Injection	34-73
34-44	Case 3BE-4: Containment Gas Temperatures Spurious ADS, Failed Gravity Injection	34-73
34-45	Case 3BE-4: Core Mass Spurious ADS, Failed Gravity Injection	34-74

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-46	Case 3BE-4: Reactor Pressure Vessel to Cavity Water Heat Transfer Spurious ADS, Failed Gravity Injection	34-74
34-47	Case 3BE-4: In-Vessel Hydrogen Generation Spurious ADS, Failed Gravity Injection	34-75
34-48	Case 3BE-4: Mass Fraction of CsI Released to Containment Spurious ADS, Failed Gravity Injection	34-75
34-49	Case 3BE-4: Mass Fraction of Noble Gases Released to Environment Spurious ADS, Failed Gravity Injection	34-76
34-50	Case 3BE-4: Mass Fraction of Fission Products Released to Environment Spurious ADS, Failed Gravity Injection	34-76
34-51	Case 3BE-4: Mass Fraction of SrO Released to Environment Spurious ADS, Failed Gravity Injection	34-77
34-52	Case 3BE-5: Reactor Coolant System and Steam Generator Pressure SBLOCA with Failed Gravity Injection	34-77
34-53	Case 3BE-5: ADS Stage 4 Flow Rates SBLOCA with Failed Gravity Injection	34-78
34-54	Case 3BE-5: Accumulator/CMT Water Mass SBLOCA with Failed Gravity Injection	34-78
34-55	Case 3BE-5: IRWST Injection Flow Rate SBLOCA with Failed Gravity Injection	34-79
34-56	Case 3BE-5: Break Flow Rate SBLOCA with Failed Gravity Injection	34-79
34-57	Case 3BE-5: Reactor Vessel Water Level SBLOCA with Failed Gravity Injection	34-80
34-58	Case 3BE-5: Core Temperatures SBLOCA with Failed Gravity Injection	34-80
34-59	Case 3BE-5: Containment Water Pool Elevations SBLOCA with Failed Gravity Injection	34-81
34-60	Case 3BE-5: Containment Pressure SBLOCA with Failed Gravity Injection	34-81
34-61	Case 3BE-5: Containment Gas Temperature SBLOCA with Failed Gravity Injection	34-82
34-62	Case 3BE-5: Core Mass SBLOCA with Failed Gravity Injection	34-82
34-63	Case 3BE-5: Reactor Pressure Vessel to Cavity Water Heat Transfer SBLOCA with Failed Gravity Injection	34-83
34-64	Case 3BE-5: In-Vessel Hydrogen Generation SBLOCA with Failed Gravity Injection	34-83
34-65	Case 3BE-5: Mass Fraction of CsI Released to Containment SBLOCA with Failed Gravity Injection	34-84
34-66	Case 3BE-5: Mass Fraction of Noble Gases Released to Environment SBLOCA with Failed Gravity Injection	34-84
34-67	Case 3BE-5: Mass Fraction of Fission Products Released to Environment SBLOCA with Failed Gravity Injection	34-85
34-68	Case 3BE-5: Mass Fraction of SrO Released to Environment SBLOCA with Failed Gravity Injection	34-85

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-69	Case 3BE-6: Reactor Coolant System and Steam Generator Pressure SBLOCA with Failed Gravity Injection	34-86
34-70	Case 3BE-6: ADS Stage 4 Flow Rates SBLOCA with Failed Gravity Injection	34-86
34-71	Case 3BE-6: Accumulator/CMT Water Mass SBLOCA with Failed Gravity Injection	34-87
34-72	Case 3BE-6: IRWST Injection Flow Rate SBLOCA with Failed Gravity Injection	34-87
34-73	Case 3BE-6: Break Flow Rate SBLOCA with Failed Gravity Injection	34-88
34-74	Case 3BE-6: Reactor Vessel Water Level SBLOCA with Failed Gravity Injection	34-88
34-75	Case 3BE-6: Core Temperatures SBLOCA with Failed Gravity Injection	34-89
34-76	Case 3BE-6: Containment Water Pool Elevations SBLOCA with Failed Gravity Injection	34-89
34-77	Case 3BE-6: Containment Pressure SBLOCA with Failed Gravity Injection	34-90
34-78	Case 3BE-6: Containment Gas Temperature SBLOCA with Failed Gravity Injection	34-90
34-79	Case 3BE-6: Core Mass SBLOCA with Failed Gravity Injection	34-91
34-80	Case 3BE-6: Reactor Pressure Vessel to Cavity Water Heat Transfer SBLOCA with Failed Gravity Injection	34-91
34-81	Case 3BE-6: In-Vessel Hydrogen Generation SBLOCA with Failed Gravity Injection	34-92
34-82	Case 3BE-6: Mass Fraction of CsI Released to Containment SBLOCA with Failed Gravity Injection	34-92
34-83	Case 3BE-6: Mass Fraction of Noble Gases Released to Environment SBLOCA with Failed Gravity Injection	34-93
34-84	Case 3BE-6: Mass Fraction of Fission Products Released to Environment SBLOCA with Failed Gravity Injection	34-93
34-85	Case 3BE-6: Mass Fraction of SrO Released to Environment SBLOCA with Failed Gravity Injection	34-94
34-86	Case 3BE-7: Reactor Coolant System and Steam Generator Pressure SBLOCA with Failed Gravity Injection	34-94
34-87	Case 3BE-7: ADS Stage 4 Flow Rates SBLOCA with Failed Gravity Injection	34-95
34-88	Case 3BE-7: Accumulator/CMT Water Mass SBLOCA with Failed Gravity Injection	34-95
34-89	Case 3BE-7: IRWST Injection Flow Rate SBLOCA with Failed Gravity Injection	34-96
34-90	Case 3BE-7: Break Flow Rate SBLOCA with Failed Gravity Injection	34-96
34-91	Case 3BE-7: Reactor Vessel Water Level SBLOCA with Failed Gravity Injection	34-97
34-92	Case 3BE-7: Core Temperatures SBLOCA with Failed Gravity Injection	34-97

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-93	Case 3BE-7: Containment Water Pool Elevations SBLOCA with Failed Gravity Injection	34-98
34-94	Case 3BE-7: Containment Pressure SBLOCA with Failed Gravity Injection	34-98
34-95	Case 3BE-7: Containment Gas Temperature SBLOCA with Failed Gravity Injection	34-99
34-96	Case 3BE-7: Core Mass SBLOCA with Failed Gravity Injection	34-99
34-97	Case 3BE-7: Reactor Pressure Vessel to Cavity Water Heat Transfer SBLOCA with Failed Gravity Injection	34-100
34-98	Case 3BE-7: In-Vessel Hydrogen Generation SBLOCA with Failed Gravity Injection	34-100
34-99	Case 3BE-7: Mass Fraction of CsI Released to Containment SBLOCA with Failed Gravity Injection	34-101
34-100	Case 3BE-7: Mass Fraction of Noble Gases Released to Environment SBLOCA with Failed Gravity Injection	34-101
34-101	Case 3BE-7: Mass Fraction of Fission Products Released to Environment SBLOCA with Failed Gravity Injection	34-102
34-102	Case 3BE-7: Mass Fraction of SrO Released to Environment SBLOCA with Failed Gravity Injection	34-102
34-103	Case 3BE-3: Reactor Coolant System and Steam Generator Pressure DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-103
34-104	Case 3BE-3: ADS Stage 4 Flow Rate DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-103
34-105	Case 3BE-3: Accumulator/CMT Water Mass DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-104
34-106	Case 3BE-3: IRWST Injection Flow Rate DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-104
34-107	Case 3BE-3: Break Flow Rate DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-105
34-108	Case 3BE-3: Reactor Vessel Water Level DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-105
34-109	Case 3BE-3: Core Temperatures DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-106
34-110	Case 3BE-3: Containment Water Pool Elevations DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-106
34-111	Case 3BE-3: Containment Pressure DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-107
34-112	Case 3BE-3: Containment Gas Temperature DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-107
34-113	Case 3BE-3: Core Mass DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-108
34-114	Case 3BE-3: Reactor Pressure Vessel to Cavity Water Heat Transfer DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-108

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-115	Case 3BE-3: In-Vessel Hydrogen Generation DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-109
34-116	Case 3BE-3: Mass Fraction of CsI Released to Containment DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-109
34-117	Case 3BE-3: Mass Fraction of Noble Gases Released to Environment DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-110
34-118	Case 3BE-3: Mass Fraction of Fission Products Released to Environment DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-110
34-119	Case 3BE-3: Mass Fraction of SrO Released to Environment DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-111
34-120	Case 3BL-1: Reactor Coolant System and Steam Generator Pressure SBLOCA with Failed Gravity Injection	34-111
34-121	Case 3BL-1: ADS Stage 4 Flow Rates SBLOCA with Failed Gravity Injection	34-112
34-122	Case 3BL-1: Accumulator/CMT Water Mass SBLOCA with Failed Gravity Injection	34-112
34-123	Case 3BL-1: IRWST Injection Flow Rate SBLOCA with Failed Gravity Injection	34-113
34-124	Case 3BL-1: Break Flow Rate SBLOCA with Failed Gravity Injection	34-113
34-125	Case 3BL-1: Reactor Vessel Water Level SBLOCA with Failed Gravity Injection	34-114
34-126	Case 3BL-1: Core Temperatures SBLOCA with Failed Gravity Injection	34-114
34-127	Case 3BL-1: Containment Water Pool Elevations SBLOCA with Failed Gravity Injection	34-115
34-128	Case 3BL-1: Containment Pressure SBLOCA with Failed Gravity Injection	34-115
34-129	Case 3BL-1: Containment Gas Temperature SBLOCA with Failed Gravity Injection	34-116
34-130	Case 3BL-1: Core Mass SBLOCA with Failed Gravity Injection	34-116
34-131	Case 3BL-1: Reactor Pressure Vessel to Cavity Water Heat Transfer SBLOCA with Failed Gravity Injection	34-117
34-132	Case 3BL-1: In-Vessel Hydrogen Generation SBLOCA with Failed Gravity Injection	34-117
34-133	Case 3BL-1: Mass Fraction of CsI Released to Containment SBLOCA with Failed Gravity Injection	34-118
34-134	Case 3BL-1: Mass Fraction of Noble Gases Released to Environment SBLOCA with Failed Gravity Injection	34-118
34-135	Case 3BL-1: Mass Fraction of Fission Products Released to Environment SBLOCA with Failed Gravity Injection	34-119
34-136	Case 3BL-1: Mass Fraction of SrO Released to Environment SBLOCA with Failed Gravity Injection	34-119
34-137	Case 3BL-2: Reactor Coolant System and Steam Generator Pressure DVI Line Break with Failed Gravity Injection	34-120

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-138	Case 3BL-2: ADS Stage 4 Flow Rates DVI Line Break with Failed Gravity Injection	34-120
34-139	Case 3BL-2: Accumulator/CMT Water Mass DVI Line Break with Failed Gravity Injection	34-121
34-140	Case 3BL-2: IRWST Injection Flow Rate DVI Line Break with Failed Gravity Injection	34-121
34-141	Case 3BL-2: Break Flow Rate DVI Line Break with Failed Gravity Injection	34-122
34-142	Case 3BL-2: Reactor Vessel Water Level DVI Line Break with Failed Gravity Injection	34-122
34-143	Case 3BL-2: Core Temperatures DVI Line Break with Failed Gravity Injection	34-123
34-144	Case 3BL-2: Containment Water Pool Elevations DVI Line Break with Failed Gravity Injection	34-123
34-145	Case 3BL-2: Containment Pressure DVI Line Break with Failed Gravity Injection	34-124
34-146	Case 3BL-2: Containment Gas Temperature DVI Line Break with Failed Gravity Injection	34-124
34-147	Case 3BL-2: Core Mass DVI Line Break with Failed Gravity Injection	34-125
34-148	Case 3BL-2: Reactor Pressure Vessel to Cavity Water Heat Transfer DVI Line Break with Failed Gravity Injection	34-125
34-149	Case 3BL-2: In-Vessel Hydrogen Generation DVI Line Break with Failed Gravity Injection	34-126
34-150	Case 3BL-2: Mass Fraction of CsI Released to Containment DVI Line Break with Failed Gravity Injection	34-126
34-151	Case 3BL-2: Mass Fraction of Noble Gases Released to Environment DVI Line Break with Failed Gravity Injection	34-127
34-152	Case 3BL-2: Mass Fraction of Fission Products Released to Environment DVI Line Break with Failed Gravity Injection	34-127
34-153	Case 3BL-2: Mass Fraction of SrO Released to Environment DVI Line Break with Failed Gravity Injection	34-128
34-154	Case 3BR-1: Reactor Coolant System and Steam Generator Pressure CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-128
34-155	Case 3BR-1: ADS Stage 4 Flow Rates CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-129
34-156	Case 3BR-1: Accumulator/CMT Water Mass CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-129
34-157	Case 3BR-1: IRWST Injection Flow Rate CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-130
34-158	Case 3BR-1: Break Flow Rate CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-130
34-159	Case 3BR-1: Reactor Vessel Water Level CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-131

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-160	Case 3BR-1: Core Temperatures CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-131
34-161	Case 3BR-1: Containment Water Pool Elevations CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-132
34-162	Case 3BR-1: Containment Pressure CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-132
34-163	Case 3BR-1: Containment Gas Temperature CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-133
34-164	Case 3BR-1: Core Mass CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-133
34-165	Case 3BR-1: Reactor Pressure Vessel to Cavity Water Heat Transfer CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-134
34-166	Case 3BR-1: In-Vessel Hydrogen Generation CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-134
34-167	Case 3BR-1: Mass Fraction of CsI Released to Containment CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-135
34-168	Case 3BR-1: Mass Fraction of Noble Gases Released to Environment CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-135
34-169	Case 3BR-1: Mass Fraction of Fission Products Released to Environment CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-136
34-170	Case 3BR-1: Mass Fraction of SrO Released to Environment CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-136
34-171	Case 3BR-1a: Reactor Coolant System and Steam Generator Pressure CL LBLOCA with Failed Accumulators	34-137
34-172	Case 3BR-1a: ADS Stage 4 Flow Rates CL LBLOCA with Failed Accumulators	34-137
34-173	Case 3BR-1a: Accumulator/CMT Water Mass CL LBLOCA with Failed Accumulators	34-138
34-174	Case 3BR-1a: IRWST Injection Flow Rate CL LBLOCA with Failed Accumulators	34-138
34-175	Case 3BR-1a: Break Flow Rate CL LBLOCA with Failed Accumulators	34-139
34-176	Case 3BR-1a: Reactor Vessel Water Level CL LBLOCA with Failed Accumulators	34-139
34-177	Case 3BR-1a: Core Temperatures CL LBLOCA with Failed Accumulators	34-140
34-178	Case 3BR-1a: Containment Water Pool Elevations CL LBLOCA with Failed Accumulators	34-140
34-179	Case 3BR-1a: Containment Pressure CL LBLOCA with Failed Accumulators	34-141

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-180	Case 3BR-1a: Containment Gas Temperature CL LBLOCA with Failed Accumulators	34-141
34-181	Case 3BR-1a: Core Mass CL LBLOCA with Failed Accumulators	34-142
34-182	Case 3BR-1a: Reactor Pressure Vessel to Cavity Water Heat Transfer CL LBLOCA with Failed Accumulators	34-142
34-183	Case 3BR-1a: In-Vessel Hydrogen Generation CL LBLOCA with Failed Accumulators	34-143
34-184	Case 3BR-1a: Mass Fraction of CsI Released to Containment CL LBLOCA with Failed Accumulators	34-143
34-185	Case 3BR-1a: Mass Fraction of Noble Gases Released to Environment CL LBLOCA with Failed Accumulators	34-144
34-186	Case 3BR-1a: Mass Fraction of Fission Products Released to Environment CL LBLOCA with Failed Accumulators	34-144
34-187	Case 3BR-1a: Mass Fraction of SrO Released to Environment CL LBLOCA with Failed Accumulators	34-145
34-188	Case 3C-1: Reactor Coolant System and Steam Generator Pressure Vessel Rupture	34-145
34-189	Case 3C-1: ADS Stage 4 Flow Rates Vessel Rupture	34-146
34-190	Case 3C-1: Accumulator/CMT Water Mass Vessel Rupture	34-146
34-191	Case 3C-1: IRWST Injection Flow Rate Vessel Rupture	34-147
34-192	Case 3C-1: Break Flow Rate Vessel Rupture	34-147
34-193	Case 3C-1: Reactor Vessel Water Level Vessel Rupture	34-148
34-194	Case 3C-1: Core Temperatures Vessel Rupture	34-148
34-195	Case 3C-1: Containment Water Pool Elevations Vessel Rupture	34-149
34-196	Case 3C-1: Containment Pressure Vessel Rupture	34-149
34-197	Case 3C-1: Containment Gas Temperature Vessel Rupture	34-150
34-198	Case 3C-1: Core Mass Vessel Rupture	34-150
34-199	Case 3C-1: Reactor Pressure Vessel to Cavity Water Heat Transfer Vessel Rupture	34-151
34-200	Case 3C-1: In-Vessel Hydrogen Generation Vessel Rupture	34-151
34-201	Case 3C-1: Mass Fraction of CsI Released to Containment Vessel Rupture	34-152
34-202	Case 3C-1: Mass Fraction of Noble Gas Released to Environment Vessel Rupture	34-152
34-203	Case 3C-1: Mass Fraction of Fission Products Released to Environment Vessel Rupture	34-153
34-204	Case 3C-1: Mass Fraction of SrO Released to Environment Vessel Rupture	34-153
34-205	Case 3C-2: Reactor Coolant System and Steam Generator Pressure Vessel Rupture with Containment Failure	34-154
34-206	Case 3C-2: ADS Stage 4 Flow Rates Vessel Rupture with Containment Failure	34-154
34-207	Case 3C-2: Accumulator/CMT Water Mass Vessel Rupture with Containment Failure	34-155

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-208	Case 3C-2: IRWST Injection Flow Rate Vessel Rupture with Containment Failure	34-155
34-209	Case 3C-2: Break Flow Rate Vessel Rupture with Containment Failure	34-156
34-210	Case 3C-2: Reactor Vessel Water Level Vessel Rupture with Containment Failure	34-156
34-211	Case 3C-2: Core Temperatures Vessel Rupture with Containment Failure	34-157
34-212	Case 3C-2: Containment Water Pool Elevations Vessel Rupture with Containment Failure	34-157
34-213	Case 3C-2: Containment Pressure Vessel Rupture with Containment Failure	34-158
34-214	Case 3C-2: Containment Gas Temperature Vessel Rupture with Containment Failure	34-158
34-215	Case 3C-2: Core Mass Vessel Rupture with Containment Failure	34-159
34-216	Case 3C-2: Reactor Pressure Vessel to Cavity Water Heat Transfer Vessel Rupture with Containment Failure	34-159
34-217	Case 3C-2: In-Vessel Hydrogen Generation Vessel Rupture with Containment Failure	34-160
34-218	Case 3C-2: Mass Fraction of CsI Released to Containment Vessel Rupture with Containment Failure	34-160
34-219	Case 3C-2: Mass Fraction of Noble Gases Released to Environment Vessel Rupture with Containment Failure	34-161
34-220	Case 3C-2: Mass Fraction of Fission Products Released to Environment Vessel Rupture with Containment Failure	34-161
34-221	Case 3C-2: Mass Fraction of SrO Released to Environment Vessel Rupture with Containment Failure	34-162
34-222	Case 3D-1: Reactor Coolant System and Steam Generator Pressure Spurious ADS-4 with Failed CMTs	34-162
34-223	Case 3D-1: ADS Stage 4 Flow Rates Spurious ADS-4 with Failed CMTs	34-163
34-224	Case 3D-1: Accumulator/CMT Water Mass Spurious ADS-4 with Failed CMTs	34-163
34-225	Case 3D-1: IRWST Injection Flow Rate Spurious ADS-4 with Failed CMTs	34-164
34-226	Case 3D-1: Break Flow Rate Spurious ADS-4 with Failed CMTs	34-164
34-227	Case 3D-1: Reactor Vessel Water Level Spurious ADS-4 with Failed CMTs	34-165
34-228	Case 3D-1: Core Temperatures Spurious ADS-4 with Failed CMTs	34-165
34-229	Case 3D-1: Containment Water Pool Elevations Spurious ADS-4 with Failed CMTs	34-166
34-230	Case 3D-1: Containment Pressure Spurious ADS-4 with Failed CMTs	34-166
34-231	Case 3D-1: Containment Gas Temperature Spurious ADS-4 with Failed CMTs	34-167
34-232	Case 3D-1: Core Mass Spurious ADS-4 with Failed CMTs	34-167

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-233	Case 3D-1: Reactor Pressure Vessel to Cavity Water Heat Transfer Spurious ADS-4 with Failed CMTs	34-168
34-234	Case 3D-1: In-Vessel Hydrogen Generation Spurious ADS-4 with Failed CMTs	34-168
34-235	Case 3D-1: Mass Fraction of CsI Released to Containment Spurious ADS-4 with Failed CMTs	34-169
34-236	Case 3D-1: Mass Fraction of Noble Gases Released to Environment Spurious ADS-4 with Failed CMTs	34-169
34-237	Case 3D-1: Mass Fraction of Fission Products Released to Environment Spurious ADS-4 with Failed CMTs	34-170
34-238	Case 3D-1: Mass Fraction of SrO Released to Environment Spurious ADS-4 with Failed CMTs	34-170
34-239	Case 3D-2: Reactor Coolant System and Steam Generator Pressure Spurious ADS-2 with Failed CMTs	34-171
34-240	Case 3D-2: ADS Stage 4 Flow Rates Spurious ADS-2 with Failed CMTs	34-171
34-241	Case 3D-2: Accumulator/CMT Water Mass Spurious ADS-2 with Failed CMTs	34-172
34-242	Case 3D-2: IRWST Injection Flow Rate Spurious ADS-2 with Failed CMTs	34-172
34-243	Case 3D-2: Break Flow Rate Spurious ADS-2 with Failed CMTs	34-173
34-244	Case 3D-2: Reactor Vessel Water Level Spurious ADS-2 with Failed CMTs	34-173
34-245	Case 3D-2: Core Temperatures Spurious ADS-2 with Failed CMTs	34-174
34-246	Case 3D-2: Containment Pool Water Elevations Spurious ADS-2 with Failed CMTs	34-174
34-247	Case 3D-2: Containment Pressure Spurious ADS-2 with Failed CMTs	34-175
34-248	Case 3D-2: Containment Gas Temperature Spurious ADS-2 with Failed CMTs	34-175
34-249	Case 3D-2: Core Mass Spurious ADS-2 with Failed CMTs	34-176
34-250	Case 3D-2: Reactor Pressure Vessel to Cavity Water Heat Transfer Spurious ADS-2 with Failed CMTs	34-176
34-251	Case 3D-2: In-Vessel Hydrogen Generation Spurious ADS-2 with Failed CMTs	34-177
34-252	Case 3D-2: Mass Fraction of CsI Released to Containment Spurious ADS-2 with Failed CMTs	34-177
34-253	Case 3D-2: Mass Fraction of Noble Gas Released to Environment Spurious ADS-2 with Failed CMTs	34-178
34-254	Case 3D-2: Mass Fraction of Fission Products Released to Environment Spurious ADS-2 with Failed CMTs	34-178
34-255	Case 3D-2: Mass Fraction of SrO Released to Environment Spurious ADS-2 with Failed CMTs	34-179
34-256	Case 3D-3: Reactor Coolant System and Steam Generator Pressure DVI Line Break with Failed ADS	34-179
34-257	Case 3D-3: ADS Stage 4 Flow Rates DVI Line Break with Failed ADS	34-180

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-258	Case 3D-3: Accumulator/CMT Water Mass DVI Line Break with Failed ADS	34-180
34-259	Case 3D-3: IRWST Injection Flow Rate DVI Line Break with Failed ADS	34-181
34-260	Case 3D-3: Break Flow Rate DVI Line Break with Failed ADS	34-181
34-261	Case 3D-3: Reactor Vessel Water Level DVI Line Break with Failed ADS	34-182
34-262	Case 3D-3: Core Temperatures DVI Line Break with Failed ADS	34-182
34-263	Case 3D-3: Containment Water Pool Elevations DVI Line Break with Failed ADS	34-183
34-264	Case 3D-3: Containment Pressure DVI Line Break with Failed ADS	34-183
34-265	Case 3D-3: Containment Gas Temperature DVI Line Break with Failed ADS	34-184
34-266	Case 3D-3: Core Mass DVI Line Break with Failed ADS	34-184
34-267	Case 3D-3: Reactor Pressure Vessel to Cavity Water Heat Transfer DVI Line Break with Failed ADS	34-185
34-268	Case 3D-3: In-Vessel Hydrogen Generation DVI Line Break with Failed ADS	34-185
34-269	Case 3D-3: Mass Fraction of CsI Released to Containment DVI Line Break with Failed ADS	34-186
34-270	Case 3D-3: Mass Fraction of Noble Gases Released to Environment DVI Line Break with Failed ADS	34-186
34-271	Case 3D-3: Mass Fraction of Fission Products Released to Environment DVI Line Break with Failed ADS	34-187
34-272	Case 3D-3: Mass Fraction of SrO Released to Environment DVI Line Break with Failed ADS	34-187
34-273	Case 3D-4: Reactor Coolant System and Steam Generator Pressure Spurious ADS-2, Failed CMTs, Diffusion Flame	34-188
34-274	Case 3D-4: ADS Stage 4 Flow Rates Spurious ADS-2, Failed CMTs, Diffusion Flame	34-188
34-275	Case 3D-4: Accumulator/CMT Water Mass Spurious ADS-2, Failed CMTs, Diffusion Flame	34-189
34-276	Case 3D-4: IRWST Injection Flow Rate Spurious ADS-2, Failed CMTs, Diffusion Flame	34-189
34-277	Case 3D-4: Break Flow Rate Spurious ADS-2, Failed CMTs, Diffusion Flame	34-190
34-278	Case 3D-4: Reactor Vessel Water Level Spurious ADS-2, Failed CMTs, Diffusion Flame	34-190
34-279	Case 3D-4: Core Temperatures Spurious ADS-2, Failed CMTs, Diffusion Flame	34-191
34-280	Case 3D-4: Containment Water Pool Elevations Spurious ADS-2, Failed CMTs, Diffusion Flame	34-191
34-281	Case 3D-4: Containment Pressure Spurious ADS-2, Failed CMTs, Diffusion Flame	34-192

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-282	Case 3D-4: Containment Gas Temperature Spurious ADS-2, Failed CMTs, Diffusion Flame	34-192
34-283	Case 3D-4: Core Mass Spurious ADS-2, Failed CMTs, Diffusion Flame	34-193
34-284	Case 3D-4: Reactor Pressure Vessel to Cavity Water Heat Transfer Spurious ADS-2, Failed CMTs, Diffusion Flame	34-193
34-285	Case 3D-4: In-Vessel Hydrogen Generation Spurious ADS-2, Failed CMTs, Diffusion Flame	34-194
34-286	Case 3D-4: Mass Fraction of CsI Released to Containment Spurious ADS-2, Failed CMTs, Diffusion Flame	34-194
34-287	Case 3D-4: Mass Fraction of Noble Gases Released to Environment Spurious ADS-2, Failed CMTs, Diffusion Flame	34-195
34-288	Case 3D-4: Mass Fraction of Fission Products Released to Environment Spurious ADS-2, Failed CMTs, Diffusion Flame	34-195
34-289	Case 3D-4: Mass Fraction of SrO Release to Environment Spurious ADS-2, Failed CMTs, Diffusion Flame	34-196
34-290	Case 6E-1: Reactor Coolant System and Steam Generator Pressure SGTR Early Core Melt	34-196
34-291	Case 6E-1: ADS Stage 4 Flow Rates SGTR Early Core Melt	34-197
34-292	Case 6E-1: Accumulator/CMT Water Mass SGTR Early Core Melt	34-197
34-293	Case 6E-1: IRWST Injection Flow Rate SGTR Early Core Melt	34-198
34-294	Case 6E-1: Break Flow Rate SGTR Early Core Melt	34-198
34-295	Case 6E-1: Reactor Vessel Water Level SGTR Early Core Melt	34-199
34-296	Case 6E-1: Core Temperatures SGTR Early Core Melt	34-199
34-297	Case 6E-1: Containment Water Pool Elevations SGTR Early Core Melt	34-200
34-298	Case 6E-1: Containment Pressure SGTR Early Core Melt	34-200
34-299	Case 6E-1: Containment Gas Temperature SGTR Early Core Melt	34-201
34-300	Case 6E-1: Core Mass SGTR Early Core Melt	34-201
34-301	Case 6E-1: Reactor Pressure Vessel to Cavity Water Heat Transfer SGTR Early Core Melt	34-202
34-302	Case 6E-1: In-Vessel Hydrogen Generation SGTR Early Core Melt	34-202
34-303	Case 6E-1: Mass Fraction of CsI Released to Containment SGTR Early Core Melt	34-203
34-304	Case 6E-1: Mass Fraction of Noble Gases Released to Environment SGTR Early Core Melt	34-203
34-305	Case 6E-1: Mass Fraction of Fission Products Released to Environment SGTR Early Core Melt	34-204
34-306	Case 6E-1: Mass Fraction of SrO Released to Environment SGTR Early Core Melt	34-204
34-307	Case 6L-1: Reactor Coolant System and Steam Generator Pressure SGTR Core Melt Failure at Recirculation	34-205
34-308	Case 6L-1: ADS Stage 4 Flow Rates SGTR Core Melt Failure at Recirculation	34-205

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-309	Case 6L-1: Accumulator/CMT Water Mass SGTR Core Melt Failure at Recirculation	34-206
34-310	Case 6L-1: IRWST Injection Flow Rate SGTR Core Melt Failure at Recirculation	34-206
34-311	Case 6L-1: Break Flow Rate SGTR Core Melt Failure at Recirculation	34-207
34-312	Case 6L-1: Reactor Vessel Water Level SGTR Core Melt Failure at Recirculation	34-207
34-313	Case 6L-1: Core Temperatures SGTR Core Melt Failure at Recirculation	34-208
34-314	Case 6L-1: Containment Water Pool Elevations SGTR Core Melt Failure at Recirculation	34-208
34-315	Case 6L-1: Containment Pressure SGTR Core Melt Failure at Recirculation	34-209
34-316	Case 6L-1: Containment Gas Temperature SGTR Core Melt Failure at Recirculation	34-209
34-317	Case 6L-1: Core Mass SGTR Core Melt Failure at Recirculation	34-210
34-318	Case 6L-1: Reactor Pressure Vessel to Cavity Water Heat Transfer SGTR Core Melt Failure at Recirculation	34-210
34-319	Case 6L-1: In-Vessel Hydrogen Generation SGTR Core Melt Failure at Recirculation	34-211
34-320	Case 6L-1: Mass Fraction of CsI Released to Containment SGTR Core Melt Failure at Recirculation	34-211
34-321	Case 6L-1: Mass Fraction of Noble Gases Released to Environment SGTR Core Melt Failure at Recirculation	34-212
34-322	Case 6L-1: Mass Fraction of Fission Products Released to Environment SGTR Core Melt Failure at Recirculation	34-212
34-323	Case 6L-1: Mass Fraction of SrO Released to Environment SGTR Core Melt Failure at Recirculation	34-213
34-324	Case 1AP-1: Reactor Coolant System and Steam Generator Pressure SBLOCA with PRHR, CMTs Failed	34-213
34-325	Case 1AP-1: ADS Stage 4 Flow Rates SBLOCA with PRHR, CMTs Failed	34-214
34-326	Case 1AP-1: Accumulator/CMT Water Mass SBLOCA with PRHR, CMTs Failed	34-214
34-327	Case 1AP-1: IRWST Injection Flow Rate SBLOCA with PRHR, CMTs Failed	34-215
34-328	Case 1AP-1: Break Flow Rate SBLOCA with PRHR, CMTs Failed	34-215
34-329	Case 1AP-1: Reactor Vessel Water Level SBLOCA with PRHR, CMTs Failed	34-216
34-330	Case 1AP-1: Core Temperatures SBLOCA with PRHR, CMTs Failed	34-216
34-331	Case 1AP-1: Containment Pool Water Elevations SBLOCA with PRHR, CMTs Failed	34-217
34-332	Case 1AP-1: Containment Pressure SBLOCA with PRHR, CMTs Failed	34-217
34-333	Case 1AP-1: Containment Gas Temperature SBLOCA with PRHR, CMTs Failed	34-218

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-334	Case 1AP-1: Core Mass SBLOCA with PRHR, CMTs Failed	34-218
34-335	Case 1AP-1: Reactor Pressure Vessel to Cavity Water Heat Transfer SBLOCA with PRHR, CMTs Failed	34-219
34-336	Case 1AP-1: In-Vessel Hydrogen Generation SBLOCA with PRHR, CMTs Failed	34-219
34-337	Case 1AP-1: Mass Fraction of CsI Released to Containment SBLOCA with PRHR, CMTs Failed	34-220
34-338	Case 1AP-1: Mass Fraction of Noble Gases Released to Environment SBLOCA with PRHR, CMTs Failed	34-220
34-339	Case 1AP-1: Mass Fraction of Fission Products Released to Environment SBLOCA with PRHR, CMTs Failed	34-221
34-340	Case 1AP-1: Mass Fraction of SrO Released to Environment SBLOCA with PRHR, CMTs Failed	34-221
34-341	Case 1AP-2: Reactor Coolant System and Steam Generator Pressure SBLOCA with PRHR, CMTs Failed	34-222
34-342	Case 1AP-2: ADS Stage 4 Flow Rates SBLOCA with PRHR, CMTs Failed	34-222
34-343	Case 1AP-2: Accumulator/CMT Water Mass SBLOCA with PRHR, CMTs Failed	34-223
34-344	Case 1AP-2: IRWST Injection Flow Rate SBLOCA with PRHR, CMTs Failed	34-223
34-345	Case 1AP-2: Break Flow Rate SBLOCA with PRHR, CMTs Failed	34-224
34-346	Case 1AP-2: Reactor Vessel Water Level SBLOCA with PRHR, CMTs Failed	34-224
34-347	Case 1AP-2: Core Temperatures SBLOCA with PRHR, CMTs Failed	34-225
34-348	Case 1AP-2: Containment Water Pool Elevations SBLOCA with PRHR, CMTs Failed	34-225
34-349	Case 1AP-2: Containment Pressure SBLOCA with PRHR, CMTs Failed	34-226
34-350	Case 1AP-2: Containment Gas Temperature SBLOCA with PRHR, CMTs Failed	34-226
34-351	Case 1AP-2: Core Mass SBLOCA with PRHR, CMTs Failed	34-227
34-352	Case 1AP-2: Reactor Pressure Vessel to Cavity Water Heat Transfer SBLOCA with PRHR, CMTs Failed	34-227
34-353	Case 1AP-2: In-Vessel Hydrogen Generation SBLOCA with PRHR, CMTs Failed	34-228
34-354	Case 1AP-2: Mass Fraction of CsI Released to Containment SBLOCA with PRHR, CMTs Failed	34-228
34-355	Case 1AP-2: Mass Fraction of Noble Gases Released to Environment SBLOCA with PRHR, CMTs Failed	34-229
34-356	Case 1AP-2: Mass Fraction of Fission Products Released to Environment SBLOCA with PRHR, CMTs Failed	34-229
34-357	Case 1AP-2: Mass Fraction of SrO Released to Environment SBLOCA with PRHR, CMTs Failed	34-230

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-358	Case 1A-1: Reactor Coolant System and Steam Generator Pressure Transient with Creep of SG Tubes	34-230
34-359	Case 1A-1: ADS Stage 4 Flow Rates Transient with Creep of SG Tubes	34-231
34-360	Case 1A-1: Accumulator/CMT Water Mass Transient with Creep of SG Tubes	34-231
34-361	Case 1A-1: IRWST Injection Flow Rate Transient with Creep of SG Tubes	34-232
34-362	Case 1A-1: Break Flow Rate Transient with Creep of SG Tubes	34-232
34-363	Case 1A-1: Reactor Vessel Water Level Transient with Creep of SG Tubes	34-233
34-364	Case 1A-1: Core Temperatures Transient with Creep of SG Tubes	34-233
34-365	Case 1A-1: Containment Pool Water Elevations Transient with Creep of SG Tubes	34-234
34-366	Case 1A-1: Containment Pressure Transient with Creep of SG Tubes	34-234
34-367	Case 1A-1: Containment Gas Temperature Transient with Creep of SG Tubes	34-235
34-368	Case 1A-1: Core Mass Transient with Creep of SG Tubes	34-235
34-369	Case 1A-1: Reactor Pressure Vessel to Cavity Water Heat Transfer Transient with Creep of SG Tubes	34-236
34-370	Case 1A-1: In-Vessel Hydrogen Generation Transient with Creep of SG Tubes	34-236
34-371	Case 1A-1: Mass Fraction of CsI Released to Containment Transient with Creep of SG Tubes	34-237
34-372	Case 1A-1: Mass Fraction of Noble Gases Released to Environment Transient with Creep of SG Tubes	34-237
34-373	Case 1A-1: Mass Fraction of Fission Products Released to Environment Transient with Creep of SG Tubes	34-238
34-374	Case 1A-1: Mass Fraction of SrO Released to Environment Transient with Creep of SG Tubes	34-238
34-375	Case 1A-2: Reactor Coolant System and Steam Generator Pressure Transient with Creep of SG Tubes	34-239
34-376	Case 1A-2: ADS Stage 4 Flow Rates Transient with Creep of SG Tubes	34-239
34-377	Case 1A-2: Accumulator/CMT Water Mass Transient with Creep of SG Tubes	34-240
34-378	Case 1A-2: IRWST Injection Flow Rate Transient with Creep of SG Tubes	34-240
34-379	Case 1A-2: Break Flow Rate Transient with Creep of SG Tubes	34-241
34-380	Case 1A-2: Reactor Vessel Water Level Transient with Creep of SG Tubes	34-241
34-381	Case 1A-2: Core Temperatures Transient with Creep of SG Tubes	34-242
34-382	Case 1A-2: Containment Water Pool Elevations Transient with Creep of SG Tubes	34-242
34-383	Case 1A-2: Containment Pressure Transient with Creep of SG Tubes	34-243
34-384	Case 1A-2: Containment Gas Temperature Transient with Creep of SG Tubes	34-243
34-385	Case 1A-2: Core Mass Transient with Creep of SG Tubes	34-244

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-386	Case 1A-2: Reactor Pressure Vessel to Cavity Water Heat Transfer Transient with Creep of SG Tubes	34-244
34-387	Case 1A-2: In-Vessel Hydrogen Generation Transient with Creep of SG Tubes	34-245
34-388	Case 1A-2: Mass Fraction of CsI Released to Containment Transient with Creep of SG Tubes	34-245
34-389	Case 1A-2: Mass Fraction of Noble Gases Released to Environment Transient with Creep of SG Tubes	34-246
34-390	Case 1A-2: Mass Fraction of Fission Products Released to Environment Transient with Creep of SG Tubes	34-246
34-391	Case 1A-2: Mass Fraction of SrO Released to Environment Transient with Creep of SG Tubes	34-247
34-392	Case 3BE-1: Containment Pressure DDT Intermediate Containment Failure	34-247
34-393	Case 3BE-1: Containment Gas Temperature DDT Intermediate Containment Failure	34-248
34-394	Case 3BE-1: Containment Hydrogen Concentration DDT Intermediate Containment Failure	34-248
34-395	Case 3BE-1: Noble Gases Release Fraction DDT Intermediate Containment Failure	34-249
34-396	Case 3BE-1: CsI and RbI Release Fraction DDT Intermediate Containment Failure	34-249
34-397	Case 3BE-1: $Te0_2$ Release Fraction DDT Intermediate Containment Failure	34-250
34-398	Case 3BE-1: Sr0 Release Fraction DDT Intermediate Containment Failure	34-250
34-399	Case 3BE-1: $Mo0_2$ Release Fraction DDT Intermediate Containment Failure	34-251
34-400	Case 3BE-1: Cs0H and Rb0H Release Fraction DDT Intermediate Containment Failure	34-251
34-401	Case 3BE-1: Ba0 Release Fraction DDT Intermediate Containment Failure	34-252
34-402	Case 3BE-1: La_20_3 Release Fraction DDT Intermediate Containment Failure	34-252
34-403	Case 3BE-1: $Ce0_2$ Release Fraction DDT Intermediate Containment Failure	34-253
34-404	Case 3BE-1: Sb Release Fraction DDT Intermediate Containment Failure	34-253
34-405	Case 3BE-1: Te_2 Release Fraction DDT Intermediate Containment Failure	34-254
34-406	Case 3BE-1: $U0_2$ Release Fraction DDT Intermediate Containment Failure	34-254
34-407	Case 3BE-1: RCS Pressure No PCS Water Cooling and Late Containment Failure	34-255
34-408	Case 3BE-1: Reactor Vessel Mixture Level No PCS Water Cooling and Late Containment Failure	34-255
34-409	Case 3BE-1: Core-Exit Temperature No PCS Water Cooling and Late Containment Failure	34-256
34-410	Case 3BE-1: In-Vessel Hydrogen Generation No PCS Water Cooling and Late Containment Failure	34-256
34-411	Case 3BE-1: Containment Pressure No PCS Water Cooling and Late Containment Failure	34-257

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-412	Case 3BE-1: Containment Gas Temperature No PCS Water Cooling and Late Containment Failure	34-257
34-413	Case 3BE-1: Containment Hydrogen Concentration No PCS Water Cooling and Late Containment Failure	34-258
34-414	Case 3BE-1: Noble Gas Release Fraction No PCS Water Cooling and Late Containment Failure	34-258
34-415	Case 3BE-1: CsI and RbI Release Fraction No PCS Water Cooling and Late Containment Failure	34-259
34-416	Case 3BE-1: $Te0_2$ Release Fraction No PCS Water Cooling and Late Containment Failure	34-259
34-417	Case 3BE-1: Sr0 Release Fraction No PCS Water Cooling and Late Containment Failure	34-260
34-418	Case 3BE-1: $Mo0_2$ Release Fraction No PCS Water Cooling and Late Containment Failure	34-260
34-419	Case 3BE-1: Cs0H and Rb0H Release Fraction No PCS Water Cooling and Late Containment Failure	34-261
34-420	Case 3BE-1: Ba0 Release Fraction No PCS Water Cooling and Late Containment Failure	34-261
34-421	Case 3BE-1: La_20_3 Release Fraction No PCS Water Cooling and Late Containment Failure	34-262
34-422	Case 3BE-1: $Ce0_2$ Release Fraction No PCS Water Cooling and Late Containment Failure	34-262
34-423	Case 3BE-1: Sb Release Fraction No PCS Water Cooling and Late Containment Failure	34-263
34-424	Case 3BE-1: Te_2 Release Fraction No PCS Water Cooling and Late Containment Failure	34-263
34-425	Case 3BE-1: $U0_2$ Release Fraction No PCS Water Cooling and Late Containment Failure	34-264
35-1	Containment Event Tree	35-29
36-1	AP1000 Accident Class 1A Base Case for Node DP Success – RCS Pressure	36-7
36-2	AP1000 Accident Class 1A Base Case for Node DP Success – Core-Exit Gas Temperature	36-8
36-3	AP1000 Accident Class 1A Base Case for Node DP Success – Steam Generator Tube Creep Damage	36-9
36-4	AP1000 Steam Generator Tube Rupture with PRHR and Stuck-Open SV – Passive RHR Heat Removal	36-10
36-5	AP1000 Steam Generator Tube Rupture with PRHR and Stuck-Open SV – Core Makeup Tank Flow (one tank)	36-11
36-6	AP1000 Steam Generator Tube Rupture with PRHR and Stuck-Open SV – Reactor Coolant System Pressure	36-12

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
36-7	AP1000 Steam Generator Tube Rupture with PRHR and Stuck-Open SV – Core-Exit Gas Temperature	36-13
39-1	AP1000 Base Case In-Vessel Retention of Molten Core Debris	39-23
39-2	AP1000 Core Shroud	39-24
39-3	Comparison of ULPU-2000 Configuration III and ULPU-2000 Configuration IV	39-25
39-4	Effect of Water Level on Water Circulation During IVR	39-26
39-5	ULPU-2000 Configuration IV Results (Reference 39-4)	39-27
39-6	AP1000 In-Vessel Retention of Molten Core Debris Quantification Zirconium Oxidation Fraction Input Probability Distribution	39-28
39-7	AP1000 In-Vessel Retention of Molten Core Debris Quantification Mass of Steel in Debris Input Probability Distribution	39-29
39-8	AP1000 In-Vessel Retention of Molten Core Debris Quantification Time of Final Bounding State Input Probability Distribution	39-30
39-9	AP1000 In-Vessel Retention of Molten Core Debris Quantification Height of the Oxide Layer	39-31
39-10	AP1000 In-Vessel Retention of Molten Core Debris Quantification Height of the Metal Layer	39-32
39-11	AP1000 In-Vessel Retention of Molten Core Debris Quantification Power Density in Oxide Debris	39-33
39-12	AP1000 In-Vessel Retention of Molten Core Debris Quantification Internal Rayleigh Number in the Oxide Layer	39-34
39-13	AP1000 In-Vessel Retention of Molten Core Debris Quantification External Rayleigh Number in the Metal Layer	39-35
39-14	AP1000 In-Vessel Retention of Molten Core Debris Quantification Normalized Heat Fluxes	39-36
39-15	AP1000 Passive Core Cooling System	39-37
39-16	Containment Floodable Region	39-38
39-17	Containment Floodable Region – Exploded View	39-39
39-18	AP1000 Cavity Flooding Rate	39-40
39-19	Schematic of the AP1000 Reactor Vessel, Vessel Cavity, Vessel Insulation, and Vents	39-41
39A-1	AP1000 Reactor Pressure Vessel, Core and Lower Internals	39A-21
39A-2	Core Shroud	39A-22
39A-3	Bottom of Core Shroud, Core Barrel, and Lower Core Support Plate (Not to Scale)	39A-23
39A-4	Axial Power Shapes Used for Core Relocation Analysis	39A-24
39A-5	Radial Power Shape Used for Core Relocation Analysis	39A-25
39A-6	Cross Section Geometry of Finite Difference Computational Model	39A-26
39A-7	Computational Mesh for Finite Difference Computational Model	39A-27
39A-8	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape Reactor – Coolant System Pressure	39A-28

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
39A-9	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape – Containment and Reactor Coolant System Pressure	39A-28
39A-10	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape – Reactor Vessel Mixture Level	39A-29
39A-11	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape – Hottest Temperature in Core	39A-29
39A-12	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape – Mass of Hydrogen Generated in Core	39A-30
39A-13	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape Temperature of Core Shroud/Barrel (Core Elevation 1.7 – 2.0 m)	39A-30
39A-14	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape Temperature of Core Shroud/Barrel (Core Elevation 2.0 – 2.3 m)	39A-31
39A-15	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape – Mass of Core Shroud/Barrel	39A-31
39A-16	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape Volume of Debris in Reactor Vessel Lower Plenum	39A-32
39A-17	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape – Reactor Coolant System Pressure	39A-32
39A-18	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape – Containment and Reactor Coolant System Pressure	39A-33
39A-19	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape – Reactor Vessel Mixture Level	39A-33
39A-20	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape – Hottest Temperature in Core	39A-34
39A-21	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape – Mass of Hydrogen Generated in Core	39A-34
39A-22	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape Temperature of Core Shroud/Barrel (Core Elevation 1.1 – 1.4 m)	39A-35
39A-23	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape Temperature of Core Shroud/Barrel (Core Elevation 1.4 – 1.7 m)	39A-35
39A-24	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape – Mass of Core Shroud/Barrel	39A-36
39A-25	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape Volume of Debris in Reactor Vessel Lower Plenum	39A-36
39A-26	Initial Oxide Relocation to Lower Plenum	39A-37
39A-27	Finite Difference Result for Top-Skewed Power Shape at Level 5	39A-38
39A-28	Finite Difference Temperature Map Level 5 at 5380 Seconds for Top-Skewed Power Shape Case	39A-38
39A-29	MAAP4 Core Temperature Profile for Top-Skewed Power Shape Core Elevation = 2.0 – 2.3 m Above Bottom of Active Fuel (Core Axial Row 12)	39A-39
39A-30	Relocation of Corium	39A-39
39A-31	Model for Relocation to Lower Plenum	39A-40

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
40-1	AP1000 Passive Containment Cooling System	40-7
40-2	Schematic of Passive Containment Cooling System Piping	40-8
40-3	AP1000 Containment Venting Pressure Response	40-9
40-4	AP1000 Containment Venting Loss of Containment Air	40-10
40-5	AP1000 Dry PCS Containment Pressure Response	40-11
40-6	AP1000 Dry PCS Containment Temperature Response	40-12
41-1	IRWST Hydrogen Venting	41-36
41-2	Accident Class 3BE Early Detonation Decomposition Event Tree – Given RFL Success	41-37
41-3	Accident Class 3BE Early Detonation Decomposition Event Tree – Given RFL Failure	41-38
41-4	Accident Class 3BL Early Detonation Decomposition Event Tree	41-39
41-5	Accident Class 3C/3BR Early Detonation Decomposition Event Tree	41-40
41-6	Accident Class 3D/1D Early Detonation Decomposition Event Tree	41-41
41-7	Accident Class AP Early Detonation Decomposition Event Tree	41-42
41-8	Boil-Off Hydrogen Generation Probability Density Function	41-43
41-9	No Reflood Pre-Burn Containment Pressure Probability Density Function	41-44
41-10	No-Reflood Hydrogen Deflagration Peak Pressure Probability	41-45
41-11	Early Reflood Hydrogen Generation Probability Density Function	41-46
41-12	Early Reflood Pre-Burn Containment Pressure Probability Density Function	41-47
41-13	Early Reflood Hydrogen Deflagration Peak Pressure Probability	41-48
41-14	Late Reflood Hydrogen Generation Probability Density Function	41-49
41-15	Late Reflood Pre-Burn Containment Pressure Probability Density Function	41-50
41-16	Late Reflood Hydrogen Deflagration Peak Pressure Probability	41-51
41-17	Accident Class 3BE Intermediate Detonation Decomposition Event Tree – Given RFL Success	41-52
41-18	Accident Class 3BE Intermediate Detonation Decomposition Event Tree – Given RFL Failure	41-53
41-19	Accident Class 3BL Intermediate Detonation Decomposition Event Tree	41-54
41-20	Accident Class 3C/3BR Intermediate Detonation Decomposition Event Tree	41-55
41-21	Accident Class 3D/1D Intermediate Detonation Decomposition Event Tree	41-56
41-22	Accident Class 1AP Intermediate Detonation Decomposition Event Tree	41-57
41A-1	Case 3BE-1: Reactor Coolant System Pressure DVI Line Break for Containment Water Level	41A-41
41A-2	Case 3BE-1: Core-Exit Gas Temperature DVI Line Break for Containment Water Level	41A-41
41A-3	Case 3BE-1: Reactor Vessel Mixture Level DVI Line Break for Containment Water Level	41A-42
41A-4	Case 3BE-1: Hydrogen Generated In-Vessel DVI Line Break for Containment Water Level	41A-42

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-5	Case 3BE-1: Containment Pressure DVI Line Break for Containment Water Level	41A-43
41A-6	Case 3BE-1: Containment Gas Temperature DVI Line Break for Containment Water Level	41A-43
41A-7	Case 3BE-1: Containment Compartments Water Level DVI Line Break for Containment Water Level	41A-44
41A-8	Case 3BE-1: Well-Mixed Compartment Hydrogen Concentration DVI Line Break for Containment Water Level	41A-44
41A-9	Case 3BE-1: Well-Mixed Compartment Steam Concentration DVI Line Break for Containment Water Level	41A-45
41A-10	Case 3BE-1: Well-Mixed Compartment Oxygen Concentration DVI Line Break for Containment Water Level	41A-45
41A-11	Case 3BE-1: Confined Compartment Hydrogen Concentration DVI Line Break for Containment Water Level	41A-46
41A-12	Case 3BE-1: Confined Compartment Steam Concentration DVI Line Break for Containment Water Level	41A-46
41A-13	Case 3BE-1: Confined Compartment Oxygen Concentration DVI Line Break for Containment Water Level	41A-47
41A-14	Case 3BE-1: Equivalence Ratio in SG Room DVI Line Break for Containment Water Level	41A-47
41A-15	Case 3BE-1: Equivalence Ratio in CMT Room DVI Line Break for Containment Water Level	41A-48
41A-16	Case 3BE-1: Equivalence Ratio in IRWST DVI Line Break for Containment Water Level	41A-48
41A-17	Case 3BE-1: Equivalence Ratio in PXS DVI Line Break for Containment Water Level	41A-49
41A-18	Case 3BE-2: Reactor Coolant System Pressure DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-49
41A-19	Case 3BE-2: Core-Exit Gas Temperature DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-50
41A-20	Case 3BE-2: Reactor Vessel Mixture Level DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-50
41A-21	Case 3BE-2: Hydrogen Generated In-Vessel DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-51
41A-22	Case 3BE-2: Containment Pressure DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-51
41A-23	Case 3BE-2: Containment Gas Temperature DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-52
41A-24	Case 3BE-2: Containment Compartments Water Level DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-52
41A-25	Case 3BE-2: Well-Mixed Compartment Hydrogen Concentration DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-53

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-26	Case 3BE-2: Well-Mixed Compartment Steam Concentration DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-53
41A-27	Case 3BE-2: Well-Mixed Compartment Oxygen Concentration DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-54
41A-28	Case 3BE-2: Confined Compartment Hydrogen Concentration DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-54
41A-29	Case 3BE-2: Confined Compartment Steam Concentration DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-55
41A-30	Case 3BE-2: Confined Compartment Oxygen Concentration DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-55
41A-31	Case 3BE-2: Equivalence Ratio in SG Room DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-56
41A-32	Case 3BE-2: Equivalence Ratio in CMT Room DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-56
41A-33	Case 3BE-2: Equivalence Ratio in IRWST DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-57
41A-34	Case 3BE-2: Equivalence Ratio in PXS DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-57
41A-35	Case 3BE-4: Reactor Coolant System Pressure Spurious ADS, Failed Gravity Injection	41A-58
41A-36	Case 3BE-4: Core-Exit Gas Temperature Spurious ADS, Failed Gravity Injection	41A-58
41A-37	Case 3BE-4: Reactor Vessel Mixture Level Spurious ADS, Failed Gravity Injection	41A-59
41A-38	Case 3BE-4: Hydrogen Generated In-Vessel Spurious ADS, Failed Gravity Injection	41A-59
41A-39	Case 3BE-4: Containment Pressure Spurious ADS, Failed Gravity Injection	41A-60
41A-40	Case 3BE-4: Containment Gas Temperature Spurious ADS, Failed Gravity Injection	41A-60
41A-41	Case 3BE-4: Containment Compartments Water Level Spurious ADS, Failed Gravity Injection	41A-61
41A-42	Case 3BE-4: Well-Mixed Compartment Hydrogen Concentration Spurious ADS, Failed Gravity Injection	41A-61
41A-43	Case 3BE-4: Well-Mixed Compartment Steam Concentration Spurious ADS, Failed Gravity Injection	41A-62
41A-44	Case 3BE-4: Well-Mixed Compartment Oxygen Concentration Spurious ADS, Failed Gravity Injection	41A-62
41A-45	Case 3BE-4: Confined Compartment Hydrogen Concentration Spurious ADS, Failed Gravity Injection	41A-63
41A-46	Case 3BE-4: Confined Compartment Steam Concentration Spurious ADS, Failed Gravity Injection	41A-63
41A-47	Case 3BE-4: Confined Compartment Oxygen Concentration Spurious ADS, Failed Gravity Injection	41A-64

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-48	Case 3BE-4: Equivalence Ratio in SG Room Spurious ADS, Failed Gravity Injection	41A-64
41A-49	Case 3BE-4: Equivalence Ratio in CMT Room Spurious ADS, Failed Gravity Injection	41A-65
41A-50	Case 3BE-4: Equivalence Ratio in IRWST Spurious ADS, Failed Gravity Injection	41A-65
41A-51	Case 3BE-4: Equivalence Ratio in PXS Spurious ADS, Failed Gravity Injection	41A-66
41A-52	Case 3BE-5: Reactor Coolant System Pressure SBLOCA with Failed Gravity Injection	41A-66
41A-53	Case 3BE-5: Core-Exit Gas Temperature SBLOCA with Failed Gravity Injection	41A-67
41A-54	Case 3BE-5: Reactor Vessel Mixture Level SBLOCA with Failed Gravity Injection	41A-67
41A-55	Case 3BE-5: Hydrogen Generated In-Vessel SBLOCA with Failed Gravity Injection	41A-68
41A-56	Case 3BE-5: Containment Pressure SBLOCA with Failed Gravity Injection	41A-68
41A-57	Case 3BE-5: Containment Gas Temperature SBLOCA with Failed Gravity Injection	41A-69
41A-58	Case 3BE-5: Containment Compartments Water Level SBLOCA with Failed Gravity Injection	41A-69
41A-59	Case 3BE-5: Well-Mixed Compartment Hydrogen Concentration SBLOCA with Failed Gravity Injection	41A-70
41A-60	Case 3BE-5: Well-Mixed Compartment Steam Concentration SBLOCA with Failed Gravity Injection	41A-70
41A-61	Case 3BE-5: Well-Mixed Compartment Oxygen Concentration SBLOCA with Failed Gravity Injection	41A-71
41A-62	Case 3BE-5: Confined Compartment Hydrogen Concentration SBLOCA with Failed Gravity Injection	41A-71
41A-63	Case 3BE-5: Confined Compartment Steam Concentration SBLOCA with Failed Gravity Injection	41A-72
41A-64	Case 3BE-5: Confined Compartment Oxygen Concentration SBLOCA with Failed Gravity Injection	41A-72
41A-65	Case 3BE-5: Equivalence Ratio in SG Room SBLOCA with Failed Gravity Injection	41A-73
41A-66	Case 3BE-5: Equivalence Ratio in CMT Room SBLOCA with Failed Gravity Injection	41A-73
41A-67	Case 3BE-5: Equivalence Ratio in IRWST SBLOCA with Failed Gravity Injection	41A-74
41A-68	Case 3BE-5: Equivalence Ratio in PXS SBLOCA with Failed Gravity Injection	41A-74
41A-69	Case 3BE-6: Reactor Coolant System Pressure SBLOCA with Failed Gravity Injection	41A-75

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-70	Case 3BE-6: Core-Exit Gas Temperature SBLOCA with Failed Gravity Injection	41A-75
41A-71	Case 3BE-6: Reactor Vessel Mixture Level SBLOCA with Failed Gravity Injection	41A-76
41A-72	Case 3BE-6: Hydrogen Generated In-Vessel SBLOCA with Failed Gravity Injection	41A-76
41A-73	Case 3BE-6: Containment Pressure SBLOCA with Failed Gravity Injection	41A-77
41A-74	Case 3BE-6: Containment Gas Temperature SBLOCA with Failed Gravity Injection	41A-77
41A-75	Case 3BE-6: Containment Compartments Water Level SBLOCA with Failed Gravity Injection	41A-78
41A-76	Case 3BE-6: Well-Mixed Compartment Hydrogen Concentration SBLOCA with Failed Gravity Injection	41A-78
41A-77	Case 3BE-6: Well-Mixed Compartment Steam Concentration SBLOCA with Failed Gravity Injection	41A-79
41A-78	Case 3BE-6: Well-Mixed Compartment Oxygen Concentration SBLOCA with Failed Gravity Injection	41A-79
41A-79	Case 3BE-6: Confined Compartment Hydrogen Concentration SBLOCA with Failed Gravity Injection	41A-80
41A-80	Case 3BE-6: Confined Compartment Steam Concentration SBLOCA with Failed Gravity Injection	41A-80
41A-81	Case 3BE-6: Confined Compartment Oxygen Concentration SBLOCA with Failed Gravity Injection	41A-81
41A-82	Case 3BE-6: Equivalence Ratio in SG Room SBLOCA with Failed Gravity Injection	41A-81
41A-83	Case 3BE-6: Equivalence Ratio in CMT Room SBLOCA with Failed Gravity Injection	41A-82
41A-84	Case 3BE-6: Equivalence Ratio in IRWST SBLOCA with Failed Gravity Injection	41A-82
41A-85	Case 3BE-6: Equivalence Ratio in PXS SBLOCA with Failed Gravity Injection	41A-83
41A-86	Case 3BE-8: Reactor Coolant System Pressure SGTR	41A-83
41A-87	Case 3BE-8: Core-Exit Gas Temperature SGTR	41A-84
41A-88	Case 3BE-8: Reactor Vessel Mixture Level SGTR	41A-84
41A-89	Case 3BE-8: Hydrogen Generated In-Vessel SGTR	41A-85
41A-90	Case 3BE-8: Containment Pressure SGTR	41A-85
41A-91	Case 3BE-8: Containment Gas Temperature SGTR	41A-86
41A-92	Case 3BE-8: Containment Compartments Water Level SGTR	41A-86
41A-93	Case 3BE-8: Well-Mixed Compartment Hydrogen Concentration SGTR	41A-87
41A-94	Case 3BE-8: Well-Mixed Compartment Steam Concentration SGTR	41A-87
41A-95	Case 3BE-8: Well-Mixed Compartment Oxygen Concentration SGTR	41A-88
41A-96	Case 3BE-8: Confined Compartment Hydrogen Concentration SGTR	41A-88
41A-97	Case 3BE-8: Confined Compartment Steam Concentration SGTR	41A-89

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-98	Case 3BE-8: Confined Compartment Oxygen Concentration SGTR	41A-89
41A-99	Case 3BE-8: Equivalence Ratio in SG Room SGTR	41A-90
41A-100	Case 3BE-8: Equivalence Ratio in CMT Room SGTR	41A-90
41A-101	Case 3BE-8: Equivalence Ratio in IRWST SGTR	41A-91
41A-102	Case 3BE-8: Equivalence Ratio in PXS SGTR	41A-91
41A-103	Case 3BE-9: Reactor Coolant System Pressure SGTR	41A-92
41A-104	Case 3BE-9: Core-Exit Gas Temperature SGTR	41A-92
41A-105	Case 3BE-9: Reactor Vessel Mixture Level SGTR	41A-93
41A-106	Case 3BE-9: Hydrogen Generated In-Vessel SGTR	41A-93
41A-107	Case 3BE-9: Containment Pressure SGTR	41A-94
41A-108	Case 3BE-9: Containment Gas Temperature SGTR	41A-94
41A-109	Case 3BE-9: Containment Compartments Water Level SGTR	41A-95
41A-110	Case 3BE-9: Well-Mixed Compartment Hydrogen Concentration SGTR	41A-95
41A-111	Case 3BE-9: Well-Mixed Compartment Steam Concentration SGTR	41A-96
41A-112	Case 3BE-9: Well-Mixed Compartment Oxygen Concentration SGTR	41A-96
41A-113	Case 3BE-9: Confined Compartment Hydrogen Concentration SGTR	41A-97
41A-114	Case 3BE-9: Confined Compartment Steam Concentration SGTR	41A-97
41A-115	Case 3BE-9: Confined Compartment Oxygen Concentration SGTR	41A-98
41A-116	Case 3BE-9: Equivalence Ratio in SG Room SGTR	41A-98
41A-117	Case 3BE-9: Equivalence Ratio in CMT Room SGTR	41A-99
41A-118	Case 3BE-9: Equivalence Ratio in IRWST SGTR	41A-99
41A-119	Case 3BE-9: Equivalence Ratio in PXS SGTR	41A-100
41A-120	Case 3BL-1: Reactor Coolant System Pressure SBLOCA with Failed Gravity Recirculation	41A-100
41A-121	Case 3BL-1: Core-Exit Gas Temperature SBLOCA with Failed Gravity Recirculation	41A-101
41A-122	Case 3BL-1: Reactor Vessel Mixture Level SBLOCA with Failed Gravity Recirculation	41A-101
41A-123	Case 3BL-1: Hydrogen Generated In-Vessel SBLOCA with Failed Gravity Recirculation	41A-102
41A-124	Case 3BL-1: Containment Pressure SBLOCA with Failed Gravity Recirculation	41A-102
41A-125	Case 3BL-1: Containment Gas Temperature SBLOCA with Failed Gravity Recirculation	41A-103
41A-126	Case 3BL-1: Containment Compartments Water Level SBLOCA with Failed Gravity Recirculation	41A-103
41A-127	Case 3BL-1: Well-Mixed Compartment Hydrogen Concentration SBLOCA with Failed Gravity Recirculation	41A-104
41A-128	Case 3BL-1: Well-Mixed Compartment Steam Concentration SBLOCA with Failed Gravity Recirculation	41A-104
41A-129	Case 3BL-1: Well-Mixed Compartment Oxygen Concentration SBLOCA with Failed Gravity Recirculation	41A-105

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-130	Case 3BL-1: Confined Compartment Hydrogen Concentration SBLOCA with Failed Gravity Recirculation	41A-105
41A-131	Case 3BL-1: Confined Compartment Steam Concentration SBLOCA with Failed Gravity Recirculation	41A-106
41A-132	Case 3BL-1: Confined Compartment Oxygen Concentration SBLOCA with Failed Gravity Recirculation	41A-106
41A-133	Case 3BL-1: Equivalence Ratio in SG Room SBLOCA with Failed Gravity Recirculation	41A-107
41A-134	Case 3BL-1: Equivalence Ratio in CMT Room SBLOCA with Failed Gravity Recirculation	41A-107
41A-135	Case 3BL-1: Equivalence Ratio in IRWST SBLOCA with Failed Gravity Recirculation	41A-108
41A-136	Case 3BL-1: Equivalence Ratio in PXS SBLOCA with Failed Gravity Recirculation	41A-108
41A-137	Case 3BL-2: Reactor Coolant System Pressure DVI Line Break with Failed Gravity Recirculation	41A-109
41A-138	Case 3BL-2: Core-Exit Gas Temperature DVI Line Break with Failed Gravity Recirculation	41A-109
41A-139	Case 3BL-2: Reactor Vessel Mixture Level DVI Line Break with Failed Gravity Recirculation	41A-110
41A-140	Case 3BL-2: Hydrogen Generated In-Vessel DVI Line Break with Failed Gravity Recirculation	41A-110
41A-141	Case 3BL-2: Containment Pressure DVI Line Break with Failed Gravity Recirculation	41A-111
41A-142	Case 3BL-2: Containment Gas Temperature DVI Line Break with Failed Gravity Recirculation	41A-111
41A-143	Case 3BL-2: Containment Compartments Water Level DVI Line Break with Failed Gravity Recirculation	41A-112
41A-144	Case 3BL-2: Well-Mixed Compartment Hydrogen Concentration DVI Line Break with Failed Gravity Recirculation	41A-112
41A-145	Case 3BL-2: Well-Mixed Compartment Steam Concentration DVI Line Break with Failed Gravity Recirculation	41A-113
41A-146	Case 3BL-2: Well-Mixed Compartment Oxygen Concentration DVI Line Break with Failed Gravity Recirculation	41A-113
41A-147	Case 3BL-2: Confined Compartment Hydrogen Concentration DVI Line Break with Failed Gravity Recirculation	41A-114
41A-148	Case 3BL-2: Confined Compartment Steam Concentration DVI Line Break with Failed Gravity Recirculation	41A-114
41A-149	Case 3BL-2: Confined Compartment Oxygen Concentration DVI Line Break with Failed Gravity Recirculation	41A-115
41A-150	Case 3BL-2: Equivalence Ratio in SG Room DVI Line Break with Failed Gravity Recirculation	41A-115

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-151	Case 3BL-2: Equivalence Ratio in CMT Room DVI Line Break with Failed Gravity Recirculation	41A-116
41A-152	Case 3BL-2: Equivalence Ratio in IRWST DVI Line Break with Failed Gravity Recirculation	41A-116
41A-153	Case 3BL-2: Equivalence Ratio in PXS DVI Line Break with Failed Gravity Recirculation	41A-117
41A-154	Case 3BR-1: Reactor Coolant System Pressure CL LBLOCA with Accumulator Failure	41A-117
41A-155	Case 3BR-1: Core-Exit Gas Temperature CL LBLOCA with Accumulator Failure	41A-118
41A-156	Case 3BR-1: Reactor Vessel Mixture Level CL LBLOCA with Accumulator Failure	41A-118
41A-157	Case 3BR-1: Hydrogen Generated In-Vessel CL LBLOCA with Accumulator Failure	41A-119
41A-158	Case 3BR-1: Containment Pressure CL LBLOCA with Accumulator Failure	41A-119
41A-159	Case 3BR-1: Containment Gas Temperature CL LBLOCA with ccumulator Failure	41A-120
41A-160	Case 3BR-1: Containment Compartments Water Level CL LBLOCA with Accumulator Failure	41A-120
41A-161	Case 3BR-1: Well-Mixed Compartment Hydrogen Concentration CL LBLOCA with Accumulator Failure	41A-121
41A-162	Case 3BR-1: Well-Mixed Compartment Steam Concentration CL LBLOCA with Accumulator Failure	41A-121
41A-163	Case 3BR-1: Well-Mixed Compartment Oxygen Concentration CL LBLOCA with Accumulator Failure	41A-122
41A-164	Case 3BR-1: Confined Compartment Hydrogen Concentration CL LBLOCA with Accumulator Failure	41A-122
41A-165	Case 3BR-1: Confined Compartment Steam Concentration CL LBLOCA with Accumulator Failure	41A-123
41A-166	Case 3BR-1: Confined Compartment Oxygen Concentration CL LBLOCA with Accumulator Failure	41A-123
41A-167	Case 3BR-1: Equivalence Ratio in SG Room CL LBLOCA with Accumulator Failure	41A-124
41A-168	Case 3BR-1: Equivalence Ratio in CMT Room CL LBLOCA with Accumulator Failure	41A-124
41A-169	Case 3BR-1: Equivalence Ratio in IRWST CL LBLOCA with Accumulator Failure	41A-125
41A-170	Case 3BR-1: Equivalence Ratio in PXS CL LBLOCA with Accumulator Failure	41A-125
41A-171	Case 3BR-1a: Reactor Coolant System Pressure CL LBLOCA with Accumulator Failure	41A-126

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-172	Case 3BR-1a: Core-Exit Gas Temperature CL LBLOCA with Accumulator Failure	41A-126
41A-173	Case 3BR-1a: Reactor Vessel Mixture Level CL LBLOCA with Accumulator Failure	41A-127
41A-174	Case 3BR-1a: Hydrogen Generated In-Vessel CL LBLOCA with Accumulator Failure	41A-127
41A-175	Case 3BR-1a: Containment Pressure CL LBLOCA with Accumulator Failure	41A-128
41A-176	Case 3BR-1a: Containment Gas Temperature CL LBLOCA with Accumulator Failure	41A-128
41A-177	Case 3BR-1a: Containment Compartments Water Level CL LBLOCA with Accumulator Failure	41A-129
41A-178	Case 3BR-1a: Well-Mixed Compartment Hydrogen Concentration CL LBLOCA with Accumulator Failure	41A-129
41A-179	Case 3BR-1a: Well-Mixed Compartment Steam Concentration CL LBLOCA with Accumulator Failure	41A-130
41A-180	Case 3BR-1a: Well-Mixed Compartment Oxygen Concentration CL LBLOCA with Accumulator Failure	41A-130
41A-181	Case 3BR-1a: Confined Compartment Hydrogen Concentration CL LBLOCA with Accumulator Failure	41A-131
41A-182	Case 3BR-1a: Confined Compartment Steam Concentration CL LBLOCA with Accumulator Failure	41A-131
41A-183	Case 3BR-1a: Confined Compartment Oxygen Concentration CL LBLOCA with Accumulator Failure	41A-132
41A-184	Case 3BR-1a: Equivalence Ratio in SG Room CL LBLOCA with Accumulator Failure	41A-132
41A-185	Case 3BR-1a: Equivalence Ratio in CMT Room CL LBLOCA with Accumulator Failure	41A-133
41A-186	Case 3BR-1a: Equivalence Ratio in IRWST CL LBLOCA with Accumulator Failure	41A-133
41A-187	Case 3BR-1a: Equivalence Ratio in PXS CL LBLOCA with Accumulator Failure	41A-134
41A-188	Case 3C-1: Reactor Coolant System Pressure Vessel Rupture	41A-134
41A-189	Case 3C-1: Core-Exit Gas Temperature Vessel Rupture	41A-135
41A-190	Case 3C-1: Reactor Vessel Mixture Level Vessel Rupture	41A-135
41A-191	Case 3C-1: Hydrogen Generated In-Vessel Vessel Rupture	41A-136
41A-192	Case 3C-1: Containment Pressure Vessel Rupture	41A-136
41A-193	Case 3C-1: Containment Gas Temperature Vessel Rupture	41A-137
41A-194	Case 3C-1: Containment Compartments Water Level Vessel Rupture	41A-137
41A-195	Case 3C-1: Well-Mixed Compartment Hydrogen Concentration Vessel Rupture	41A-138
41A-196	Case 3C-1: Well-Mixed Compartment Steam Concentration Vessel Rupture	41A-138

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-197	Case 3C-1: Well-Mixed Compartment Oxygen Concentration Vessel Rupture	41A-139
41A-198	Case 3C-1: Confined Compartment Hydrogen Concentration Vessel Rupture	41A-139
41A-199	Case 3C-1: Confined Compartment Steam Concentration Vessel Rupture	41A-140
41A-200	Case 3C-1: Confined Compartment Oxygen Concentration Vessel Rupture	41A-140
41A-201	Case 3C-1: Equivalence Ratio in SG Room Vessel Rupture	41A-141
41A-202	Case 3C-1: Equivalence Ratio in CMT Room Vessel Rupture	41A-141
41A-203	Case 3C-1: Equivalence Ratio in IRWST Vessel Rupture	41A-142
41A-204	Case 3C-1: Equivalence Ratio in PXS Vessel Rupture	41A-142
41A-205	Case 3D-1: Reactor Coolant System Pressure Spurious ADS-4 with Failed CMTs	41A-143
41A-206	Case 3D-1: Core-Exit Gas Temperature Spurious ADS-4 with Failed CMTs	41A-143
41A-207	Case 3D-1: Reactor Vessel Mixture Level Spurious ADS-4 with Failed CMTs	41A-144
41A-208	Case 3D-1: Hydrogen Generated In-Vessel Spurious ADS-4 with Failed CMTs	41A-144
41A-209	Case 3D-1: Containment Pressure Spurious ADS-4 with Failed CMTs	41A-145
41A-210	Case 3D-1: Containment Gas Temperature Spurious ADS-4 with Failed CMTs	41A-145
41A-211	Case 3D-1: Containment Compartments Water Level Spurious ADS-4 with Failed CMTs	41A-146
41A-212	Case 3D-1: Well-Mixed Compartment Hydrogen Concentration Spurious ADS-4 with Failed CMTs	41A-146
41A-213	Case 3D-1: Well-Mixed Compartment Steam Concentration Spurious ADS-4 with Failed CMTs	41A-147
41A-214	Case 3D-1: Well-Mixed Compartment Oxygen Concentration Spurious ADS-4 with Failed CMTs	41A-147
41A-215	Case 3D-1: Confined Compartment Hydrogen Concentration Spurious ADS-4 with Failed CMTs	41A-148
41A-216	Case 3D-1: Confined Compartment Steam Concentration Spurious ADS-4 with Failed CMTs	41A-148
41A-217	Case 3D-1: Confined Compartment Oxygen Concentration Spurious ADS-4 with Failed CMTs	41A-149
41A-218	Case 3D-1: Equivalence Ratio in SG Room Spurious ADS-4 with Failed CMTs	41A-149
41A-219	Case 3D-1: Equivalence Ratio in CMT Room Spurious ADS-4 with Failed CMTs	41A-150
41A-220	Case 3D-1: Equivalence Ratio in IRWST Spurious ADS-4 with Failed CMTs	41A-150

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-221	Case 3D-1: Equivalence Ratio in PXS Spurious ADS-4 with Failed CMTs	41A-151
41A-222	Case 3D-2: Reactor Coolant System Pressure Spurious ADS-2, Failed CMTs	41A-151
41A-223	Case 3D-2: Core-Exit Gas Temperature Spurious ADS-2, Failed CMTs	41A-152
41A-224	Case 3D-2: Reactor Vessel Mixture Level Spurious ADS-2, Failed CMTs	41A-152
41A-225	Case 3D-2: Hydrogen Generated In-Vessel Spurious ADS-2, Failed CMTs	41A-153
41A-226	Case 3D-2: Containment Pressure Spurious ADS-2, Failed CMTs	41A-153
41A-227	Case 3D-2: Containment Gas Temperature Spurious ADS-2, Failed CMTs	41A-154
41A-228	Case 3D-2: Containment Compartments Water Level Spurious ADS-2, Failed CMTs	41A-154
41A-229	Case 3D-2: Well-Mixed Compartment Hydrogen Concentration Spurious ADS-2, Failed CMTs	41A-155
41A-230	Case 3D-2: Well-Mixed Compartment Steam Concentration Spurious ADS-2, Failed CMTs	41A-155
41A-231	Case 3D-2: Well-Mixed Compartment Oxygen Concentration Spurious ADS-2, Failed CMTs	41A-156
41A-232	Case 3D-2: Confined Compartment Hydrogen Concentration Spurious ADS-2, Failed CMTs	41A-156
41A-233	Case 3D-2: Confined Compartment Steam Concentration Spurious ADS-2, Failed CMTs	41A-157
41A-234	Case 3D-2: Confined Compartment Oxygen Concentration Spurious ADS-2, Failed CMTs	41A-157
41A-235	Case 3D-2: Equivalence Ratio in SG Room Spurious ADS-2, Failed CMTs	41A-158
41A-236	Case 3D-2: Equivalence Ratio in CMT Room Spurious ADS-2, Failed CMTs	41A-158
41A-237	Case 3D-2: Equivalence Ratio in IRWST Spurious ADS-2, Failed CMTs	41A-159
41A-238	Case 3D-2: Equivalence Ratio in PXS Spurious ADS-2, Failed CMTs	41A-159
41A-239	Case 3D-3: Reactor Coolant System Pressure DVI Line Break with no ADS	41A-160
41A-240	Case 3D-3: Core-Exit Gas Temperature DVI Line Break with no ADS	41A-160
41A-241	Case 3D-3: Reactor Vessel Mixture Level DVI Line Break with no ADS	41A-161
41A-242	Case 3D-3: Hydrogen Generated In-Vessel DVI Line Break with no ADS	41A-161
41A-243	Case 3D-3: Containment Pressure DVI Line Break with no ADS	41A-162

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-244	Case 3D-3: Containment Gas Temperature DVI Line Break with no ADS	41A-162
41A-245	Case 3D-3: Containment Compartments Water Level DVI Line Break with no ADS	41A-163
41A-246	Case 3D-3: Well-Mixed Compartment Hydrogen Concentration DVI Line Break with no ADS	41A-163
41A-247	Case 3D-3: Well-Mixed Compartment Steam Concentration DVI Line Break with no ADS	41A-164
41A-248	Case 3D-3: Well-Mixed Compartment Oxygen Concentration DVI Line Break with no ADS	41A-164
41A-249	Case 3D-3: Confined Compartment Hydrogen Concentration DVI Line Break with no ADS	41A-165
41A-250	Case 3D-3: Confined Compartment Steam Concentration DVI Line Break with no ADS	41A-165
41A-251	Case 3D-3: Confined Compartment Oxygen Concentration DVI Line Break with no ADS	41A-166
41A-252	Case 3D-3: Equivalence Ratio in SG Room DVI Line Break with no ADS	41A-166
41A-253	Case 3D-3: Equivalence Ratio in CMT Room DVI Line Break with no ADS	41A-167
41A-254	Case 3D-3: Equivalence Ratio in IRWST DVI Line Break with no ADS	41A-167
41A-255	Case 3D-3: Equivalence Ratio in PXS DVI Line Break with no ADS	41A-168
41A-256	Case 3D-5: Reactor Coolant System Pressure Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-168
41A-257	Case 3D-5: Core-Exit Gas Temperature Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-169
41A-258	Case 3D-5: Reactor Vessel Mixture Level Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-169
41A-259	Case 3D-5: Hydrogen Generated In-Vessel Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-170
41A-260	Case 3D-5: Containment Pressure Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-170
41A-261	Case 3D-5: Containment Gas Temperature Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-171
41A-262	Case 3D-5: Containment Compartments Water Level Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-171
41A-263	Case 3D-5: Well-Mixed Compartment Hydrogen Concentration Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-172
41A-264	Case 3D-5: Well-Mixed Compartment Steam Concentration Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-172
41A-265	Case 3D-5: Well-Mixed Compartment Oxygen Concentration Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-173

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-266	Case 3D-5: Confined Compartment Hydrogen Concentration Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-173
41A-267	Case 3D-5: Confined Compartment Steam Concentration Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-174
41A-268	Case 3D-5: Confined Compartment Oxygen Concentration Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-174
41A-269	Case 3D-5: Equivalence Ratio in SG Room Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-175
41A-270	Case 3D-5: Equivalence Ratio in CMT Room Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-175
41A-271	Case 3D-5: Equivalence Ratio in IRWST Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-176
41A-272	Case 3D-5: Equivalence Ratio in PXS Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-176
41A-273	Case 1A-3: Reactor Coolant System Pressure FW Failure with Creep of SG Tubes	41A-177
41A-274	Case 1A-3: Core-Exit Gas Temperature FW Failure with Creep of SG Tubes	41A-177
41A-275	Case 1A-3: Reactor Vessel Mixture Level FW Failure with Creep of SG Tubes	41A-178
41A-276	Case 1A-3: Hydrogen Generated In-Vessel FW Failure with Creep of SG Tubes	41A-178
41A-277	Case 1A-3: Containment Pressure FW Failure with Creep of SG Tubes	41A-179
41A-278	Case 1A-3: Containment Gas Temperature FW Failure with Creep of SG Tubes	41A-179
41A-279	Case 1A-3: Containment Compartments Water Level FW Failure with Creep of SG Tubes	41A-180
41A-280	Case 1A-3: Well-Mixed Compartment Hydrogen Concentration FW Failure with Creep of SG Tubes	41A-180
41A-281	Case 1A-3: Well-Mixed Compartment Steam Concentration FW Failure with Creep of SG Tubes	41A-181
41A-282	Case 1A-3: Well-Mixed Compartment Oxygen Concentration FW Failure with Creep of SG Tubes	41A-181
41A-283	Case 1A-3: Confined Compartment Hydrogen Concentration FW Failure with Creep of SG Tubes	41A-182
41A-284	Case 1A-3: Confined Compartment Steam Concentration FW Failure with Creep of SG Tubes	41A-182
41A-285	Case 1A-3: Confined Compartment Oxygen Concentration FW Failure with Creep of SG Tubes	41A-183
41A-286	Case 1A-3: Equivalence Ratio in SG Room FW Failure with Creep of SG Tubes	41A-183
41A-287	Case 1A-3: Equivalence Ratio in CMT Room FW Failure with Creep of SG Tubes	41A-184

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-288	Case 1A-3: Equivalence Ratio in IRWST FW Failure with Creep of SG Tubes	41A-184
41A-289	Case 1A-3: Equivalence Ratio in PXS FW Failure with Creep of SG Tubes	41A-185
41A-290	Case 1A-3a: Reactor Coolant System Pressure Transient with Creep of SG Tubes	41A-185
41A-291	Case 1A-3a: Core-Exit Gas Temperature Transient with Creep of SG Tubes	41A-186
41A-292	Case 1A-3a: Reactor Vessel Mixture Level Transient with Creep of SG Tubes	41A-186
41A-293	Case 1A-3a: Hydrogen Generated In-Vessel Transient with Creep of SG Tubes	41A-187
41A-294	Case 1A-3a: Containment Pressure Transient with Creep of SG Tubes	41A-187
41A-295	Case 1A-3a: Containment Gas Temperature Transient with Creep of SG Tubes	41A-188
41A-296	Case 1A-3a: Containment Compartments Water Level Transient with Creep of SG Tubes	41A-188
41A-297	Case 1A-3a: Well-Mixed Compartment Hydrogen Concentration Transient with Creep of SG Tubes	41A-189
41A-298	Case 1A-3a: Well-Mixed Compartment Steam Concentration Transient with Creep of SG Tubes	41A-189
41A-299	Case 1A-3a: Well-Mixed Compartment Oxygen Concentration Transient with Creep of SG Tubes	41A-190
41A-300	Case 1A-3a: Confined Compartment Hydrogen Concentration Transient with Creep of SG Tubes	41A-190
41A-301	Case 1A-3a: Confined Compartment Steam Concentration Transient with Creep of SG Tubes	41A-191
41A-302	Case 1A-3a: Confined Compartment Oxygen Concentration Transient with Creep of SG Tubes	41A-191
41A-303	Case 1A-3a: Approximate Detonation Cell Width in SG Room Transient with Creep of SG Tubes	41A-192
41A-304	Case 1A-3a: Approximate Detonation Cell Width in CMT Room Transient with Creep of SG Tubes	41A-192
41A-305	Case 1A-3a: Equivalence Ratio in IRWST Transient with Creep of SG Tubes	41A-193
41A-306	Case 1A-3a: Approximate Detonation Cell Width in PXS Transient with Creep of SG Tubes	41A-193
41A-307	Case 1A-4: Reactor Coolant System Pressure FW Failure with Creep of SG Tubes	41A-194
41A-308	Case 1A-4: Core-Exit Gas Temperature FW Failure with Creep of SG Tubes	41A-194
41A-309	Case 1A-4: Reactor Vessel Mixture Level FW Failure with Creep of SG Tubes	41A-195
41A-310	Case 1A-4: Hydrogen Generated In-Vessel FW Failure with Creep of SG Tubes	41A-195

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-311	Case 1A-4: Containment Pressure FW Failure with Creep of SG Tubes	41A-196
41A-312	Case 1A-4: Containment Gas Temperature FW Failure with Creep of SG Tubes	41A-196
41A-313	Case 1A-4: Containment Compartments Water Level FW Failure with Creep of SG Tubes	41A-197
41A-314	Case 1A-4: Well-Mixed Compartment Hydrogen Concentration FW Failure with Creep of SG Tubes	41A-197
41A-315	Case 1A-4: Well-Mixed Compartment Steam Concentration FW Failure with Creep of SG Tubes	41A-198
41A-316	Case 1A-4: Well-Mixed Compartment Oxygen Concentration FW Failure with Creep of SG Tubes	41A-198
41A-317	Case 1A-4: Confined Compartment Hydrogen Concentration FW Failure with Creep of SG Tubes	41A-199
41A-318	Case 1A-4: Confined Compartment Steam Concentration FW Failure with Creep of SG Tubes	41A-199
41A-319	Case 1A-4: Confined Compartment Oxygen Concentration FW Failure with Creep of SG Tubes	41A-200
41A-320	Case 1A-4: Equivalence Ratio in SG Room FW Failure with Creep of SG Tubes	41A-200
41A-321	Case 1A-4: Equivalence Ratio in CMT Room FW Failure with Creep of SG Tubes	41A-201
41A-322	Case 1A-4: Equivalence Ratio in IRWST FW Failure with Creep of SG Tubes	41A-201
41A-323	Case 1A-4: Equivalence Ratio in PXS FW Failure with Creep of SG Tubes	41A-202
41A-324	Case 1A-4a: Reactor Coolant System Pressure Transient with Creep of SG Tubes	41A-202
41A-325	Case 1A-4a: Core-Exit Gas Temperature Transient with Creep of SG Tubes	41A-203
41A-326	Case 1A-4a: Reactor Vessel Mixture Level Transient with Creep of SG Tubes	41A-203
41A-327	Case 1A-4a: Hydrogen Generated In-Vessel Transient with Creep of SG Tubes	41A-204
41A-328	Case 1A-4a: Containment Pressure Transient with Creep of SG Tubes	41A-204
41A-329	Case 1A-4a: Containment Gas Temperature Transient with Creep of SG Tubes	41A-205
41A-330	Case 1A-4a: Containment Compartments Water Level Transient with Creep of SG Tubes	41A-205
41A-331	Case 1A-4a: Well-Mixed Compartment Hydrogen Concentration Transient with Creep of SG Tubes	41A-206
41A-332	Case 1A-4a: Well-Mixed Compartment Steam Concentration Transient with Creep of SG Tubes	41A-206
41A-333	Case 1A-4a: Well-Mixed Compartment Oxygen Concentration Transient with Creep of SG Tubes	41A-207

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-334	Case 1A-4a: Confined Compartment Hydrogen Concentration Transient with Creep of SG Tubes	41A-207
41A-335	Case 1A-4a: Confined Compartment Steam Concentration Transient with Creep of SG Tubes	41A-208
41A-336	Case 1A-4a: Confined Compartment Oxygen Concentration Transient with Creep of SG Tubes	41A-208
41A-337	Case 1A-4a: Approximate Detonation Cell Width in SG Room Transient with Creep of SG Tubes	41A-209
41A-338	Case 1A-4a: Equivalence Ratio in CMT Room Transient with Creep of SG Tubes	41A-209
41A-339	Case 1A-4a: Equivalence Ratio in IRWST Transient with Creep of SG Tubes	41A-210
41A-340	Case 1A-4a: Equivalence Ratio in PXS Transient with Creep of SG Tubes	41A-210
41A-341	Case 1AP-3: Reactor Coolant System Pressure SBLOCA, Failed PRHR and CMTs	41A-211
41A-342	Case 1AP-3: Core-Exit Gas Temperature SBLOCA, Failed PRHR and CMTs	41A-211
41A-343	Case 1AP-3: Reactor Vessel Mixture Level SBLOCA, Failed PRHR and CMTs	41A-212
41A-344	Case 1AP-3: Hydrogen Generated In-Vessel SBLOCA, Failed PRHR and CMTs	41A-212
41A-345	Case 1AP-3: Containment Pressure SBLOCA, Failed PRHR and CMTs	41A-213
41A-346	Case 1AP-3: Containment Gas Temperature SBLOCA, Failed PRHR and CMTs	41A-213
41A-347	Case 1AP-3: Containment Compartments Water Level SBLOCA, Failed PRHR and CMTs	41A-214
41A-348	Case 1AP-3: Well-Mixed Compartment Hydrogen Concentration SBLOCA, Failed PRHR and CMTs	41A-214
41A-349	Case 1AP-3: Well-Mixed Compartment Steam Concentration SBLOCA, Failed PRHR and CMTs	41A-215
41A-350	Case 1AP-3: Well-Mixed Compartment Oxygen Concentration SBLOCA, Failed PRHR and CMTs	41A-215
41A-351	Case 1AP-3: Confined Compartment Hydrogen Concentration SBLOCA, Failed PRHR and CMTs	41A-216
41A-352	Case 1AP-3: Confined Compartment Steam Concentration SBLOCA, Failed PRHR and CMTs	41A-216
41A-353	Case 1AP-3: Confined Compartment Oxygen Concentration SBLOCA, Failed PRHR and CMTs	41A-217
41A-354	Case 1AP-3: Equivalence Ratio in SG Room SBLOCA, Failed PRHR and CMTs	41A-217
41A-355	Case 1AP-3: Equivalence Ratio in CMT Room SBLOCA, Failed PRHR and CMTs	41A-218

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-356	Case 1AP-3: Equivalence Ratio in IRWST SBLOCA, Failed PRHR and CMTs	41A-218
41A-357	Case 1AP-3: Equivalence Ratio in PXS SBLOCA, Failed PRHR and CMTs	41A-219
41A-358	Case 1AP-4: Reactor Coolant System Pressure SBLOCA with Failed PRHR and ADS	41A-219
41A-359	Case 1AP-4: Core-Exit Gas Temperature SBLOCA with Failed PRHR and ADS	41A-220
41A-360	Case 1AP-4: Reactor Vessel Mixture Level SBLOCA with Failed PRHR and ADS	41A-220
41A-361	Case 1AP-4: Hydrogen Generated In-Vessel SBLOCA with Failed PRHR and ADS	41A-221
41A-362	Case 1AP-4: Containment Pressure SBLOCA with Failed PRHR and ADS	41A-221
41A-363	Case 1AP-4: Containment Gas Temperature SBLOCA with Failed PRHR and ADS	41A-222
41A-364	Case 1AP-4: Containment Compartments Water Level SBLOCA with Failed PRHR and ADS	41A-222
41A-365	Case 1AP-4: Well-Mixed Compartment Hydrogen Concentration SBLOCA with Failed PRHR and ADS	41A-223
41A-366	Case 1AP-4: Well-Mixed Compartment Steam Concentration SBLOCA with Failed PRHR and ADS	41A-223
41A-367	Case 1AP-4: Well-Mixed Compartment Oxygen Concentration SBLOCA with Failed PRHR and ADS	41A-224
41A-368	Case 1AP-4: Confined Compartment Hydrogen Concentration SBLOCA with Failed PRHR and ADS	41A-224
41A-369	Case 1AP-4: Confined Compartment Steam Concentration SBLOCA with Failed PRHR and ADS	41A-225
41A-370	Case 1AP-4: Confined Compartment Oxygen Concentration SBLOCA with Failed PRHR and ADS	41A-225
41A-371	Case 1AP-4: Equivalence Ratio in SG Room SBLOCA with Failed PRHR and ADS	41A-226
41A-372	Case 1AP-4: Equivalence Ratio in CMT Room SBLOCA with Failed PRHR and ADS	41A-226
41A-373	Case 1AP-4: Equivalence Ratio in IRWST SBLOCA with Failed PRHR and ADS	41A-227
41A-374	Case 1AP-4: Equivalence Ratio in PXS SBLOCA with Failed PRHR and ADS	41A-227
41B-1	Case 3BR – LLOCA with Accumulator Failure Reactor Coolant System Pressure	41B-3
41B-2	Case 3BR – LLOCA with Accumulator Failure Reactor Vessel Mixture Level	41B-3

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41B-3	Case 3BR – LLOCA with Accumulator Failure Core-Exit Gas Temperature	41B-4
41B-4	Case 3BR – LLOCA with Accumulator Failure Hydrogen Generated In-Vessel	41B-4
41B-5	Case 3BR – LLOCA with Accumulator Failure Containment Pressure	41B-5
41B-6	Case 3BR – LLOCA with Accumulator Failure Containment Gas Temperature	41B-5
41B-7	Case 3BR – LLOCA with Accumulator Failure Containment Compartment Hydrogen Concentration	41B-6
41B-8	Case 3BR – LLOCA with Accumulator Failure Hydrogen Flow Rate Through Break	41B-6
41B-9	Case 3BR – LLOCA with Accumulator Failure Well-Mixed Compartment Hydrogen Concentration	41B-7
41B-10	Case 3BR – LLOCA with Accumulator Failure Well-Mixed Compartment Oxygen Concentration	41B-7
41B-11	Case 3BR – LLOCA with Accumulator Failure Well-Mixed Compartment Steam Concentration	41B-8
41B-12	Case 3BR – LLOCA with Accumulator Failure Approximate Detonation Cell Width in Steam Generator Compartment	41B-8
41B-13	Case 3BR – LLOCA with Accumulator Failure Containment Compartments Water Level	41B-9
41B-14	Case 3BR – LLOCA with Accumulator Failure Hydrogen Flow Rate Through ADS to IRWST	41B-9
41B-15	Case 3BR – LLOCA with Accumulator Failure Confined Compartment Hydrogen Concentration	41B-10
41B-16	Case 3BR – LLOCA with Accumulator Failure Confined Compartment Oxygen Concentration	41B-10
41B-17	Case 3BR – LLOCA with Accumulator Failure Confined Compartment Steam Concentration	41B-11
42-1	AP1000 Containment Fragility at Containment Temperature of 400°F	42-12
42-2	AP1000 Containment Fragility at Containment Temperature of 331°F	42-13
43-1	Plant Damage State Contributions to CDF	43-119
43-2	Containment Event Tree – CET (Sheets 1 – 3)	43-120
43-3	3BE CET (Sheets 1 – 3)	43-123
43-4	3BL CET (Sheets 1 – 3)	43-126
43-5	3BR CET (Sheets 1 – 3)	43-129
43-6	1A CET (Sheets 1 – 3)	43-132
43-7	1AP CET (Sheets 1 – 3)	43-135
43-8	3A CET (Sheets 1 – 3)	43-138
43-9	3C CET (Sheets 1 – 3)	43-141
43-10	3D CET (Sheets 1 – 3)	43-144
43-11	6 CET (Sheets 1 – 3)	43-147

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
43-12	Contribution of PDS to LRF	43-150
43-13	Summary of CET Quantification (Sheets 1 – 2)	43-151
44-1	MAAP4 AP1000 Containment Nodalization	44-12
45-1	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Noble Gases	45-7
45-2	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Cesium Iodide	45-7
45-3	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Tellurium Dioxide	45-8
45-4	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Strontium Oxide	45-8
45-5	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Molybdenum Dioxide	45-9
45-6	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Cesium Hydroxide	45-9
45-7	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Barium Oxide	45-10
45-8	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Dilanthanum Trioxide	45-10
45-9	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Cerium Dioxide	45-11
45-10	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Tin	45-11
45-11	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Tellurium	45-12
45-12	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Uranium Dioxide	45-12
45-13	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Noble Gases	45-13
45-14	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Cesium Iodide	45-13
45-15	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Tellurium Dioxide	45-14
45-16	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Strontium Oxide	45-14
45-17	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Molybdenum Dioxide	45-15
45-18	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Cesium Hydroxide	45-15
45-19	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Barium Oxide	45-16

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
45-20	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Dilanthanum Trioxide	45-16
45-21	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Cerium Dioxide	45-17
45-22	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Tin	45-17
45-23	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Tellurium	45-18
45-24	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Uranium Dioxide	45-18
45-25	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Noble Gases	45-19
45-26	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Cesium Iodide	45-19
45-27	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Tellurium Dioxide	45-20
45-28	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Strontium Oxide	45-20
45-29	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Molybdenum Dioxide	45-21
45-30	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Cesium Hydroxide	45-21
45-31	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Barium Oxide	45-22
45-32	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Dilanthanum Trioxide	45-22
45-33	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Cerium Dioxide	45-23
45-34	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Tin	45-23
45-35	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Tellurium	45-24
45-36	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Uranium Dioxide	45-24
45-37	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Noble Gases	45-25
45-38	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Cesium Iodide	45-25
45-39	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Tellurium Dioxide	45-26
45-40	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Strontium Oxide	45-26

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
45-41	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Molybdenum Dioxide	45-27
45-42	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Cesium Hydroxide	45-27
45-43	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Barium Oxide	45-28
45-44	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Dilanthanum Trioxide	45-28
45-45	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Cerium Dioxide	45-29
45-46	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Tin	45-29
45-47	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Tellurium	45-30
45-48	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Uranium Dioxide	45-30
45-49	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Noble Gases	45-31
45-50	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Cesium Iodide	45-31
45-51	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Tellurium Dioxide	45-32
45-52	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Strontium Oxide	45-32
45-53	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Molybdenum Dioxide	45-33
45-54	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Cesium Hydroxide	45-33
45-55	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Barium Oxide	45-34
45-56	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Dilanthanum Trioxide	45-34
45-57	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Cerium Dioxide	45-35
45-58	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Tin	45-35
45-59	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Tellurium	45-36
45-60	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Uranium Dioxide	45-36
45-61	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Noble Gases	45-37

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
45-62	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Cesium Iodide	45-37
45-63	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Tellurium Dioxide	45-38
45-64	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Strontium Oxide	45-38
45-65	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Molybdenum Dioxide	45-39
45-66	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Cesium Hydroxide	45-39
45-67	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Barium Oxide	45-40
45-68	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Dilanthanum Trioxide	45-40
45-69	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Cerium Dioxide	45-41
45-70	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Tin	45-41
45-71	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Tellurium	45-42
45-72	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Uranium Dioxide	45-42
45-73	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Noble Gases	45-43
45-74	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Cesium Iodide	45-43
45-75	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Tellurium Dioxide	45-44
45-76	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Strontium Oxide	45-44
45-77	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Molybdenum Dioxide	45-45
45-78	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Cesium Hydroxide	45-45
45-79	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Barium Oxide	45-46
45-80	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Dilanthanum Trioxide	45-46
45-81	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Cerium Dioxide	45-47
45-82	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Tin	45-47

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
45-83	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Tellurium	45-48
45-84	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Uranium Dioxide	45-48
45A-1	AP1000 Fission Product Release Fractions for Release Category CFE – Noble Gases	45A-3
45A-2	AP1000 Fission Product Release Fractions for Release Category CFE – CsI and RbI	45A-3
45A-3	AP1000 Fission Product Release Fractions for Release Category CFE – TeO_2	45A-4
45A-4	AP1000 Fission Product Release Fractions for Release Category CFE – SrO	45A-4
45A-5	AP1000 Fission Product Release Fractions for Release Category CFE – MoO_2	45A-5
45A-6	AP1000 Fission Product Release Fractions for Release Category CFE – CsOH and RbOH	45A-5
45A-7	AP1000 Fission Product Release Fractions for Release Category CFE – BaO	45A-6
45A-8	AP1000 Fission Product Release Fractions for Release Category CFE – La_2O_3	45A-6
45A-9	AP1000 Fission Product Release Fractions for Release Category CFE – CeO_2	45A-7
45A-10	AP1000 Fission Product Release Fractions for Release Category CFE – Sb	45A-7
45A-11	AP1000 Fission Product Release Fractions for Release Category CFE – Te_2	45A-8
45A-12	AP1000 Fission Product Release Fractions for Release Category CFE – UO_2	45A-8
45A-13	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – RCS Pressure	45A-9
45A-14	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Reactor Vessel Mixture Level	45A-9
45A-15	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Core-Exit Temperature	45A-10
45A-16	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – In-Vessel Hydrogen Generation	45A-10
45A-17	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Containment Pressure	45A-11
45A-18	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Containment Gas Temperature	45A-11
45A-19	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Containment Hydrogen Concentration	45A-12
45A-20	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Noble Gases Release Fraction	45A-12

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
45A-21	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – CsI and RbI Release Fraction	45A-13
45A-22	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – TeO_2 Release Fraction	45A-13
45A-23	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – SrO Release Fraction	45A-14
45A-24	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – MoO_2 Release Fraction	45A-14
45A-25	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – CsOH and RbOH Release Fraction	45A-15
45A-26	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – BaO Release Fraction	45A-15
45A-27	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – La_2O_3 Release Fraction	45A-16
45A-28	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – CeO_2 Release Fraction	45A-16
45A-29	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Sb Release Fraction	45A-17
45A-30	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Te_2 Release Fraction	45A-17
45A-31	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – UO_2 Release Fraction	45A-18
45A-32	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – Containment Pressure	45A-18
45A-33	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – Noble Gases Release Fraction	45A-19
45A-34	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – CsI and RbI Release Fraction	45A-19
45A-35	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – TeO_2 Release Fraction	45A-20
45A-36	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – SrO Release Fraction	45A-20
45A-37	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – MoO_2 Release Fraction	45A-21
45A-38	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – CsOH and RbOH Release Fraction	45A-21
45A-39	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – BaO Release Fraction	45A-22
45A-40	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – La_2O_3 Release Fraction	45A-22
45A-41	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – CeO_2 Release Fraction	45A-23

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
45A-42	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – Sb Release Fraction	45A-23
45A-43	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – Te_2 Release Fraction	45A-24
45A-44	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – UO_2 Release Fraction	45A-24
49-1	Population Whole Body Dose – BP Source Term, 24 Hours	49-20
49-2	Population Whole Body Dose – BP Source Term 72 Hours	49-20
49-3	Site Boundary Whole Body Dose – BP Source Term, 24 Hours	49-21
49-4	Site Boundary Whole Body Dose – BP Source Term, 72 Hours	49-21
49-5	Site Boundary Red Bone Marrow Dose – BP Source Term, 24 Hours	49-22
49-6	Site Boundary Red Bone Marrow Dose – BP Source Term, 72 Hours	49-22
49-7	Site Boundary Thyroid Dose – BP Source Term, 24 Hours	49-23
49-8	Site Boundary Thyroid Dose – BP Source Term, 72 Hours	49-23
49-9	Population Whole Body Dose – CFE Source Term, 24 Hours	49-24
49-10	Population Whole Body Dose – CFE Source Term, 72 Hours	49-24
49-11	Site Boundary Whole Body Dose – CFE Source Term, 24 Hours	49-25
49-12	Site Boundary Whole Body Dose – CFE Source Term, 72 Hours	49-25
49-13	Site Boundary Red Bone Marrow Dose – CFE Source Term, 24 Hours	49-26
49-14	Site Boundary Red Bone Marrow Dose – CFE Source Term, 72 Hours	49-26
49-15	Site Boundary Thyroid Dose – CFE Source Term, 24 Hours	49-27
49-16	Site Boundary Thyroid Dose – CFE Source Term, 72 Hours	49-27
49-17	Population Whole Body Dose – CFI Source Term, 24 Hours	49-28
49-18	Population Whole Body Dose – CFI Source Term, 72 Hours	49-28
49-19	Site Boundary Whole Body Dose – CFI Source Term, 24 Hours	49-29
49-20	Site Boundary Whole Body Dose – CFI Source Term, 72 Hours	49-29
49-21	Site Boundary Red Bone Marrow Dose – CFI Source Term, 24 Hours	49-30
49-22	Site Boundary Red Bone Marrow Dose – CFI Source Term, 72 Hours	49-30
49-23	Site Boundary Thyroid Dose – CFI Source Term, 24 Hours	49-31
49-24	Site Boundary Thyroid Dose – CFI Source Term, 72 Hours	49-31
49-25	Population Whole Body Dose – CFL Source Term, 24 Hours	49-32
49-26	Population Whole Body Dose – CFL Source Term, 72 Hours	49-32
49-27	Site Boundary Whole Body Dose – CFL Source Term, 24 Hours	49-33
49-28	Site Boundary Whole Body Dose – CFL Source Term, 72 Hours	49-33
49-29	Site Boundary Red Bone Marrow Dose – CFL Source Term, 24 Hours	49-34
49-30	Site Boundary Red Bone Marrow Dose – CFL Source Term, 72 Hours	49-34
49-31	Site Boundary Thyroid Dose – CFL Source Term, 24 Hours	49-35
49-32	Site Boundary Thyroid Dose – CFL Source Term, 72 Hours	49-35
49-33	Population Whole Body Dose – CI Source Term, 24 Hours	49-36
49-34	Population Whole Body Dose – CI Source Term, 72 Hours	49-36
49-35	Site Boundary Whole Body Dose – CI Source Term, 24 Hours	49-37
49-36	Site Boundary Whole Body Dose – CI Source Term, 72 Hours	49-37

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
49-37	Site Boundary Red Bone Marrow Dose – CI Source Term, 24 Hours	49-38
49-38	Site Boundary Red Bone Marrow Dose – CI Source Term, 72 Hours	49-38
49-39	Site Boundary Thyroid Dose – CI Source Term, 24 Hours	49-39
49-40	Site Boundary Thyroid Dose – CI Source Term, 72 Hours	49-39
49-41	Population Whole Body Dose – DIRECT Source Term, 24 Hours	49-40
49-42	Population Whole Body Dose – DIRECT Source Term, 72 Hours	49-40
49-43	Site Boundary Whole Body Dose – DIRECT Source Term, 24 Hours	49-41
49-44	Site Boundary Whole Body Dose – DIRECT Source Term, 72 Hours	49-41
49-45	Site Boundary Red Bone Marrow Dose – DIRECT Source Term, 24 Hours	49-42
49-46	Site Boundary Red Bone Marrow Dose – DIRECT Source Term, 72 Hours	49-42
49-47	Site Boundary Thyroid Dose – DIRECT Source Term, 24 Hours	49-43
49-48	Site Boundary Thyroid Dose – DIRECT Source Term, 72 Hours	49-43
49-49	Population Whole Body Dose – IC Source Term, 24 Hours	49-44
49-50	Population Whole Body Dose – IC Source Term, 72 Hours	49-44
49-51	Site Boundary Whole Body Dose – IC Source Term, 24 Hours	49-45
49-52	Site Boundary Whole Body Dose – IC Source Term, 72 Hours	49-45
49-53	Site Boundary Red Bone Marrow Dose – IC Source Term, 24 Hours	49-46
49-54	Site Boundary Red Bone Marrow Dose – IC Source Term, 72 Hours	49-46
49-55	Site Boundary Thyroid Dose – IC Source Term, 24 Hours	49-47
49-56	Site Boundary Thyroid Dose – IC Source Term, 72 Hours	49-47
49-57	Overall Dose Risk – Site Boundary Whole Body EDE Dose, 24 Hours	49-48
49-58	Overall Dose Risk – Site Boundary Red Bone Marrow Dose (Acute), 24 Hours	49-49
51-1	AP1000 Base Core Damage Frequency Uncertainty Analysis	51-11
51-2	AP1000 Sensitivity Case Uncertainty Analysis	51-11
51B-1	Distribution for Plant Core Damage Frequency	51B-2
51B-2	Safety Injection Line Break	51B-2
51B-3	Large LOCA	51B-3
51B-4	Large Spurious ADS Actuation	51B-3
51B-5	Small LOCA	51B-4
51B-6	Medium LOCA	51B-4
51B-7	Reactor Vessel Rupture	51B-5
51B-8	Steam Generator Tube Rupture	51B-5
51B-9	Safety Injection Line Break – Sequence 7	51B-6
51B-10	Large LOCA – Sequence 9	51B-6
51B-11	Spurious ADS – Sequence 8	51B-7
51B-12	Safety Injection Line Break – Sequence 8d	51B-7
51B-13	Reactor Vessel Rupture – Sequence 2	51B-8
51B-14	Small LOCA – Sequence 5	51B-8
51B-15	Medium LOCA – Sequence 5	51B-9
51B-16	Small LOCA – Sequence 12	51B-9
51B-17	Medium LOCA – Sequence 12	51B-10

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
51B-18	Spurious ADS – Sequence 9	51B-10
51B-19	Spurious ADS – Sequence 7	51B-11
51B-20	Safety Injection Line Break – Sequence 3	51B-11
51B-21	SGTR Event – Sequence 41	51B-12
51B-22	ATWS Precursor with no MFW – Sequence 23	51B-12
51B-23	Small LOCA – Sequence 9	51B-13
51B-24	Medium LOCA – Sequence 9	51B-13
51B-25	SGTR Event – Sequence 13	51B-14
51B-26	Large LOCA – Sequence 8	51B-14
51B-27	CMT Line Break – Sequence 5	51B-15
54-1	Loss of Offsite Power During Hot/Cold Shutdown (RCS Filled) Event Tree (Sheets 1 – 2)	54-138
54-2	Loss of RNS During Hot/Cold Shutdown (RCS Filled) Event Tree	54-140
54-3	Loss of CCW/SW During Hot/Cold Shutdown (RCS Filled) Event Tree	54-141
54-4	LOCA/RNS-V024 Opens During Hot/Cold Shutdown (RCS Filled) Event Tree	54-142
54-5	LOCA/RNS Pipe Rupture During Hot/Cold Shutdown (RCS Filled) Event Tree	54-143
54-6	Overdraining of Reactor Coolant System During Draindown to Mid-loop Event Tree	54-144
54-7	Loss of Offsite Power During RCS drained Condition Event Tree	54-145
54-8	Loss of RNS During RCS drained Condition Event Tree	54-146
54-9	Loss of CCW/SW During RCS drained Condition Event Tree	54-147
54-10	LOCA/RNS-V024 Opens During RCS drained Condition Event Tree	54-148
55-1	Seismic Initiating Event Hierarchy Tree	55-30
57-1	Example Event Tree Model	57-125
57-2	Contribution of Plant Areas to Fire CDF	57-126
57-3	Contribution of Fire Area to Fire CDF	57-127
57A-1	DAS-ACT Fault Tree	57A-37
57C-1	0000 AF 00 Yard Building (Including Transformer Yard)	57C-12
57C-2	1200 AF 01 RCA of Auxiliary Building (All Zones)	57C-13
57C-3	1200 AF 02 New Fuel and Used Fuel Storage, Waste Disposal Container (All Zones)	57C-14
57C-4	1200 AF 03 Corridors 100′ & 117′ 6″	57C-15
57C-5	1201 AF 02 Division B Batteries/DC Equipment Room/Instrumentation and Control	57C-16
57C-6	1201 AF 03 Division D DC Equipment/I&C	57C-17
57C-7	1201 AF 04 Division B/D VBS Equipment	57C-18
57C-8	1201 AF 05 MSIV Compartment A	57C-19
57C-9	1201 AF 06 MSIV Compartment B	57C-20

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
57C-10	1202 AF 02 Northeast Elevator Shaft	57C-21
57C-11	1202 AF 03 Division C Batteries/DC Equipment/I&C Room/ RCP Trip Switchgear Room/I&C Penetration Room	57C-22
57C-12	1202 AF 04 Division A Electrical Equipment/Battery Room/I&C Room	57C-23
57C-13	1204 AF 01 RNS Pump Room B	57C-24
57C-14	1204 AF 03 South Shield Building Elevator Shaft	57C-25
57C-15	1205 AF 02 Southeast Elevator Shaft	57C-26
57C-16	1210 AF 01 Corridor/Spare Battery Room/Spare Room/Spare Battery Charger Room	57C-27
57C-17	1220 AF 01 Division B RCP Trip Switchgear/Spare Room/Corridor 82' 6"	57C-28
57C-18	1220 AF 02 Lower Annulus Valve Area	57C-29
57C-19	1230 AF 01 Corridor Division A, B, C, D and Remote Shutdown Workstation	57C-30
57C-20	1230 AF 02 Non-Class 1E Electrical Compartment - 100'	57C-31
57C-21	1232 AF 01 Remote Shutdown Workstation	57C-32
57C-22	1240 AF 01 Non-Class 1E Electrical Compartment - 117'	57C-33
57C-23	1242 AF 02 Division A Penetration Area	57C-34
57C-24	1243 AF 01 Reactor Trip Switchgear I	57C-35
57C-25	1243 AF 02 Reactor Trip Switchgear II	57C-36
57C-26	1250 AF 01 Nonradioactive Ventilation System	57C-37
57C-27	2000 AF 01 Turbine Building Floor	57C-38
57C-28	2003 AF 01 Auxiliary Boiler Equipment Room	57C-39
57C-29	2009 AF 02 Elevator Machine Room	57C-40
57C-30	2033 AF 02 Motor-Driven Fire Pump Room	57C-41
57C-31	2040 AF 01 Clean and Dirty Lube Oil Storage	57C-42
57C-32	2043 AF 01 Chemical Laboratory	57C-43
57C-33	2050 AF 01 Lube Oil Conditioner Room	57C-44
57C-34	2052 AF 01 Southwest 6.9KV Switchgear Room	57C-45
57C-35	2053 AF 01 Electrical Equipment Room	57C-46
57C-36	2053 AF 02 Northwest 6.9KV Switchgear Room	57C-47
57C-37	4003 AF 01 Demineralized Water Deoxygenating Room/ Air Handling Equipment Rooms	57C-48
57C-38	4031 AF 01 Battery Room and Battery Charger Room 1	57C-49
57C-39	4031 AF 02 Battery Room and Battery Charger Room 2/ Computer Room B/Shift Turnover Room	57C-50
57C-40	4031 AF 05 Corridor/Spare Battery Room/Spare Room/ Spare Battery Charger Room	57C-51
57C-41	4031 AF 06 Central Alarm Station/Security Room 1	57C-52
57C-42	4032 AF 01 Decontamination Room, Non-Radiological and Radiological Controlled Area Entry/Exit Area	57C-53
57C-43	4032 AF 02 Containment Access Corridor Elevation 107' 2"	57C-54
57C-44	4033 AF 01 Hot Machine Shop	57C-55
57C-45	4034 AF 01 General Offices	57C-56
57C-46	4041 AF 01 Conference Rooms/Computer Room A/Corridor	57C-57

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
57C-47	4041 AF 02 Corridor/Restroom	57C-58
57C-48	4042 AF 01 Non-Class 1E Switchgear #1	57C-59
57C-49	4042 AF 02 Non-Class 1E Switchgear #2	57C-60
57C-50	4052 AF 01 Staging and Storage Area/Containment Air Filtration Exhaust Rooms A & B	57C-61
57C-51	5031 AF 01 Radwaste Building	57C-62
57C-52	6030 AF 01 Diesel Generator Room A	57C-63
57C-53	6030 AF 02 Diesel Generator Room B	57C-64
57C-54	6030 AF 03 Fuel Oil Day Tank Room A	57C-65
57C-55	6030 AF 04 Fuel Oil Day Take Room B	57C-66
57C-56	1100 AF 11204 Reactor Coolant Drain Tank Room	57C-67
57C-57	1100 AF 11206 Accumulator Room A	57C-68
57C-58	1100 AF 11207 Accumulator Room B	57C-69
57C-59	1100 AF 11208 RNS Valve Room	57C-70
57C-60	1100 AF 11300A Maintenance Floor (SE Quadrant Access)	57C-71
57C-61	1100 AF 11300B Maintenance Floor (NNE Quadrant) and RCDT Access	57C-72
57C-62	1100 AF 11301 SG Compartment 1	57C-73
57C-63	1100 AF 11302 SG Compartment 2	57C-74
57C-64	1100 AF 11303 Pressurizer Compartment	57C-75
57C-65	1100 AF 11303A ADS Lower Valve Area	57C-76
57C-66	1100 AF 11303B ADS Upper Valve Area	57C-77
57C-67	1100 AF 11500 Operating Deck	57C-78
57C-68	1200 AF 12341 Middle Annulus	57C-79
57C-69	1200 AF 12555 Main Control Room Emergency Habitability System Air Storage/Operating Deck Staging Area	57C-80
59-1	Contribution of Initiating Events to Core Damage	59-99
59-2	24-Hour Site Boundary Dose Cumulative Frequency Distribution	59-100

REVISION 1 CHANGE ROADMAP

Section	Page No.	Type of Change[1]
AP1000 Document Cover Sheet		Editorial
Probabilistic Risk Assessment, Title Page		Editorial
T of C	i through c	Editorial
Revision 1 Change Roadmap	ci through civ	Editorial
1	1-6	Editorial
3	3-4	Editorial
Attachment 4B	4B-24	720.027
Attachment 4B	4B-74	Editorial
6	6-9	720.025 (720.029)
6	6-12	720.025 (720.029) Editorial
6	6-16	Editorial
6	6-17	720.026
6	6-19 through 6-53	720.023 (720.024) (720.097)
6	6-62	720.031
6	6-69	720.025 (720.029)
6	6-71	720.025 (720.029)
8	8-23 and 8-25	Editorial
12	12-6	720.033
12	12-30	720.033
26	26-11 and 26-12	Editorial
28	28-10 and 28-11	Editorial
29	29-17	720.033
29	29-21	720.033

REVISION 1 CHANGE ROADMAP (Cont.)

Section	Page No.	Type of Change[1]
30	30-35 and 30-36	720.068
30	30-66 and 30-67	720.068
30	30-110	Editorial
34	34-1	720.042
34	34-4 and 34-5	720.042
34	34-6 and 34-7	720.042 Editorial
34	34-8 through 34-243	720.042
35	35-28	720.043
39	39-4	720.073 Editorial
39	39-5	720.088 (720.048, 720.074, 720.083, 720.089)
39	39-6	720.088 720.073 (720.048, 720.074, 720.083, and 720.089)
39	39-12	Editorial
39	39-19	Editorial
39	39-20	720.073
39	39-21	Editorial 720.088
Attachment 39A	39A-1 through 39A-40	720.088 (720.048, 720.074, 720.083, and 720.089)
41	41-6	720.042
41	41-15	720.093
41	41-20	720.054
41	41-31	Editorial
Attachment 41A	41A-1 through 41A-228	720.042
Attachment 41B	41B-1 through 41B-11	720.093
43	43-126 and 43-127	Editorial
Attachment 43C	43C-1 and 43C-2	720.043
44	44-7	Editorial

REVISION 1 CHANGE ROADMAP (Cont.)

Section	Page No.	Type of Change[1]
45	45-1 through 45-3	470.013 (470.012)
45	45-4	470.013 (470.012) Editorial
45	45-5 through 45-48	470.013 (470.012)
49	49-1	720.056
49	49-4 through 49-6	720.056
49	49-9 through 49-49	720.056
50	50-14	720.034
55	55-5	DSER OI 19A.2-5 (R1)
55	55-7	DSER OI 19A.2-4 (R1) DSER OI 19A.2-5 (R1) DSER OI 19A.2-6 (R1)
55	55-20	DSER OI 19A.2-6 (R1)
57	57-1 through 57-109	Letter DCP/NRC1515
Attachment 57A	57A-1 through 57A-37	Letter DCP/NRC1515
Attachment 57B	57B-1 through 57B-6	Letter DCP/NRC1515
Attachment 57C	57C-1 through 57C-80	Letter DCP/NRC1515
Attachment 57D	57D-1 through 57D-7	Letter DCP/NRC1515
59	59-20 and 59-21	Editorial
59	59-23 through 59-25	Letter DCP/NRC1515
59	59-26	720.056
59	59-28	Editorial
59	59-29 through 59-32	720.038
59	59-34 through 59-38	720.038
59	59-72	Editorial
59	59-73	Technical
59	59-83	Editorial
59	59-75 through 59-96	720.038
59	59-97	720.038 720.066
59	59-98	720.038
59	59-100	Technical

REVISION 1 CHANGE ROADMAP (Cont.)

Section	Page No.	Type of Change[(1)]
Appendix A	A-1 through A-166	720.007 720.010 720.011 720.012 720.013 720.015 720.016
Appendix B	B-6	720.058
Appendix B	B-13	720.076
Appendix D	D-14 and D-15	720.078
Appendix D	D-31	720.078
Appendix D	D-35 and D-36	Technical
Appendix D	D-37 through D-58	720.078

1. Changes incorporated as a result of Westinghouse responses to NRC Request for Additional Information (RAI) identified by RAI number. RAI number in parenthesis contains a reference to RAI response listed above.

REVISION 2 CHANGE ROADMAP

Section	Page No.	Type of Change[1]
AP1000 Document Cover Sheet		Editorial
Probabilistic Risk Assessment, Title Page		Editorial
T of C	i through c	Editorial
Revision 2 Change Roadmap	cv through cvii	Editorial
6	6-17	720.026 (R1)
6	6-28	720.024 (R1)
6	6-32 and 6-33	720.024 (R1)
6	6-37 through 6-39	720.024 (R1)
6	6-41	720.024 (R1)
6	6-50 through 6-53	720.024 (R1)
6	6-69	720.029 (R1)
24	24-17	720.046 (R1)
24	24-22 and 24-23	720.046 (R1)
24	24-27	720.046 (R1)
30	30-26a through 30-28	720.029 (R1)
35	35-28	720.043 (R1)
43	43-9 and 43-9a	720.039 (R2)
43	43-9b	Editorial
43	43-10a	720.039 (R2)
43	43-10b	Editorial
43	43-93a through 43-93w	720.039 (R2)
43	93-93x	Editorial
Attachment 43C	43C-2	720.043 (R1)
50	50-1	
50	50-1a and 50-1b	Editorial
50	50-14	720.039 (R2)
50	50-14a	720.039 (R2)
50	50-14b	Editorial
54	54-1 through 54-131	720.038 (R2)

REVISION 2 CHANGE ROADMAP (Cont.)

Section	Page No.	Type of Change[1]
56	56-1	720.038 (R1) Editorial
56	56-9	Editorial
56	56-17 and 56-18	Editorial
56	56-20	Editorial
56	56-36 and 56-37	Editorial
56	56-38	Editorial 720.038 (R1)
56	56-38a through 56-38k	720.038 (R1)
56	56-38l	Editorial
56	56-47 through 56-49	Editorial
56	56-51	Editorial
56	56-54 and 56-55	720.038 (R1)
57	57-14 and 57-15	280.011 (R1)
57	57-15a and 57-15b	Editorial
59	59-23 and 59-23a	720.038 (R1)
59	59-23b	Editorial
59	59-34	720.038 (R1)
59	59-72	720.038 (R1)
Appendix A	A-12	Editorial
Appendix A	A-24 through A-26	440.014 (R1)
Appendix A	A-26a	440.014 (R1) 720.024 (R1)
Appendix A	A-26b	Editorial
Appendix A	A-27	720.012 (R1)
Appendix A	A-31	720.012 (R1)
Appendix A	A-33	720.010 (R1)
Appendix A	A-33a and A-33b	Editorial
Appendix A	A-44	Editorial
Appendix A	A-57 through A-61	720.012 (R1)
Appendix A	A-63	720.012 (R1)
Appendix A	A-66	720.012 (R1)
Appendix A	A-103a through A-103b	440.014 (R1)
Appendix A	A-103c and A-103d	720.012 (R1)
Appendix A	A-151 and A-152	720.013 (R1)
Appendix A	A-165 and A-166	720.013 (R1)

REVISION 2 CHANGE ROADMAP (Cont.)

Section	Page No.	Type of Change[1]
Appendix D	D-13 and D-14	720.080 (R1)
Appendix D	D-35 and D-36	720.080 (R1)

1. Changes incorporated as a result of Westinghouse responses to NRC Request for Additional Information (RAI) identified by RAI number.

REVISION 3 CHANGE ROADMAP

Section	Page No.	Type of Change[(1)]
AP1000 Document Cover Sheet		Editorial
Probabilistic Risk Assessment, Title Page		Editorial
T of C	i through cii	Editorial
Revision 3 Change Roadmap	cx	Editorial
Attachment 45A	45A-1 through 45A-24	Technical
57	57-1 and 57-2	Editorial
57	57-4	Editorial
57	57-11 and 57-12	Editorial
57	57-17	Editorial
57	57-22 and 57-23	Editorial
57	57-30 through 57-39	720.038 (R1)
57	57-40	720.038 (R1) Editorial
57	57-41 and 57-42	720.038 (R1)
57	57-78	Editorial
57	57-117 through 57-124	720.038 (R1)
Appendix A	A-23 through A-25	720.009 (R2)
Appendix A	A-105 through A-111	720.009 (R2)

1. Changes incorporated as a result of Westinghouse responses to NRC Request for Additional Information (RAI) identified by RAI number.

REVISION 4 CHANGE ROADMAP

Section	Page No.	Type of Change[(1)]
AP1000 Document Cover Sheet		Editorial
Probabilistic Risk Assessment, Title Page		Editorial
T of C	i through ciii	Editorial
Revision 4 Change Roadmap	cxii and cxiii	Editorial
34	34-4	Editorial
34	34-16	DSER OI 19.1.10.3-1 (R1)
34	34-19 through 34-21	DSER OI 19.1.10.3-1 (R1)
34	34-50 and 34-51	DSER OI 19.1.10.3-1 (R1)
34	34-247 through 34-264	DSER OI 19.1.10.3-1 (R1)
42	42-3	DSER OI 19.2.6-1 (R1)
42	42-6	DSER OI 19.2.6-3
42	42-7 and 42-8	Editorial
43	43-10	Editorial
43	43-13	Editorial
Attachment 43D	43D-1	DSER OI 19.1.3.2-1
Attachment 43E	43E-1 and 43E-2	DSER OI 19.1.3.2-2
45	45-2	DSER OI 19.1.10.3-1 (R1)
45	45-5 and 45-6	DSER OI 19.1.10.3-1 (R1)
45	45-13 through 45-18	DSER OI 19.1.10.3-1 (R1)
45	45-31 through 45-42	DSER OI 19.1.10.3-1 (R1)
Attachment 45A	45A-1 through 45A-24	Deleted per DSER OI 19.1.10.3-1 (R1)
49	49-6	DSER OI 19.1.10.3-1 (R1)
49	49-9 through 49-49	DSER OI 19.1.10.3-1 (R1)
50	50-1	Editorial
54	54-9	DSER OI 19.1.10.2-3
54	54-12	DSER OI 19.1.10.2-3
54	54-13	Editorial
54	54-22 through 54-71	Editorial
54	54-76 through 54-80	DSER OI 19.1.10.2-5 Editorial

REVISION 4 CHANGE ROADMAP (Cont.)

Section	Page No.	Type of Change[1]
54	54-83 through 54-110	DSER OI 19.1.10.2-5 Editorial
54	54-112 through 54-118	DSER OI 19.1.10.2-5 Editorial
54	54-121 through 54-137	DSER OI 19.1.10.2-3
55	55-5	DSER OI 19A.2-5 (R1)
55	55-7	DSER OI 19A.2-4 (R1) DSER OI 19A.2-5 (R1) DSER OI 19A.2-6 (R1) Editorial
55	55-16 through 55-18	Editorial
55	55-20	DSER OI 19A.2-6 (R1)
55	55-25 through 55-29	Editorial
56	56-46	DSER OI 19.3.10-1
59	59-26	DSER OI 19.1.10.3-1 (R1)
59	59-37	DSER OI 19A.3-2 (R1)
59	59-45 through 59-70	Editorial
59	59-73	DSER OI 19.1.10.3-1 (R1)
59	59-74	Editorial
59	59-100	DSER OI 19.1.10.3-1 (R1)

1. Changes incorporated as a result of Draft Safety Evaluation Report (DSER) Open Item (OI) Response identified by DSER OI number.

Volume 3

TABLE OF CONTENTS

Section	Title	Page
	LIST OF TABLES	xxxv
	LIST OF FIGURES	liii
	REVISION 1 CHANGE ROADMAP	civ
	REVISION 2 CHANGE ROADMAP	cviii
	REVISION 3 CHANGE ROADMAP	cxi
	REVISION 4 CHANGE ROADMAP	cxii
CHAPTER 1	INTRODUCTION	
1.1	Introduction	1-1
	1.1.1 Background and Overview	1-1
	1.1.2 Objectives	1-1
	1.1.3 Technical Scope	1-2
	1.1.4 Project Methodology Overview	1-3
	1.1.5 Results	1-4
	1.1.6 Plant Definition	1-6
	1.1.7 References	1-6
CHAPTER 2	INTERNAL INITIATING EVENTS	
2.1	Introduction	2-1
2.2	Internal Initiating Event Identification and Categorization	2-1
	2.2.1 Logic Diagram for Internal Initiating Events	2-2
	2.2.2 Loss-of-Coolant Accidents	2-3
	2.2.3 Transients	2-6
	2.2.4 Anticipated Transient without Scram	2-8
	2.2.5 AP1000 Specific Initiating Event Analysis	2-10
	2.2.6 Consequential Events	2-19
	2.2.7 Summary of Internal Initiating Event Categories	2-19
2.3	Internal Initiating Event Frequency Quantification	2-20
	2.3.1 Quantification of LOCA Initiating Event Frequencies	2-20
	2.3.2 Quantification of Transient Initiating Event Frequencies	2-24
	2.3.3 ATWS Precursor Initiating Event Frequency	2-27
	2.3.4 Summary of Internal Initiating Event Frequencies	2-27
2.4	References	2-27
ATTACHMENT 2A	QUANTIFICATION OF LOCA INITIATING EVENT FREQUENCIES	
2A-1	Primary System Pipe Break Frequencies	2A-1
2A-2	Reactor Cooling System Leakage Initiating Event Frequency	2A-1
2A-3	Steam Generator Tube Rupture Initiating Event Frequency	2A-1
2A-4	Quantification of Stuck-Open Pressurizer Safety Valve, Accumulator Interface Break, and IRWST Interface Break	2A-1
2A-5	Initiating Events Review Data Summary and INPO Data	2A-1

TABLE OF CONTENTS (Cont.)

Section	Title	Page
ATTACHMENT 2B	QUANTIFICATION OF TRANSIENT INITIATING EVENT FREQUENCIES	
2B-1	Secondary Side Line Breaks & Stuck-open Main Steam Line Safety Valve Frequencies	2B-1
CHAPTER 3	MODELING OF SPECIAL INITIATORS	
3.1	Introduction	3-1
3.2	Ground Rules for Special Initiating Event Analysis	3-1
3.3	Loss of Component Cooling Water System/Service Water System Initiating Event	3-1
3.4	Loss of Compressed and Instrument Air System Initiating Event	3-2
3.5	Spurious Actuation of Automatic Depressurization System	3-2
3.5.1	Evaluation of Automatic Depressurization System Spurious Actuation	3-3
CHAPTER 4	EVENT TREE MODELS	
4.1	Introduction	4-1
4.2	Large LOCA Event Tree Model	4-1
4.2.1	Event Description	4-1
4.2.2	Event Tree Model and its Nodes	4-2
4.2.3	Event Tree Success Criteria and Core Damage Categories	4-4
4.2.4	Operator Actions	4-4
4.2.5	Transfers and Consequential Events	4-4
4.3	Large Spurious ADS Event Tree Model	4-4
4.3.1	Event Description	4-4
4.3.2	Event Tree Model and its Nodes	4-4
4.3.3	Event Tree Success Criteria and Core Damage Categories	4-6
4.3.4	Operator Actions	4-6
4.3.5	Transfers and Consequential Events	4-6
4.4	Medium LOCA Event Tree Model	4-6
4.4.1	Event Description	4-6
4.4.2	Event Tree Model and its Nodes	4-7
4.4.3	Event Tree Success Criteria and Core Damage Categories	4-9
4.4.4	Operator Actions	4-9
4.4.5	Transfers and Consequential Events	4-10
4.5	Core Makeup Tank Line Break Event Tree Model	4-10
4.5.1	Event Description	4-10
4.5.2	Event Tree Model and its Nodes	4-10
4.5.3	Event Tree Success Criteria and Core Damage Categories	4-13
4.5.4	Operator Actions	4-13
4.5.5	Transfers and Consequential Events	4-13
4.6	Safety Injection Line Break Event Tree Model	4-13
4.6.1	Event Description	4-13
4.6.2	Event Tree Model and its Nodes	4-14
4.6.3	Event Tree Success Criteria and Core Damage Categories	4-16

TABLE OF CONTENTS (Cont.)

Section	Title		Page
	4.6.4	Operator Actions	4-16
	4.6.5	Transfers and Consequential Events	4-17
4.7	Small LOCA Event Tree Model		4-17
	4.7.1	Event Description	4-17
	4.7.2	Event Tree Model and its Nodes	4-17
	4.7.3	Event Tree Success Criteria and Core Damage Categories	4-20
	4.7.4	Operator Actions	4-20
	4.7.5	Transfers and Consequential Events	4-21
4.8	RCS Leak Event Tree Model		4-21
	4.8.1	Event Description	4-21
	4.8.2	Event Tree Model and its Nodes	4-21
	4.8.3	Event Tree Success Criteria	4-22
	4.8.4	Operator Actions	4-22
	4.8.5	Transfers and Consequential Events	4-22
	4.8.6	Core Damage Categories	4-23
4.9	PRHR Tube Rupture Event Tree Model		4-23
	4.9.1	Event Description	4-23
	4.9.2	Event Tree Model and its Nodes	4-23
	4.9.3	Event Tree Success Criteria	4-24
	4.9.4	Operator Actions	4-24
	4.9.5	Transfers and Consequential Events	4-24
	4.9.6	Core Damage Categories	4-24
4.10	Steam Generator Tube Rupture Event Tree Model		4-25
	4.10.1	Event Description	4-25
	4.10.2	Event Tree Model and its Nodes	4-27
	4.10.3	Event Tree Success Criteria and Core Damage Categories	4-33
	4.10.4	Operator Actions	4-33
	4.10.5	Transfers and Consequential Events	4-33
4.11	Reactor Vessel Rupture Event Tree Model		4-34
	4.11.1	Event Description	4-34
	4.11.2	Event Tree Model and its Nodes	4-34
	4.11.3	Event Tree Success Criteria	4-34
	4.11.4	Operator Actions	4-34
	4.11.5	Transfers and Consequential Events	4-34
	4.11.6	Core Damage Categories	4-34
4.12	Interfacing System LOCA Event Tree Model		4-34
	4.12.1	Event Description	4-34
	4.12.2	Event Tree Model and its Nodes	4-35
	4.12.3	Event Tree Success Criteria	4-35
	4.12.4	Operator Actions	4-35
	4.12.5	Transfers and Consequential Events	4-35
	4.12.6	Core Damage Categories	4-35

TABLE OF CONTENTS (Cont.)

Section	Title	Page
4.13	Transients With MFW Event Tree Model	4-35
4.13.1	Event Description	4-35
4.13.2	Event Tree Model and its Nodes	4-37
4.13.3	Event Tree Success Criteria and Core Damage Categories	4-41
4.13.4	Operator Actions	4-41
4.13.5	Transfers and Consequential Events	4-42
4.14	Transients With Loss of RCS Flow Event Tree Model	4-42
4.14.1	Event Description	4-42
4.14.2	Event Tree Model and its Nodes	4-42
4.14.3	Event Tree Success Criteria and Core Damage Categories	4-46
4.14.4	Operator Actions	4-46
4.14.5	Transfers and Consequential Events	4-46
4.15	Transients With Loss of MFW to One Steam Generator Event Tree Model	4-46
4.15.1	Event Description	4-46
4.15.2	Event Tree Model and its Nodes	4-47
4.15.3	Event Tree Success Criteria and Core Damage Categories	4-50
4.15.4	Operator Actions	4-50
4.15.5	Transfers and Consequential Events	4-51
4.16	Transients With Core Power Excursion Event Tree Model	4-51
4.16.1	Event Description	4-51
4.16.2	Event Tree Model and its Nodes	4-51
4.16.3	Event Tree Success Criteria and Core Damage Categories	4-55
4.16.4	Operator Actions	4-55
4.16.5	Transfers and Consequential Events	4-55
4.17	Transients With Loss of CCW/SW Event Tree Model	4-56
4.17.1	Event Description	4-56
4.17.2	Event Tree Model and its Nodes	4-56
4.17.3	Event Tree Success Criteria and Core Damage Categories	4-59
4.17.4	Operator Actions	4-59
4.17.5	Transfers and Consequential Events	4-60
4.18	Loss of Main Feedwater Event Tree Model	4-60
4.18.1	Event Description	4-60
4.18.2	Event Tree Model and its Nodes	4-62
4.18.3	Event Tree Success Criteria and Core Damage Categories	4-65
4.18.4	Operator Actions	4-65
4.18.5	Transfers and Consequential Events	4-66
4.19	Loss of Condenser Event Tree Model	4-66
4.19.1	Event Description	4-66
4.19.2	Event Tree Model and its Nodes	4-66
4.19.3	Event Tree Success Criteria and Core Damage Categories	4-70
4.19.4	Operator Actions	4-70
4.19.5	Transfers and Consequential Events	4-70

TABLE OF CONTENTS (Cont.)

Section	Title	Page
4.20	Loss of Compressed Air Event Tree Model	4-70
	4.20.1 Event Description	4-70
	4.20.2 Event Tree Model and its Nodes	4-71
	4.20.3 Event Tree Success Criteria and Core Damage Categories	4-74
	4.20.4 Operator Actions	4-74
	4.20.5 Transfers and Consequential Events	4-75
4.21	Loss of Offsite Power Event Tree Model	4-75
	4.21.1 Event Description	4-75
	4.21.2 Event Tree Model and its Nodes	4-75
	4.21.3 Event Tree Success Criteria and Core Damage Categories	4-79
	4.21.4 Operator Actions	4-79
	4.21.5 Transfers and Consequential Events	4-80
4.22	Main Steam Line Break Downstream of MSIVs Event Tree Model	4-80
	4.22.1 Event Description	4-80
	4.22.2 Event Tree Model and its Nodes	4-81
	4.22.3 Event Tree Success Criteria and Core Damage Categories	4-84
	4.22.4 Operator Actions	4-84
	4.22.5 Transfers and Consequential Events	4-85
4.23	Main Steam Line Break Upstream of MSIVs Event Tree Model	4-85
	4.23.1 Event Description	4-85
	4.23.2 Event Tree Model and its Nodes	4-85
	4.23.3 Event Tree Success Criteria and Core Damage Categories	4-89
	4.23.4 Operator Actions	4-89
	4.23.5 Transfers and Consequential Events	4-90
4.24	Stuck-Open Secondary Side Safety Valve Event Tree Model	4-90
	4.24.1 Event Description	4-90
	4.24.2 Event Tree Model and its Nodes	4-91
	4.24.3 Event Tree Success Criteria and Core Damage Categories	4-94
	4.24.4 Operator Actions	4-94
	4.24.5 Transfers and Consequential Events	4-94
4.25	ATWS Precursors Without MFW Event Tree Model	4-95
	4.25.1 Event Description	4-95
	4.25.2 Event Tree Model and its Nodes	4-96
	4.25.3 Event Tree Success Criteria and Core Damage Categories	4-101
	4.25.4 Operator Actions	4-101
	4.25.5 Transfers and Consequential Events	4-101
4.26	ATWS Precursor with SI Event Tree Model	4-101
	4.26.1 Event Description	4-101
	4.26.2 Event Tree Model and its Nodes	4-102
	4.26.3 Event Tree Success Criteria and Core Damage Categories	4-106
	4.26.4 Operator Actions	4-106
	4.26.5 Transfers and Consequential Events	4-106

TABLE OF CONTENTS (Cont.)

Section	Title	Page
4.27	ATWS Precursor Transients with MFW Event Tree Model	4-106
4.27.1	Event Description	4-106
4.27.2	Event Tree Model and its Nodes	4-107
4.27.3	Event Tree Success Criteria and Core Damage Categories	4-110
4.27.4	Operator Actions	4-111
4.27.5	Transfers and Consequential Events	4-111
ATTACHMENT 4A	EVENT TREE GUIDELINES	
4A.1	Event Tree Analysis Methodology	4A-1
4A.2	Event Tree Guidelines for Core Damage	4A-3
4A.2.1	Event Trees	4A-3
4A.2.2	Success Criteria	4A-6
4A.2.3	Definition of End States	4A-7
4A.2.4	Plant Response Functions	4A-9
4A.2.5	Event Tree Node Notation	4A-13
4A.2.6	Consequential Events	4A-13
4A.2.7	Transient Template	4A-14
4A.2.8	Small LOCA Template	4A-15
ATTACHMENT 4B	EVENT TREE PICTURES	4B-1
CHAPTER 5	SUPPORT SYSTEMS	
5.1	Introduction	5-1
5.2	Support Systems and Their Interdependencies	5-1
5.3	Front Line Systems and Their Dependencies	5-1
CHAPTER 6	SUCCESS CRITERIA ANALYSIS	
6.1	Introduction	6-1
6.2	Acceptance Criteria and Critical Functions for Success Criteria	6-1
6.3	Event Sequences and Timing, Passive/Active System Interactions	6-3
6.3.1	General Sequence Success Criteria	6-3
6.3.2	Timing of Events and Key Operator Actions	6-9
6.3.3	Passive/Active System Interactions	6-15
6.3.4	Sequence Success Criteria Summary	6-18
6.4	Event Tree Top Events Success Criteria	6-18
6.5	References	6-19
CHAPTER 7	FAULT TREE GUIDELINES	
7.1	Purpose	7-1
7.2	Fault Tree Development	7-1
7.2.1	Procedural Steps for Fault Tree Preparation	7-1
7.2.2	Procedural Steps for Fault Tree Construction	7-2

TABLE OF CONTENTS (Cont.)

Section	Title	Page
7.3	Primary Events to be Considered in Fault Trees	7-3
	7.3.1 Random Component Failure	7-3
	7.3.2 Outage for Maintenance and Testing	7-5
	7.3.3 Common Cause Failures	7-6
	7.3.4 Human Errors	7-6
	7.3.5 Power and Control Model	7-9
7.4	Data Base	7-10
7.5	Fault Tree Model: Identification Codes	7-10
	7.5.1 Identification Code for Fault Tree Names	7-10
	7.5.2 Identification Code for Support Systems	7-10
	7.5.3 Identification Code for Primary Event Names	7-11
	7.5.4 Identification Code for Common Cause Failures	7-11
	7.5.5 Identification Code for Undeveloped Events (Modules)	7-12
	7.5.6 Identification Code for Operator Errors	7-13
7.6	Fault Tree Quantification	7-13
7.7	References	7-14
CHAPTER 8	PASSIVE CORE COOLING SYSTEM – PASSIVE RESIDUAL HEAT REMOVAL	
8.1	System Function	8-1
8.2	System Description	8-1
	8.2.1 Support Systems	8-1
	8.2.2 Instrumentation and Control	8-2
	8.2.3 Test and Maintenance	8-2
8.3	System Operation	8-3
8.4	Performance During Accident Conditions	8-3
	8.4.1 Plant Shutdown	8-3
	8.4.2 Loss of Coolant Accidents	8-3
	8.4.3 Passive Residual Heat Removal Heat Exchanger Tube Rupture	8-3
8.5	Initiating Events Review	8-4
	8.5.1 Initiating Events Impacting the PRHR System	8-4
	8.5.2 Initiating Events Caused by PRHR System Malfunction	8-4
8.6	System Logic Models	8-4
	8.6.1 Assumptions and Boundary Conditions	8-5
	8.6.2 Fault Tree Models	8-6
	8.6.3 Human Interactions	8-6
	8.6.4 Common Cause Failures	8-6
8.7	Quantification and Results	8-6

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 9	PASSIVE CORE COOLING SYSTEM – CORE MAKEUP TANK	
9.1	System Description	9-1
9.1.1	Support Systems	9-1
9.1.2	Instrumentation and Control	9-1
9.1.3	Test and Maintenance Assumptions	9-2
9.2	System Operation	9-2
9.3	Performance During Accident Conditions	9-3
9.3.1	Inadvertent Opening of a Steam Generator Relief or Safety Valve	9-3
9.3.2	Steam Line Break	9-3
9.3.3	Steam Generator Tube Rupture	9-3
9.3.4	Reactor Coolant System Heatup Transients	9-4
9.3.5	Loss-of-Coolant Accidents	9-4
9.3.6	Loss of Offsite Power	9-4
9.3.7	Anticipated Transient without Trip	9-4
9.4	Initiating Event Review	9-4
9.4.1	Initiating Events Impacting the Core Makeup Tank Subsystem	9-5
9.4.2	Initiating Events Due to Loss of the Core Makeup Tank Subsystem	9-5
9.5	System Logic Models	9-5
9.5.1	Assumptions and Boundary Conditions	9-5
9.5.2	Fault Tree Models	9-7
9.5.3	Human Interactions	9-7
9.5.4	Common Cause Failures	9-8
CHAPTER 10	PASSIVE CORE COOLING SYSTEM – ACCUMULATOR	
10.1	System Description	10-1
10.1.1	Support Systems	10-1
10.1.2	Instrumentation and Control	10-1
10.1.3	Test and Maintenance Assumptions	10-1
10.2	System Operation	10-1
10.3	Performance During Accident Conditions	10-2
10.3.1	Steam Line Break	10-2
10.3.2	Loss-of-Coolant Accidents or Non-Loss-of-Coolant Accidents with Automatic Depressurization System	10-2
10.4	Initiating Event Review	10-3
10.4.1	Initiating Events Impacting the Accumulator Subsystem	10-3
10.4.2	Initiating Events Due to Loss of the Accumulator Subsystem	10-3
10.5	System Logic Models	10-3
10.5.1	Assumptions and Boundary Conditions	10-3
10.5.2	Fault Tree Models	10-4
10.5.3	Human Interactions	10-4
10.5.4	Common Cause Failures	10-4

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 11	PASSIVE COOLING SYSTEM – AUTOMATIC DEPRESSURIZATION SYSTEM	
11.1	System Function	11-1
11.2	System Description	11-1
	11.2.1 Support Systems	11-1
	11.2.2 Instrumentation and Control	11-2
	11.2.3 Test and Maintenance	11-2
11.3	System Operation	11-2
11.4	Performance During Accident Conditions	11-3
	11.4.1 Loss of Coolant Accidents	11-3
	11.4.2 Transients	11-3
11.5	Initiating Events Review	11-3
	11.5.1 Initiating Events Impacting the Automatic Depressurization System	11-3
	11.5.2 Initiating Events Caused by the ADS Malfunction	11-4
11.6	System Logic Model	11-4
	11.6.1 Assumptions and Boundary Conditions	11-4
	11.6.2 Fault Tree Models	11-5
	11.6.3 Human Interactions	11-6
	11.6.4 Common Cause Failures	11-7
11.7	Quantification and Results	11-7
CHAPTER 12	PASSIVE CORE COOLING SYSTEM – IN-CONTAINMENT REFUELING WATER STORAGE TANK	
12.1	System Function	12-1
12.2	System Description	12-1
	12.2.1 Support Systems	12-1
	12.2.2 Instrumentation and Control	12-1
	12.2.3 Test and Maintenance	12-2
12.3	System Operation	12-2
12.4	Performance During Accident Conditions	12-2
	12.4.1 Transients	12-3
	12.4.2 Loss of Coolant Accidents	12-4
	12.4.3 In-Vessel Core Damage Mitigation	12-5
	12.4.4 Containment Isolation System Failure	12-5
12.5	Initiating Event	12-5
	12.5.1 Initiating Event Impacting IRWST/Gravity Injection Subsystem	12-5
	12.5.2 Initiating Event due to Loss of IRWST/Gravity Injection Subsystem	12-5
12.6	System Logic Models	12-6
	12.6.1 Assumptions and Boundary Conditions	12-6
	12.6.2 Fault Tree Models	12-8
	12.6.3 Human Interactions	12-8
	12.6.4 Common Cause Failures	12-8
12.7	Quantification and Results	12-9

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 13	PASSIVE CONTAINMENT COOLING SYSTEM	
13.1	System Description	13-1
13.1.1	Support Systems	13-1
13.1.2	Instrumentation and Control	13-1
13.1.3	Test and Maintenance Assumptions	13-2
13.2	System Operation	13-2
13.3	Performance During Accident Conditions	13-2
13.3.1	Post-Reactor Trip with Loss of All ac Power	13-2
13.3.2	Automatic Depressurization System Actuation	13-2
13.3.3	Post-Loss-of-Coolant Accident	13-3
13.3.4	Post-Main Steam Line Break	13-3
13.4	Initiating Event Review	13-3
13.4.1	Initiating Events Impacting the Passive Containment Cooling System	13-3
13.4.2	Initiating Events due to Loss of the Passive Containment Cooling System	13-3
13.5	System Logic Model	13-3
13.5.1	Assumptions and Boundary Conditions	13-4
13.5.2	Fault Tree Model	13-5
13.5.3	Human Interactions	13-6
13.5.4	Common Cause Failures	13-6
CHAPTER 14	MAIN AND STARTUP FEEDWATER SYSTEM	
14.1	System Description	14-1
14.1.1	Support Systems	14-1
14.1.2	Instrumentation and Control	14-2
14.1.3	Test and Maintenance	14-2
14.2	System Operation	14-2
14.3	Performance During Accident Conditions	14-2
14.4	Initiating Event Review	14-4
14.4.1	Initiating Event Impacting Main and Startup Feedwater/ Condensate System	14-4
14.4.2	Initiating Event due to Loss of Main and Startup Feedwater/ Condensate System	14-4
14.5	System Logic Models	14-4
14.5.1	Assumptions and Boundary Conditions	14-5
14.5.2	Fault Tree Models	14-7
14.5.3	Human Interactions	14-7
14.5.4	Common Cause Failures	14-7
14.6	Quantification and Results	14-7

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 15	CHEMICAL AND VOLUME CONTROL SYSTEM	
15.1	System Description	15-1
	15.1.1 Support Systems	15-1
	15.1.2 Instrumentation and Control Assumptions	15-1
	15.1.3 Test and Maintenance Assumptions	15-2
15.2	System Operation	15-3
15.3	Performance During Accident Conditions	15-3
15.4	Initiating Event Review	15-4
	15.4.1 Initiating Events Impacting the Chemical and Volume Control System	15-5
	15.4.2 Initiating Events Due to Loss of the Chemical and Volume Control System	15-5
15.5	System Logic Models	15-5
	15.5.1 Assumptions and Boundary Conditions	15-5
	15.5.2 Fault Tree Models	15-7
	15.5.3 Human Interactions	15-7
	15.5.4 Common Cause Failures	15-8
CHAPTER 16	CONTAINMENT HYDROGEN CONTROL SYSTEM	
16.1	System Description	16-1
	16.1.1 Support Systems	16-1
	16.1.2 Instrumentation and Control	16-1
	16.1.3 Test and Maintenance	16-1
16.2	System Operation	16-2
16.3	Performance During Accident Conditions	16-2
16.4	Initiating Event Review	16-2
16.5	System Logic Model	16-2
	16.5.1 Assumptions and Boundary Conditions	16-2
	16.5.2 Fault Tree Model	16-3
	16.5.3 Human Interactions	16-3
	16.5.4 Common Cause Failures	16-4
CHAPTER 17	NORMAL RESIDUAL HEAT REMOVAL SYSTEM	
17.1	System Description	17-1
	17.1.1 Support Systems	17-1
	17.1.2 Instrumentation and Control	17-1
	17.1.3 Test and Maintenance Assumptions	17-1
17.2	System Operation	17-1
17.3	Performance During Accident Conditions	17-2
17.4	Initiating Event Review	17-3
	17.4.1 Initiating Events Impacting the Normal Residual Heat Removal System	17-3
	17.4.2 Initiating Events Due to Loss of the Normal Residual Heat Removal System	17-4

TABLE OF CONTENTS (Cont.)

Section	Title	Page
17.5	System Logic Models	17-4
	17.5.1 Assumptions and Boundary Conditions	17-4
	17.5.2 Fault Tree Models	17-6
	17.5.3 Human Interactions	17-6
	17.5.4 Common Cause Failures	17-6
17.6	References	17-6
CHAPTER 18	COMPONENT COOLING WATER SYSTEM	
18.1	System Description	18-1
	18.1.1 Support Systems	18-1
	18.1.2 Instrumentation and Control	18-1
	18.1.3 Test and Maintenance Assumptions	18-1
18.2	System Operation	18-2
18.3	Performance During Accident Conditions	18-2
18.4	Initiating Event Review	18-2
	18.4.1 Initiating Events Impacting the Component Cooling Water System	18-2
	18.4.2 Initiating Events Due to Loss of the Component Cooling Water System	18-3
18.5	System Logic Models	18-3
	18.5.1 Assumptions and Boundary Conditions	18-3
	18.5.2 Fault Tree Models	18-4
	18.5.3 Human Interactions	18-4
	18.5.4 Common Cause Failures	18-5
CHAPTER 19	SERVICE WATER SYSTEM	
19.1	System Description	19-1
	19.1.1 Support Systems	19-1
	19.1.2 Instrumentation and Control	19-1
	19.1.3 Test and Maintenance Assumptions	19-1
19.2	System Operation	19-2
19.3	Performance During Accident Conditions	19-2
19.4	Initiating Event Review	19-2
	19.4.1 Initiating Events Impacting the Service Water System	19-2
	19.4.2 Initiating Events Due to Loss of the Service Water System	19-2
19.5	System Logic Models	19-3
	19.5.1 Assumptions and Boundary Conditions	19-3
	19.5.2 Fault Tree Models	19-4
	19.5.3 Human Interactions	19-5
	19.5.4 Common Cause Failures	19-5

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 20	CENTRAL CHILLED WATER SYSTEM	
20.1	System Description	20-1
	20.1.1 Support Systems	20-1
	20.1.2 Instrumentation and Control	20-1
	20.1.3 Test and Maintenance Assumptions	20-1
20.2	System Operation	20-2
20.3	Performance During Accident Conditions	20-2
20.4	Initiating Event Review	20-2
	20.4.1 Initiating Events Impacting the Central Chilled Water System	20-2
	20.4.2 Initiating Events Due to Loss of the Central Chilled Water System	20-3
20.5	System Logic Model	20-3
	20.5.1 Assumptions and Boundary Conditions	20-3
	20.5.2 Fault Tree Model	20-4
	20.5.3 Human Interactions	20-4
	20.5.4 Common Cause Failures	20-4
CHAPTER 21	AC POWER SYSTEM	
21.1	System Description	21-1
	21.1.1 Support Systems	21-1
	21.1.2 Instrumentation and Control	21-2
	21.1.3 Test and Maintenance Assumptions	21-2
21.2	System Operation	21-2
21.3	Performance During Accident Conditions	21-3
	21.3.1 Automatic Load Shedding	21-3
	21.3.2 Manual Transfer	21-3
	21.3.3 Electric Circuit Protection	21-3
21.4	Initiating Event Review	21-3
	21.4.1 Loss of the Main Generator	21-4
	21.4.2 Loss of Offsite Power	21-4
	21.4.3 Loss of 6900-vac and 480-vac Busses	21-4
21.5	System Logic Models	21-4
	21.5.1 Assumptions and Boundary Conditions	21-5
	21.5.2 Fault Tree Models	21-7
	21.5.3 Human Interactions	21-8
	21.5.4 Common Cause Failures	21-8
CHAPTER 22	CLASS 1E DC AND UNINTERRUPTIBLE POWER SUPPLY SYSTEM	
22.1	System Description	22-1
	22.1.1 Support Systems	22-1
	22.1.2 Instrumentation and Control	22-1
	22.1.3 Test and Maintenance Assumptions	22-1
22.2	System Operation	22-2
22.3	Performance During Accident Conditions	22-2

TABLE OF CONTENTS (Cont.)

Section	Title	Page
22.4	Initiating Event Review	22-2
	22.4.1 Initiating Events Impacting the Class 1E dc and UPS System	22-3
	22.4.2 Initiating Events Due to Loss of the Class 1E dc and UPS System	22-3
22.5	System Logic Models	22-3
	22.5.1 Assumptions and Boundary Conditions	22-3
	22.5.2 Fault Tree Models	22-4
	22.5.3 Human Interactions	22-4
	22.5.4 Common Cause Failures	22-4
22.6	References	22-5
CHAPTER 23	NON-CLASS 1E DC AND UPS SYSTEM	
23.1	System Description	23-1
	23.1.1 Support Systems	23-1
	23.1.2 Instrumentation and Control	23-1
	23.1.3 Test and Maintenance Assumptions	23-1
23.2	System Operation	23-2
23.3	Performance During Accident Conditions	23-2
23.4	Initiating Event Review	23-2
	23.4.1 Initiating Events Impacting the Non-Class 1E dc and UPS System	23-2
	23.4.2 Initiating Events Due to Loss of the Non-Class 1E dc and UPS Power System	23-3
23.5	System Logic Models	23-3
	23.5.1 Assumptions and Boundary Conditions	23-3
	23.5.2 Fault Tree Models	23-4
	23.5.3 Human Interactions	23-5
	23.5.4 Common Cause Failures	23-5
23.6	References	23-5
CHAPTER 24	CONTAINMENT ISOLATION	
24.1	System Description	24-1
	24.1.1 Support Systems	24-1
	24.1.2 Instrumentation and Control	24-1
	24.1.3 Test and Maintenance Assumptions	24-2
24.2	System Operation	24-2
24.3	Performance During Accident Conditions	24-2
24.4	Initiating Event Review	24-2
	24.4.1 Initiating Events Impacting Containment Isolation	24-2
	24.4.2 Initiating Events Due to Loss of the Containment Isolation System	24-2
24.5	System Logic Models	24-3
	24.5.1 Assumptions and Boundary Conditions	24-4
	24.5.2 Fault Tree Models	24-5
	24.5.3 Human Interactions	24-6
	24.5.4 Common Cause Failures	24-6
24.6	References	24-6

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 25	COMPRESSED AND INSTRUMENT AIR SYSTEM	
25.1	System Description	25-1
	25.1.1 Support Systems	25-2
	25.1.2 Instrumentation and Control	25-2
	25.1.3 Test and Maintenance Assumptions	25-3
25.2	System Operation	25-3
25.3	Performance During Accident Conditions	25-3
25.4	Initiating Event Review	25-4
	25.4.1 Initiating Events Impacting the Instrument Air Subsystem	25-4
	25.4.2 Initiating Events Due to Loss of the Instrument Air Subsystem	25-4
25.5	System Logic Models	25-4
	25.5.1 Assumptions and Boundary Conditions	25-4
	25.5.2 Fault Tree Models	25-6
	25.5.3 Human Interactions	25-7
	25.5.4 Common Cause Failures	25-7
CHAPTER 26	PROTECTION AND SAFETY MONITORING SYSTEM	
26.1	System Analysis Description	26-1
	26.1.1 Analysis of Support Systems	26-4
	26.1.2 Analysis of Instrumentation	26-5
	26.1.3 Test and Maintenance Assumptions	26-6
26.2	Performance During Accident Conditions	26-7
26.3	Initiating Event Review	26-7
	26.3.1 Initiating Event Impacting PMS	26-7
	26.3.2 Initiating Event due to Loss of PMS	26-8
26.4	System Logic Model Development	26-8
	26.4.1 Assumptions and Boundary Conditions	26-8
	26.4.2 Fault Tree Models	26-12
	26.4.3 Description of I&C Subtree Development	26-12
	26.4.4 Human Interactions	26-19
26.5	Discussion of Methodology	26-19
	26.5.1 Fault Tree Analysis	26-20
	26.5.2 Unavailability	26-20
	26.5.3 Spurious Failure Rate Per Year	26-20
	26.5.4 Common Cause Failures	26-22
	26.5.5 Data Manipulation	26-23
26.6	References	26-24
CHAPTER 27	DIVERSE ACTUATION SYSTEM	
27.1	System Analysis Description	27-1
	27.1.1 Support Systems Analysis	27-2
	27.1.2 Analysis of Instrumentation and Control	27-2
	27.1.3 Test and Maintenance	27-2

TABLE OF CONTENTS (Cont.)

Section	Title	Page
27.2	Analysis of System Operation	27-2
27.3	Performance During Accident Conditions	27-6
27.4	Initiating Event Review	27-6
27.4.1	Initiating Events Impacting the Diverse Actuation System	27-6
27.4.2	Initiating Events Due to Loss of the Diverse Actuation System	27-6
27.5	System Logic Model	27-6
27.5.1	Assumptions and Boundary Conditions	27-7
27.5.2	Fault Tree Model	27-7
27.5.3	Human Interactions	27-7
27.5.4	Common Cause Failures	27-8
CHAPTER 28	PLANT CONTROL SYSTEM	
28.1	System Analysis Description	28-1
28.1.1	Analysis of Support Systems	28-3
28.1.2	Analysis of Instrumentation	28-4
28.1.3	Test and Maintenance Assumptions	28-4
28.2	Performance During Accident Conditions	28-6
28.3	Initiating Event Review	28-6
28.3.1	Initiating Events Impacting the Plant Control System	28-6
28.3.2	Initiating Event due to Loss of the Plant Control System	28-6
28.4	System Logic Model Development	28-7
28.4.1	Assumptions and Boundary Conditions	28-7
28.4.2	Fault Tree Models	28-9
28.4.3	Description of I&C Subtree Development	28-10
28.4.4	Human Interactions	28-16
28.5	Discussion of Methodology	28-17
28.5.1	Fault Tree Analysis	28-17
28.5.2	Unavailability	28-17
28.5.3	Common Cause Failures	28-17
28.5.4	Data Manipulation	28-18
CHAPTER 29	COMMON-CAUSE ANALYSIS	
29.1	Introduction	29-1
29.2	Dependent Failures	29-1
29.3	Common-Cause Analysis	29-4
29.3.1	Assumptions	29-4
29.3.2	Analysis of Potential Common-Cause Failures within the Systems	29-6
29.3.3	Analysis of Potential Common-Cause Failures among Several Systems	29-6
29.4	Calculations For Component Groups	29-6
29.4.1	DC Batteries	29-7
29.4.2	Reactor Trip Breakers	29-8
29.4.3	Automatic Depressurization System Explosive Valves	29-9

TABLE OF CONTENTS (Cont.)

Section		Title	Page
	29.4.4	Air-Operated Valves in Core Makeup Tanks	29-10
	29.4.5	Automatic Depressurization System Motor-Operated Valves	29-11
	29.4.6	Common-Cause Failure for IRWST Valves	29-14
29.5	Results		29-17
29.6	References		29-17
ATTACHMENT 29A	COMMON-CAUSE ANALYSIS GUIDELINES		29A-1
29A.1	Introduction		29A-1
29A.2	Types of Dependencies		29A-1
29A.3	Common Cause Failures Definition		29A-2
29A.4	Methodology		29A-3
29A.5	Common Cause Failures Calculation Procedure		29A-4
	29A.5.1	Procedure for Treatment of Common Cause Failures Within a System	29A-5
	29A.5.2	Procedure for Treatment of Common Cause Failures Among More Systems	29A-7
29A.6	Common Cause Failure Numerical Evaluation		29A-8
	29A.6.1	Evaluation through Beta Factor Method	29A-8
	29A.6.2	Evaluation through Multiple-Greek Letter (MGL) Method	29A-8
29A.7	References		29A-10
CHAPTER 30	HUMAN RELIABILITY ANALYSIS		
30.1	Introduction		30-1
30.2	Summary of Results		30-1
30.3	Methodology		30-2
30.4	Major Assumptions		30-4
30.5	Types of Human Interactions		30-10
	30.5.1	Quantification Model	30-11
30.6	Quantification		30-12
	30.6.1	ZON-MAN01 (Start the Onsite Standby Diesel Generator)	30-12
	30.6.2	LPM-MAN01 (Recognize the Need for Reactor Coolant System Depressurization)	30-13
	30.6.3	LPM-MAN02 (Recognize the Need for Reactor Coolant System Depressurization)	30-15
	30.6.4	LPM-MAN05 (Recognize the Need for Reactor Coolant System Depressurization)	30-16
	30.6.5	LPM-REC01 (Recognize the Need for Reactor Coolant System Depressurization)	30-17
	30.6.6	ADN-MAN01 (Actuate the Automatic Depressurization System)	30-17
	30.6.7	ADN-REC01 (Actuate the Automatic Depressurization System)	30-19
	30.6.8	CCB-MAN01 (Start the Standby Component Cooling Water Pump)	30-19
	30.6.9	CCN-MAN02 (Inadvertent Misalignment of Heat Exchanger)	30-20
	30.6.10	CIB-MAN00 (Diagnose Steam Generator Tube Rupture)	30-21
	30.6.11	DUMP-MAN01 (Operate Steam Dump Valves)	30-22

TABLE OF CONTENTS (Cont.)

Section	Title	Page
30.6.12	CIC-MAN01 (Isolate Containment)	30-23
30.6.13	ADS-MANTEST (Recognize the Need and Reclose ADS Stage MOV)	30-24
30.6.14	CAN-MAN0S (Locally Close Manual Valve CAS-V204 to Isolate Containment)	30-25
30.6.15	CIT-MAN0S (Isolate Containment)	30-26
30.6.16	CMN-MAN01 (Actuate Core Makeup Tank)	30-27
30.6.17	CMN-REC01 (Actuate the Core Makeup Tanks)	30-28
30.6.18	CVN-MAN00 (Align Chemical and Volume Control System)	30-29
30.6.19	CVN-MAN02 (Align Chemical and Volume Control System)	30-30
30.6.20	CVN-MAN03 (Start Chemical and Volume Control System Pump B)	30-30
30.6.21	ADF-MAN01 (Depressurize the RCS to Refill the Pressurizer)	30-31
30.6.22	SGHL-MAN01 (Isolate Feedwater to Failed Steam Generator)	30-32
30.6.23	CAN-MAN01 (Start Standby Compressor)	30-33
30.6.24	REN-MAN02 (Initiate Recirculation)	30-33
30.6.25	REN-MAN03 (Initiate Recirculation)	30-34
30.6.26	IWN-MAN00 (Operate In-Containment Refueling Water Storage Tank Motor-Operated Valves)	30-35
30.6.27	RHN-MAN01 (Align Normal Residual Heat Removal System)	30-36
30.6.28	RHN-MANDIV (Align Normal Residual Heat Removal System)	30-37
30.6.29	RHN-MAN02/RHN-MAN03 (Align Normal Residual Heat Removal System)	30-38
30.6.30	PCN-MAN01 (Actuate Passive Containment Cooling System)	30-40
30.6.31	HPM-MAN01 (Diagnose Need for High Pressure Heat Removal)	30-40
30.6.32	PRN-MAN01 (Align Passive Residual Heat Removal System)	30-41
30.6.33	PRN-MAN02 (Align Passive Residual Heat Removal System)	30-42
30.6.34	PRN-MAN03 (Align Passive Residual Heat Removal System)	30-43
30.6.35	PRI-MAN01 (Isolate Failed Passive Residual Heat Removal Heat Exchanger)	30-44
30.6.36	REN-MAN04 (Initiate Recirculation)	30-45
30.6.37	RCN-MAN01 (Trip Reactor Coolant Pumps)	30-46
30.6.38	ATW-MAN01 (Manually Insert Control Rods)	30-47
30.6.39	ATW-MAN03 (Manually Trip the Reactor through Protection and Safety Monitoring System in One Minute)	30-48
30.6.40	ATW-MAN04 (Manually Trip the Reactor through Diverse Actuation System in One Minute)	30-49
30.6.41	ATW-MAN05 (Manually Trip the Reactor through Protection and Safety Monitoring System in Seven Minutes)	30-49
30.6.42	ATW-MAN06 (Manually Trip the Reactor through Diverse Actuation System In Seven Minutes)	30-50
30.6.43	RTN-MAN01 (Perform Controlled Reactor Shutdown)	30-51
30.6.44	FWN-MAN02 (Start the Startup Feedwater Pumps)	30-52
30.6.45	FWN-MAN03 (Start the Startup Feedwater Pumps)	30-53
30.6.46	REG-MAN00 (Regulate Startup Feedwater)	30-54

TABLE OF CONTENTS (Cont.)

Section	Title	Page
30.6.47	CIA-MAN01 (Isolate Failed Steam Generator)	30-55
30.6.48	CIB-MAN01 (Close Main Steam Isolation Valve)	30-56
30.6.49	SGA-MAN01 (Inadvertent Opening of Steam Generator Power-Operated Relief Valve)	30-57
30.6.50	SWN-MAN01N (Open Air-Operated Valve on Motor Strainer Line)	30-58
30.6.51	SWB-MAN02 (Start Standby Service Water Pump)	30-58
30.6.52	SWB-MAN02N (Start Standby Service Water Pump)	30-59
30.6.53	TCB-MAN01 (Start Standby Turbine Closed Cooling Water Pump)	30-60
30.6.54	TCB-MAN02 (Locally Align Standby Turbine Closed Cooling Water Heat Exchanger)	30-61
30.6.55	VLN-MAN01 (Actuate Hydrogen Control System)	30-62
30.6.56	VWN-MAN01 (Align Standby Chiller)	30-63
30.6.57	ATW-MAN11 (Recognize the Need for Manual Boration)	30-64
30.6.58	REC-MANDAS (Diagnosis of an Event Through DAS Signals or Perform an Activity by Operating DAS Controls)	30-65
30.6.59	RHN-MAN04 (Isolate the RNS During Shutdown Conditions)	30-65
30.6.60	RHN-MAN05 (Initiate Gravity Injection from IRWST via RNS Suction Line)	30-66
30.6.61	RHN-MAN06 (Recognize the Need and Throttle RNS Valve V011)	30-68
30.6.62	RCS-MANODS1 (Close AOVs CVS-V045 or -V047, Given Failure of HL Level Instruments)	30-68
30.6.63	RCS-MANODS2 (Close AOVs CVS-V045 or -V047, Given Failure of Valves to Close Automatically)	30-70
30.6.64	SWN-MAN03 (Recognize the Need and Locally Refill Service Water Basin)	30-70
30.7	Conditional Probability Evaluation	30-71
30.7.1	Application	30-72
30.7.2	Process Used to Determine Dependencies	30-72
30.7.3	Calculation of Dependent Human Error Probabilities	30-72
30.8	References	30-74
ATTACHMENT 30A	HUMAN RELIABILITY ANALYSIS GUIDELINES	30A-1
30A.1	Introduction	30A-1
30A.2	Schedule for Human Reliability Analysis	30A-1
30A.3	Methodology	30A-1
30A.4	Responsibility	30A-2
30A.5	Procedure for Human Interaction Evaluation	30A-2
30A.5.1	Type A	30A-3
30A.5.2	Type B	30A-3
30A.5.3	Type C	30A-4
30A.5.4	Commission Errors That Have Detrimental Effects	30A-6

TABLE OF CONTENTS (Cont.)

Section	Title	Page
30A.6	Procedure for Human Error Probabilities Quantification	30A-8
	30A.6.1 Basic Assumptions for Human Interaction Analysis	30A-8
30A.7	References	30A-9
CHAPTER 31	OTHER EVENT TREE NODE PROBABILITIES	
31.1	Introduction	31-1
31.2	Identification of Cases Requiring Calculations	31-1
	31.2.1 BL – Main Steam Line Break Occurs Inside Containment	31-1
	31.2.2 CNB – Containment Isolation Fails Due to Reactor Coolant System Vessel Rupture	31-1
	31.2.3 MGSET – Control Rods Motor-Generator Set Trip	31-1
	31.2.4 NSGTR – Consequential Steam Generator Tube Rupture	31-2
	31.2.5 PO – Pre-existing Containment Opening Allowing Bypass	31-2
	31.2.6 PRES – Reactor Coolant System Pressure Relief via Pressurizer Safety Valves	31-2
	31.2.7 PRSOV – Pressurizer Safety Valves Reclose	31-2
	31.2.8 R05 – Offsite Power Recovered within One-Half Hour	31-2
	31.2.9 SLSOV – Main Steam Line Relief Valves Reclose	31-2
31.3	Case-Specific Calculations	31-3
	31.3.1 BL – Main Steam Line Break Occurs Inside Containment	31-3
	31.3.2 CNB – Containment Isolation Fails Due to RCS Vessel Rupture	31-3
	31.3.3 MGSET – Control Rods Motor-Generator Set Trip	31-3
	31.3.4 PO – Pre-existing Containment Opening Allowing Bypass	31-4
	31.3.5 PRES – Reactor Coolant System Pressure Relief via Pressurizer Safety Valves	31-4
	31.3.6 PRSOV – Pressurizer Safety Valves Reclose	31-5
	31.3.7 R05 – Offsite Power Recovered within One-Half Hour	31-6
	31.3.8 SGTR1 – Single Consequential Steam Generator Tube Rupture	31-6
	31.3.9 SGTR – Multiple Consequential Steam Generator Tube Rupture	31-8
	31.3.10 SLSOV – Main Steam Line Relief and Safety Valves Reclose	31-8
	31.3.11 SLSOV1 – Main Steam Line Relief and Safety Valves Reclose	31-9
	31.3.12 SLSOV2 – Main Steam Line Safety Valves Reclose	31-10
	31.3.13 SLSOV3 – Main Steamline Relief and Safety Valves Reclose, SGTR	31-10
31.4	References	31-11
CHAPTER 32	DATA ANALYSIS AND MASTER DATA BANK	
32.1	Data Analysis	32-1
	32.1.1 Random Component Failure Data	32-1
	32.1.2 Test and Maintenance Unavailability	32-2
	32.1.3 Common Cause Failure Data	32-2
	32.1.4 Human Reliability Data	32-2
	32.1.5 Initiating Event Frequency Data	32-2

TABLE OF CONTENTS (Cont.)

Section	Title	Page
32.2	Master Data Bank	32-2
	32.2.1 Initiating Event Frequencies	32-3
	32.2.2 Random Component Failures	32-3
	32.2.3 Common Cause Failure Probabilities	32-3
	32.2.4 Human Error Probabilities	32-3
	32.2.5 System-Specific Calculations	32-3
	32.2.6 Other Event Tree Node Probabilities	32-3
	32.2.7 Master Data Bank	32-4
32.3	References	32-4
CHAPTER 33	FAULT TREE AND CORE DAMAGE QUANTIFICATION	
33.1	Introduction	33-1
33.2	Fault Tree Model Quantification	33-1
33.3	Event Tree Model Calculation	33-1
	33.3.1 Core Damage Quantification Method	33-2
	33.3.2 Core Damage Quantification Input Files and Data	33-4
	33.3.3 Definition of Consequential Event Categories	33-4
	33.3.4 Incorporate Operator Action Dependencies Into Plant Core Damage Frequency Quantification	33-6
	33.3.5 Core Damage Frequency Results	33-6
CHAPTER 34	SEVERE ACCIDENT PHENOMENA TREATMENT	
34.1	Introduction	34-1
34.2	Treatment of Physical Processes	34-1
	34.2.1 In-Vessel Retention of Molten Core Debris	34-1
	34.2.2 Fuel-Coolant Interaction (Steam Explosions)	34-2
	34.2.3 Hydrogen Combustion and Detonation	34-4
	34.2.4 High-Pressure Melt Ejection	34-5
	34.2.5 Core Debris Coolability	34-5
	34.2.6 Containment Pressurization from Decay Heat	34-6
	34.2.7 Elevated Temperature (Equipment Survivability)	34-7
	34.2.8 Summary	34-7
34.3	Analysis Method	34-7
34.4	Severe Accident Analyses	34-8
	34.4.1 Accident Class 3BE – Intact Containment	34-8
	34.4.2 Accident Class 3BE – Failed Containment	34-10
	34.4.3 Accident Class 3BL – Intact Containment	34-11
	34.4.4 Accident Class 3BR – Intact Containment	34-12
	34.4.5 Accident Class 3C – Intact Containment	34-13
	34.4.6 Accident Class 3C – Failed Containment	34-14
	34.4.7 Accident Class 3D – Intact Containment	34-14
	34.4.8 Accident Class 3D – Failed Containment	34-16

TABLE OF CONTENTS (Cont.)

Section	Title	Page
	34.4.9 Accident Class 6E – Bypass Containment	34-16
	34.4.10 Accident Class 6L – Bypass Containment	34-17
	34.4.11 Accident Class 1AP	34-17
	34.4.12 Accident Class 1A	34-18
	34.4.13 Intermediate and Late Containment Failure Cases	34-19
34.5	Insights and Conclusions	34-21
34.6	References	34-21
CHAPTER 35	CONTAINMENT EVENT TREE ANALYSIS	
35.1	Introduction	35-1
35.2	Containment Event Tree – General Discussion	35-1
35.3	Event Tree Construction	35-2
35.4	Level 1/Level 2 Interface	35-3
35.5	Containment Event Tree Top Events	35-3
	35.5.1 Severe Accident Phenomena Considerations	35-3
	35.5.2 Operator Action and Systems Top-Event Considerations	35-5
35.6	Release Category Definitions	35-7
	35.6.1 Release Category BP – Containment Bypass	35-8
	35.6.2 Release Category CI – Containment Isolation Failure	35-9
	35.6.3 Release Category CFE – Early Containment Failure	35-9
	35.6.4 Release Category CFI – Intermediate Containment Failure	35-9
	35.6.5 Release Category CFL – Late Containment Failure	35-9
	35.6.6 Release Category CFV – Containment Venting	35-10
	35.6.7 Release Category IC – Intact Containment	35-10
35.7	Top-Event Nodal Questions and Success Criteria	35-10
	35.7.1 Top Event DP – RCS Depressurization After Core Uncovery	35-11
	35.7.2 Top Event IS – Containment Isolation	35-12
	35.7.3 Top Event IR – Reactor Cavity Flooding	35-13
	35.7.4 Top Event RFL – Reflooding of a Degraded Core	35-14
	35.7.5 Top Event VF – Debris Relocation to the Reactor Cavity	35-14
	35.7.6 Top Event PC – Passive Containment Cooling	35-15
	35.7.7 Top Event VNT – Containment Venting	35-16
	35.7.8 Top Event IF – Intermediate Containment Failure	35-16
	35.7.9 Top Event IG – Hydrogen Control System	35-17
	35.7.10 Top Event DF – Diffusion Flame	35-17
	35.7.11 Top Event DTE – Early Hydrogen Detonation	35-18
	35.7.12 Top Event DFG – Hydrogen Deflagration	35-19
	35.7.13 Top Event DTI – Intermediate Hydrogen Detonation	35-19
35.8	Summary	35-20
35.9	References	35-20

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 36	REACTOR COOLANT SYSTEM DEPRESSURIZATION	
36.1	Introduction	36-1
36.2	Definition of High Pressure	36-1
36.3	Node DP	36-2
36.4	Success Criteria	36-2
	36.4.1 Accident Classes 3BE, 3BL, 3BR, 3C	36-2
	36.4.2 Accident Class 3D/1D	36-3
	36.4.3 Accident Classes 1A and 1AP	36-3
	36.4.4 Steam Generator Tube Rupture – Accident Class 6	36-4
	36.4.5 Anticipated Transient Without Scram – Accident Class 3A	36-5
36.6	References	36-5
CHAPTER 37	CONTAINMENT ISOLATION	
37.1	Introduction	37-1
37.2	Definition of Containment Isolation	37-1
37.3	Success Criteria	37-1
	37.3.1 Accident Classes 1A and 1AP	37-2
	37.3.2 Accident Class 3A	37-2
	37.3.3 Accident Class 3BR	37-2
	37.3.4 Accident Class 3BE	37-2
	37.3.5 Accident Class 3BL	37-2
	37.3.6 Accident Class 3C	37-2
	37.3.7 Accident Class 3D/1D	37-3
	37.3.8 Accident Class 6	37-3
37.4	Summary	37-3
CHAPTER 38	REACTOR VESSEL REFLOODING	
38.1	Introduction	38-1
38.2	Definition of Reflooding Success	38-1
38.3	Success Criteria	38-1
	38.3.1 Accident Classes 1A and 1AP	38-1
	38.3.2 Accident Class 3BR	38-2
	38.3.3 Accident Class 3BE	38-2
	38.3.4 Accident Class 3BL	38-3
	38.3.5 Accident Class 3D/1D	38-3
	38.3.6 Accident Class 6	38-3
	38.3.7 Accident Class 3C	38-3
	38.3.8 Accident Class 3A	38-4
38.4	Summary	38-4

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 39	IN-VESSEL RETENTION OF MOLTEN CORE DEBRIS	
39.1	Introduction	39-1
39.2	Background on the Application of IVR to the Passive Plant	39-1
39.3	Application of IVR to the AP1000 Passive Plant	39-2
39.4	Reactor Vessel Failure Criteria	39-3
39.5	In-Vessel Melt Progression and Relocation	39-4
39.6	Application of Heat Transfer Correlations to the AP1000	39-6
	39.6.1 Debris Pool to Vessel Wall Heat Transfer	39-6
	39.6.2 Vessel Wall to External Cooling Water Heat Transfer	39-7
39.7	Quantification of Margin to Failure of the Reactor Vessel Wall	39-8
	39.7.1 Zirconium Oxidation Fraction Input Probability Distribution	39-9
	39.7.2 Steel Mass Input Probability Distribution	39-9
	39.7.3 Final Bounding State Timing Input Probability Distribution	39-10
	39.7.4 Critical Heat Flux	39-10
	39.7.5 Results and Conclusions of Heat Flux Quantification	39-10
39.8	Reactor Coolant System Depressurization	39-11
39.9	Reactor Cavity Flooding (Node IR)	39-11
	39.9.1 Node IR Success Criteria	39-12
	39.9.2 Cavity Flooding Scenario Dependencies	39-13
39.10	Reactor Vessel Insulation Design Concept	39-15
	39.10.1 Description of Reactor Vessel Insulation and Venting	39-15
	39.10.2 Design Analysis of the Insulation and Support Frame	39-17
39.11	Reactor Vessel External Surface Treatment	39-18
39.12	Reactor Vessel Failure (Node VF)	39-18
	39.12.1 Node VF Success Criteria	39-18
39.13	Summary	39-19
39.14	References	39-19
ATTACHMENT 39A	AP1000 IN-VESSEL CORE MELTING RELOCATION	39A-1
39A.1	Introduction	39A-1
39A.2	Phenomenological Issues	39A-1
	39A.2.1 Focusing Effect	39A-1
	39A.2.2 Material Interaction	39A-1
39A.3	AP1000 Reactor Vessel Lower Internals Geometry	39A-1
39A.4	Modeling of Core and Reactor Vessel Lower Internals Heatup	39A-2
	39A.4.1 MAAP4 Model	39A-2
	39A.4.2 Finite Difference Modeling	39A-3
	39A.4.3 Relocation of In-Core Debris to Lower Plenum	39A-3
39A-5	Base Core Damage Sequence for In-Vessel Retention	39A-3
	39A.5.1 Core Heatup and Formation of In-Core Molten Debris Layers	39A-4
	39A.5.2 Melting of Core Shroud and Core Barrel	39A-6
	39A.5.3 Initial Relocation of Molten Core Debris to Lower Plenum	39A-7
	39A.5.4 Lower Plenum Debris Pool Formation	39A-8

TABLE OF CONTENTS (Cont.)

Section	Title	Page
39A.6	Potential for Debris Interaction	39A-12
39A.7	Conclusions from Analysis of AP1000 In-Vessel Core Melting and Relocation	39A-12
39A.8	References	39A-13
CHAPTER 40	PASSIVE CONTAINMENT COOLING, LONG TERM CONTAINMENT INTEGRITY AND CONTAINMENT VENTING	
40.1	Passive Containment Cooling System	40-1
40.2	Passive Containment Cooling Water – Node PC	40-2
	40.2.1 Node PC Success Criteria	40-2
	40.2.2 Operator Action	40-2
	40.2.3 Node PC Failure Probability	40-3
40.3	Containment Venting – Node VT	40-3
	40.3.1 Venting Success Criteria	40-3
	40.3.2 Venting Failure Probability	40-4
40.4	Intermediate Containment Failure – Node IF	40-4
	40.4.1 Success Criterion	40-5
	40.4.2 Intermediate Containment Failure Probability	40-5
40.5	References	40-5
CHAPTER 41	HYDROGEN MIXING AND COMBUSTION ANALYSIS	
41.1	Discussion of the Issue	41-1
41.2	Controlling Phenomena	41-2
41.3	Major Assumptions and Phenomenological Uncertainties	41-3
	41.3.1 Hydrogen Generation	41-3
	41.3.2 Containment Pressure	41-3
	41.3.3 Flammability Limits	41-3
	41.3.4 Detonation Limits and Loads	41-4
	41.3.5 Igniter System	41-4
	41.3.6 Other Ignition Sources	41-5
	41.3.7 Severe Accident Management Actions	41-5
41.4	Hydrogen Generation and Mixing	41-5
	41.4.1 Accident Class 3BE – Failure of Gravity Injection	41-6
	41.4.2 Accident Class 3BL – Failure of Gravity Recirculation	41-9
	41.4.3 Accident Class 3BR – Large LOCA with Accumulator Failure	41-10
	41.4.4 Accident Class 3C	41-11
	41.4.5 Accident Classes 3D and 1D	41-12
	41.4.6 Accident Class 1AP	41-12
	41.4.7 Accident Class 1A	41-13
	41.4.8 Accident Class 3A	41-13
	41.4.9 Accident Class 6	41-13
	41.4.10 Overall Mixing Insights	41-14

TABLE OF CONTENTS (Cont.)

Section	Title	Page
41.5	Hydrogen Burning at Igniters	41-15
41.6	Early Hydrogen Combustion	41-15
41.6.1	Hydrogen Generation Rates	41-15
41.6.2	Hydrogen Release Locations	41-17
41.6.3	Early Hydrogen Combustion Ignition Sources	41-18
41.7	Diffusion Flame Analysis – CET Node DF	41-18
41.7.1	AP1000 Diffusion Flame Mitigation Strategy	41-19
41.7.2	Node DF Containment Failure Probability Assignment	41-20
41.8	Early Hydrogen Detonation – Containment Event Tree Node DTE	41-21
41.8.1	Containment Success Criteria at Node DTE	41-21
41.8.2	Early Hydrogen Detonation Decomposition Event Tree	41-22
41.9	Deflagration in Time Frame 3	41-23
41.9.1	Containment Success Criterion at Node DFL	41-23
41.9.2	AICC Peak Pressure	41-24
41.9.3	Conditional Containment Failure Probability from Deflagration	41-25
41.10	Detonation in Intermediate Time Frame	41-29
41.10.1	Containment Success Criterion at Node DTI	41-29
41.10.2	Mixing and Stratification	41-29
41.10.3	Quantification of DTI Failure Probabilities	41-30
41.11	Safety Margin Basis Containment Performance Requirement	41-30
41.12	Summary	41-31
41.13	References	41-31
ATTACHMENT 41A	AP1000 SPECIFIC MAAP4.04 ANALYSES	41A-1
ATTACHMENT 41B	ANALYSIS OF HYDROGEN BURNING AT IGNITERS	41B-1
CHAPTER 42	CONDITIONAL CONTAINMENT FAILURE PROBABILITY DISTRIBUTION	
42.1	Introduction	42-1
42.2	Probabilistic Model	42-1
42.3	Containment Failure Characteristics	42-2
42.3.1	Median Values for Containment Failure	42-2
42.3.2	Uncertainties in Containment Failure	42-3
42.4	Containment Failure Predictions	42-4
42.4.1	Containment Cylindrical Shell	42-4
42.4.2	Ellipsoidal Upper Head	42-5
42.4.3	Equipment Hatches	42-5
42.4.4	Personnel Airlock	42-6
42.5	Overall Failure Distribution	42-6
42.6	Summary and Conclusions	42-7
42.7	References	42-7

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 43	RELEASE FREQUENCY QUANTIFICATION	
43.1	Introduction	43-1
43.2	Plant Damage State Frequency Calculations	43-2
43.3	Containment Event Tree Node Frequencies	43-2
43.3.1	CET Nodes	43-2
43.3.2	CET Node Probabilities From Boolean Expressions	43-3
43.3.3	Probabilities for Hydrogen-Related CET Nodes	43-6
43.3.4	Other CET Node Probabilities	43-6
43.4	Containment Event Tree Quantification	43-7
43.4.1	Containment Event Tree	43-7
43.4.2	Dominant CET Sequences	43-7
43.4.3	LRF Cutsets for Dominant Sequences	43-7
43.5	Summary of Results	43-7
43.6	Importance and Sensitivity Analyses	43-8
43.6.1	CET Event Node Importance Analysis	43-8
43.6.2	No Credit Taken for DP Node for PDS-6	43-8
43.6.3	Lesser Reliability for Containment Isolation	43-8
43.6.4	Lesser Reliability for Hydrogen Igniters	43-8
43.6.5	Lesser Reliability for PCS	43-9
43.6.6	No Credit for Depressurization for High Pressure PDS	43-9
43.6.7	Set PDS-3C Vessel Failure Probability to 1.0	43-9
43.6.8	Set 3D and 1AP Diffusion Flame and Detonation Failure Probability to 1.0	43-9
43.7	Other Importance and Sensitivity Analyses	43-9
43.7.1	Initiating Event Importances	43-9
43.7.2	Sensitivity to Standby Systems	43-10
43.7.3	Sensitivity to Standby Systems With Credit for Manual DAS	43-10
43.8	Conclusions and Insights	43-10
ATTACHMENT 43A	PDS CALCULATIONS	43A-1
ATTACHMENT 43B	DP NODE PROBABILITY FOR PDS	43B-1
ATTACHMENT 43C	EVALUATION OF OPERATOR ACTIONS	43C-1
ATTACHMENT 43D	EFFECT OF "PRE-EXISTING CONTAINMENT OPENING" ON LRF	43D-1
ATTACHMENT 43E	EFFECT OF CONTAINMENT AIR-COOLING FAILURE ON PLANT RISK	43E-1

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 44	MAAP4 CODE DESCRIPTION AND AP1000 MODELING	
44.0	MAAP Background	44-1
44.1	MAAP4	44-1
44.2	The AP1000 MAAP4 Modeling	44-3
44.3	Benchmarking	44-5
44.4	Summary and Conclusions	44-6
44.5	References	44-7
CHAPTER 45	FISSION-PRODUCT SOURCE TERMS	
45.1	Summary of AP1000 Release Categories	45-1
45.2	Release Category Source Terms	45-2
	45.2.1 Release Category IC	45-2
	45.2.2 Release Category BP	45-2
	45.2.3 Release Category CI	45-2
	45.2.4 Release Category CFE	45-2
	45.2.5 Release Category CFI	45-3
	45.2.6 Release Category CFL	45-3
	45.2.7 Release Category CFV	45-3
45.3	Direct-Release Sensitivity Case	45-4
45.4	Summary	45-4
45.5	References	45-4
CHAPTERS 46 THROUGH 48 NOT USED		
CHAPTER 49	OFFSITE DOSE RISK QUANTIFICATION	
49.1	Introduction	49-1
49.2	Conformance with Regulatory Requirements	49-2
49.3	Assumptions	49-2
49.4	Methodology	49-2
49.5	Dose Evaluation Results and Discussion	49-5
49.6	Quantification of Site Risk	49-6
49.7	Risk Quantification Results	49-7
49.8	References	49-7
CHAPTER 50	IMPORTANCE AND SENSITIVITY ANALYSES	
50.1	Introduction	50-1
50.2	Importance Analyses for Core Damage	50-1
	50.2.1 Initiating Event Importances	50-2
	50.2.2 Accident Sequence Importances	50-3
	50.2.3 End State Importances	50-4
	50.2.4 Common Cause Failure Importances	50-4
	50.2.5 Human Error Importances	50-5
	50.2.6 Component Importances	50-6

TABLE OF CONTENTS (Cont.)

Section	Title	Page
50.3	System Importances for Core Damage	50-7
50.4	Human Error Sensitivity Analyses	50-8
	50.4.1 Set HEPs to 1.0 (Failure) in Core Damage Output File	50-9
	50.4.2 Set HEPs to 0.0 (Success) in Core Damage Output File	50-10
	50.4.3 Set HEPs to 0.1 in Core Damage Output File	50-10
50.5	Other Sensitivity Analyses for Core Damage	50-10
	50.5.1 Impact of Passive System Check Valves on Core Damage Frequency	50-10
	50.5.2 Sensitivity to Squib Valve Failure Probability	50-11
	50.5.3 Sensitivity to Circuit Breaker Failure Probability	50-11
	50.5.4 Sensitivity to Standby Systems	50-12
	50.5.5 Sensitivity to Standby Systems; Manual DAS Credited	50-14
50.6	Results	50-15
CHAPTER 51	UNCERTAINTY ANALYSIS	
51.1	Introduction	51-1
51.2	Input Data/Error Factors	51-2
51.3	Input Files	51-3
51.4	Output Files	51-3
51.5	Sensitivity Analyses	51-3
	51.5.1 Sensitivity to Simulation Parameters	51-3
	51.5.2 Sensitivity to Key Basic Events	51-3
	51.5.3 Sensitivity to Operator Actions	51-4
51.6	Summary of Results	51-6
51.7	References	51-8
ATTACHMENT 51A	ASSIGNMENT OF ERROR FACTORS TO BASIC EVENT PROBABILITIES	51A-1
ATTACHMENT 51B	@RISK UNCERTAINTY ANALYSIS RESULTS	51B-1
CHAPTERS 52 AND 53 NOT USED		
CHAPTER 54	LOW-POWER AND SHUTDOWN RISK ASSESSMENT	
54.1	Introduction	54-1
54.2	Data Analysis	54-2
54.3	Initiating Event Analysis	54-3
54.4	Event Tree/Mitigation System Evaluation	54-3
54.5	Common Cause Analysis Update for AP1000	54-3
54.6	Human Reliability Assessment for AP1000	54-5
54.7	Core Damage Quantification	54-6
	54.7.1 Discussion of Results	54-9
54.8	Estimation of Shutdown Large Release Frequency	54-9

TABLE OF CONTENTS (Cont.)

Section		Title	Page
54.9	Sensitivity Analyses		54-10
	54.9.1	Case 1 – Minimum Equipment per Tech Specs During Drained Conditions	54-10
	54.9.2	Case 2 – No Credit for Standby Nonsafety Systems	54-11
	54.9.3	Case 3 – HEP's Set Equal to 0.5	54-12
	54.9.4	Case 4 – No Credit for Standby Nonsafety Systems – Credit for Manual DAS	54-12
	54.9.5	Case 5 – Assessment of Containment Closure Failure Probability	54-13
54.10	Conclusions		54-17
54.11	References		54-17
CHAPTER 55	AP1000 SEISMIC MARGINS EVALUATION		
55.1	Seismic Margin HCLPF Methodology		55-1
55.2	Calculation of HCLPF Values		55-1
	55.2.1	Seismic Margin HCLPF Methodology	55-1
	55.2.2	Calculation of HCLPF Values	55-2
55.3	Seismic Margin Model		55-11
	55.3.1	Major SMA Model Assumptions	55-11
	55.3.2	Seismic Initiating Events	55-12
	55.3.3	Initiating Event Category HCLPFs	55-13
55.4	Calculation of Plant HCLPF		55-16
	55.4.1	HCLPFs for Basic Events	55-16
	55.4.2	Calculation of Initiating Event HCLPFs	55-17
55.5	Results and Insights		55-17
	55.5.1	AP1000 SMA Results	55-17
	55.5.2	AP1000 SMA Insights	55-18
55.6	References		55-20
CHAPTER 56	INTERNAL FLOODING ANALYSIS		
56.1	Introduction		56-1
	56.1.1	Definitions	56-1
56.2	Methodology		56-1
	56.2.1	Summary of Methodology	56-1
	56.2.2	Information Collection	56-2
	56.2.3	Initial Screening Assessment	56-2
	56.2.4	Detailed Screening Assessment	56-4
	56.2.5	Identification of Flood-Induced Initiating Events	56-5
	56.2.6	Initiating Event Frequencies	56-6
56.3	Assumptions		56-6
	56.3.1	General Flooding Analysis Assumptions and Engineering Judgments	56-6
	56.3.2	AP1000-Specific Assumptions	56-8

TABLE OF CONTENTS (Cont.)

Section	Title	Page
56.4	Information Collection	56-10
	56.4.1 PRA-Modeled Equipment and Locations	56-10
	56.4.2 Identification of Areas for Flooding Evaluation	56-10
56.5	At-Power Operations	56-10
	56.5.1 Initial Screening Assessment	56-11
	56.5.2 Detailed Screening Assessment	56-11
	56.5.3 Identification of Flood-Induced Initiating Events	56-26
	56.5.4 Calculation of Flood-Induced Initiating Event Frequencies	56-29
	56.5.5 Quantification of At-Power Flood-Induced Events	56-36
56.6	Internal Flooding During Low-Power and Shutdown Conditions	56-38
	56.6.1 Detailed Screening Assessment	56-38
	56.6.2 Identification of Flood-Induced Initiating Events	56-39
	56.6.3 Calculation of Flood-Induced Initiating Event Frequencies	56-40
	56.6.4 Quantification of Shutdown Internal Flooding Scenario CDFs	56-45
	56.6.5 Total Shutdown Flooding Core Damage Frequency	56-47
	56.6.6 Seismically Induced Flooding	56-47
	56.6.7 Flooding Hazards During Refueling Outages	56-47
	56.6.8 Summary of Results	56-47
56.7	Large Release Frequency Estimates for Internal Flooding	56-48
56.8	Results of AP1000 Internal Flooding Analysis	56-49
CHAPTER 57	FIRE RISK ASSESSMENT	
57.1	Introduction	57-1
57.2	Qualitative Analysis	57-1
	57.2.1 AP600 Qualitative Analysis	57-1
	57.2.2 AP1000 Qualitative Analysis	57-5
	57.2.3 AP1000 Fire Areas	57-6
57.3	Initiating Event Frequencies	57-6
	57.3.1 Introduction	57-6
	57.3.2 Methodology	57-7
	57.3.3 Results for Plant Except Containment and the Main Control Room	57-7
	57.3.4 Results for the Containment	57-7
	57.3.5 Results for the Main Control Room	57-7
57.4	Development of Fire Scenarios	57-10
	57.4.1 Spurious Actuation Model	57-11
	57.4.2 Propagation Model	57-14
	57.4.3 Fire Suppression Model	57-15
	57.4.4 Operation Actions	57-15
	57.4.5 Development of Fire Scenarios	57-16
57.5	Calculation of Conditional Core Damage Probabilities (CCDP)	57-22
57.6	Calculation of CDF from Fire Events	57-23
	57.6.1 Calculation of Plant Fire CDF	57-23
	57.6.2 Comments on Plant Areas	57-23

TABLE OF CONTENTS (Cont.)

Section	Title	Page
57.6.3	Importances of Fire Areas	57-25
57.6.4	Conclusion	57-27
57.7	Sensitivity Studies	57-27
57.7.1	Manual Fire Suppression Systems	57-27
57.7.2	Sensitivity Analysis of the Probability of a Spurious Actuation of ADS Valves	57-27
57.7.3	Sensitivity of Human Action on Fire	57-28
57.7.4	Sensitivity Analysis on Ignition Frequencies	57-28
57.7.5	Sensitivity Analysis on ADS Actuation by DAS	57-29
57.7.6	Sensitivity Analysis on 1E to Non-1E Separation in the Containment	57-29
57.7.7	Sensitivity Analysis to Area to Area Propagation	57-30
57.7.8	Importance of Hot Shorts	57-30
57.8	Shutdown Fire Analysis	57-30
57.8.1	Introduction	57-30
57.8.2	Evaluation of AP1000 Shutdown Risk (Non-Drained Conditions)	57-33
57.8.3	Evaluation for Drained Shutdown Operations	57-37
57.8.4	Evaluation of Main Control Room	57-40
57.9	Conclusion and Insights	57-40
57.9.1	At-Power Analysis	57-40
57.9.2	Shutdown Fire Analysis	57-41
57.9.3	Conclusions	57-42
57.10	References	57-42
ATTACHMENT 57A	CALCULATION OF SCENARIO CCDPs	57A-1
57A.1	Calculation of Scenario CCDPs	57A-1
57A.2	Calculation of Scenario CCDPs for Overly Conservative Cases	57A-3
ATTACHMENT 57B	MODELING OF OPERATOR ACTIONS IN FIRE SCENARIOS	57B-1
57B.1	Calculation of Failure Probability of OPA-01	57B-1
57B.2	Calculation of Failure Probability of OPA-02	57B-3
57B.3	Operator Actions at Remote Shutdown Panel	57B-6
57B.4	More Reliable REC-MANDAS	57B-6
ATTACHMENT 57C	FIRE AREA EVENT TREES DEFINING SCENARIOS	57C-1
ATTACHMENT 57D	AP1000 POTENTIAL FOR FIRE-INDUCED SPURIOUS ACTUATION OF FUNCTIONS THAT RESULT IN A BREACH OF HIGH/LOW PRESSURE BOUNDARY	57D-1

TABLE OF CONTENTS (Cont.)

Section	Title	Page
CHAPTER 58	WINDS, FLOODS, AND OTHER EXTERNAL EVENTS	
58.1	Introduction	58-1
58.2	External Events Analysis	58-1
	58.2.1 Severe Winds and Tornadoes	58-1
	58.2.2 External Floods	58-2
	58.2.3 Transportation and Nearby Facility Accidents	58-2
58.3	Conclusion	58-2
58.4	References	58-3
CHAPTER 59	PRA RESULTS AND INSIGHTS	
59.1	Introduction	59-1
59.2	Use of PRA in the Design Process	59-3
59.3	Core Damage Frequency from Internal Initiating Events at Power	59-4
	59.3.1 Dominant Core Damage Sequences	59-6
	59.3.2 Component Importances for At-Power Core Damage Frequency	59-7
	59.3.3 System Importances for At-Power Core Damage	59-8
	59.3.4 System Failure Probabilities for At-Power Core Damage	59-9
	59.3.5 Common Cause Failure Importances for At-Power Core Damage	59-9
	59.3.6 Human Error Importances for At-Power Core Damage	59-9
	59.3.7 Accident Class Importances	59-10
	59.3.8 Sensitivity Analyses Summary for At-Power Core Damage	59-11
	59.3.9 Summary of Important Level 1 At-Power Results	59-12
59.4	Large Release Frequency for Internal Initiating Events at Power	59-15
	59.4.1 Dominant Large Release Frequency Sequences	59-15
	59.4.2 Summary of Important Level 2 At-Power Results	59-16
59.5	Core Damage and Severe Release Frequency from Events at Shutdown	59-19
	59.5.1 Summary of Shutdown Level 1 Results	59-19
	59.5.2 Large Release Frequency for Shutdown and Low-Power Events	59-22
	59.5.3 Shutdown Results Summary	59-22
59.6	Results from Internal Flooding, Internal Fire, and Seismic Margin Analyses	59-23
	59.6.1 Results of Internal Flooding Assessment	59-23
	59.6.2 Results of Internal Fire Assessment	59-24
	59.6.3 Results of Seismic Margin Analysis	59-25
59.7	Plant Dose Risk From Release of Fission-Products	59-26
59.8	Overall Plant Risk Results	59-26
59.9	Plant Features Important to Reducing Risk	59-27
	59.9.1 Reactor Design	59-28
	59.9.2 Systems Design	59-28
	59.9.3 Instrumentation and Control Design	59-31
	59.9.4 Plant Layout	59-32
	59.9.5 Containment Design	59-32

TABLE OF CONTENTS (Cont.)

Section	Title	Page
59.10	PRA Input to Design Certification Process	59-36
59.10.1	PRA Input to Reliability Assurance Program	59-36
59.10.2	PRA Input to Tier 1 Information	59-36
59.10.3	PRA Input to MMI/Human Factors/Emergency Response Guidelines	59-36
59.10.4	Summary of PRA Based Insights	59-37
59.10.5	Combined License Information	59-37
59.11	References	59-38
APPENDIX A	THERMAL HYDRAULIC ANALYSIS TO SUPPORT SUCCESS CRITERIA	A-1
APPENDIX B	EX-VESSEL SEVERE ACCIDENT PHENOMENA	B-1
APPENDIX C	ADDITIONAL ASSESSMENT OF AP1000 DESIGN FEATURES	C-1
APPENDIX D	EQUIPMENT SURVIVABILITY ASSESSMENT	D-1
APPENDIX E	AP1000 PRA FAULT TREE PICTURES FOR LEVEL 1 ANALYSIS FOR EVENTS AT POWER OPERATION	E-1

LIST OF TABLES

Table No.	Title	Page
2-1	Internal Initiating Event Grouping Plant Systems and Equipment Available for Transient/Accident Conditions (Sheets 1 – 10)	2-28
2-2	NUREG/CR 3862 Initiator Categories (Sheets 1 – 4)	2-38
2-3	NUREG/CR 3862 Initiator Categories not Considered in the AP1000 PRA Analysis	2-42
2-4	AP1000 Internal Initiating Event Frequencies (Sheets 1 – 3)	2-43
2-5	Initiating Event Frequencies Used in Event Trees Quantification	2-46
2A-1	Summary of Primary System Piping Data	2A-2
2A-2	Summary of Primary System Pipe Break Frequency Quantification	2A-3
2A-3	Summary of Steam Generator Tube Rupture Events	2A-4
2A-4	Spurious Stuck-Open Pressurizer Safety Valve	2A-5
2A-5	Interface Break on Accumulator Lines	2A-6
2A-6	Interface Break on IRWST Injection Lines	2A-7
2A-7	Initiating Events Review Data Summary (Sheets 1 – 8)	2A-8
2B-1	Summary of Main Steam Line and Feedwater Line Piping Data for Secondary Side Break Frequency Quantification	2B-2
2B-2	Secondary Side Line Break Frequency Quantification	2B-3
2B-3	Stuck-Open Main Steam Line Safety Valve Frequency Quantification (Sheets 1 – 2)	2B-4
3-1	Loss of CCS/SWS Initiating Event Fault Tree CSWF Success Criteria Summary	3-8
3-2	Spurious Actuation of Automatic Depressurization Failure Criteria Summary	3-9
3-3	Evaluation of Spurious Automatic Depressurization System Frequencies (Sheets 1 – 6)	3-10
4-1	AP1000 Large LOCA Event End State Summary	4-112
4-2	AP1000 Spurious ADS Actuation Event End State Summary	4-112
4-3	AP1000 Medium LOCA Event End State Summary	4-113
4-4	AP1000 CMT Line Break LOCA Event End State Summary	4-114
4-5	AP1000 SI Line Break Event End State Summary	4-115
4-6	AP1000 Small LOCA Event End State Summary	4-116
4-7	AP1000 RCS Leak Event End State Summary	4-117
4-8	AP1000 PRHR Tube Rupture Event End State Summary	4-117
4-9	AP1000 SGTR Event End State Summary	4-118
4-10	AP1000 Vessel Rupture Event End State Summary	4-119
4-11	AP1000 Interfacing Systems LOCA Event End State Summary	4-119
4-12	AP1000 Transients with MFW Event End State Summary	4-120
4-13	AP1000 Transients with Loss of RCS Flow Event End State Summary	4-121

LIST OF TABLES (Cont.)

Table No.	Title	Page
4-14	AP1000 Transients with Loss of MFW to One SG Event End State Summary	4-122
4-15	AP1000 Transients with Core Power Excursion Event End State Summary	4-123
4-16	AP1000 Transients with Loss of CCW/SW Event End State Summary	4-124
4-17	AP1000 Transients without Main Feedwater Event End State Summary	4-125
4-18	AP1000 Transients with Loss of Condenser Event End State Summary	4-126
4-19	AP1000 Transients with Loss of Compressed Air Event End State Summary	4-127
4-20	AP1000 Loss of Offsite Power Event End State Summary	4-128
4-21	AP1000 SLB Downstream of MSIVs Event End State Summary	4-129
4-22	AP1000 SLB Downstream of MSIVs Event End State Summary	4-130
4-23	AP1000 Stuck Open Secondary Side Safety Valve Event End State Summary	4-131
4-24	AP1000 ATWS Precursor without MFW Event End State Summary	4-132
4-25	AP1000 ATWS Precursor with SI Event End State Summary	4-133
4-26	AP1000 ATWS Precursor Transients with MFW Event End State Summary	4-134
4A-1	End States (Plant Damage States)	4A-17
4A-2	Summary of Systems Associated with Mitigating Functions for AP1000	4A-18
5-1	AP1000 Safety-Related Plant Support Systems with Letter Designators	5-3
5-2	AP1000 Non Safety-Related Plant Support Systems with Letter Designators	5-3
5-3	AP1000 Support Systems Interdependency Matrix (Sheets 1 – 14)	5-4
5-4	AP1000 Safety-Related Front Line Plant Systems Letter Designators	5-18
5-5	AP1000 Non Safety-Related Front Line Plant Systems Letter Designators	5-18
5-6	AP1000 Front Line System Dependencies Matrix (Sheets 1 – 18)	5-19
6-1	Summary of Event Tree Top Events Success Criteria (Internal Initiating Events at Power Cases) (Sheets 1 – 34)	6-20
6-2	Summary of Success Criteria for the Mitigating Systems (Sheets 1 – 9)	6-54
6-3	Summary of Success Criteria for Operator Actions and Mission Times (Sheets 1 – 4)	6-68
7-1	Example for Fault Tree XXX Success Criteria Summary	7-15
7-2	Example for System Dependency Matrix	7-15
7-3	Example for Component Test Assumptions	7-16
7-4	Example for Component Maintenance Assumptions	7-16
7-5	Example for Operator Actions and Misposition Analysis Summary	7-16
7-6	Fault Tree Identification Codes (Sheets 1 – 3)	7-17
7-7	System Identification Codes for Basic Events (Sheets 1 – 3)	7-20
7-8	Component Identification Codes (Sheets 1 – 7)	7-23
7-9	Failure Mode Identification Codes (Sheets 1 – 3)	7-30
8-1	List of Passive Residual Heat Removal System Fault Trees	8-7
8-2a	Fault Tree "PRT" Success Criteria	8-8
8-2b	Fault Tree "PRTA" Success Criteria	8-9

LIST OF TABLES (Cont.)

Table No.	Title	Page
8-2c	Fault Tree "PRL" Success Criteria	8-10
8-2d	Fault Tree "PRP" Success Criteria	8-11
8-2e	Fault Tree "PRS" Success Criteria	8-12
8-2f	Fault Tree "PRW" Success Criteria	8-13
8-2g	Fault Tree "PRI" Success Criteria	8-14
8-3	System Dependency Matrix	8-15
8-4	Component Test Assumptions	8-16
8-5	Component Maintenance Assumptions	8-17
8-6	Operator Actions and Misposition Analysis Summary	8-18
8-7	Common Cause Failures Summary	8-19
8-8	Basic Events Database for the PRHR System Fault Trees (Sheets 1 – 3)	8-20
9-1	List of System Fault Trees	9-9
9-2a	Fault Tree CM2AB Success Criteria Summary	9-10
9-2b	Fault Tree CM2SL Success Criteria Summary	9-11
9-2c	Fault Tree CM2L Success Criteria Summary	9-12
9-2d	Fault Tree CM2P Success Criteria Summary	9-13
9-2e	Fault Tree CM1A Success Criteria Summary	9-14
9-2f	Fault Tree CM2LLT Success Criteria Summary	9-15
9-2g	Fault Tree CMBOTH Success Criteria Summary	9-16
9-2h	Fault Tree CM2LA Success Criteria Summary	9-17
9-3	Notes Related to System Fault Tree Assumptions	9-18
9-4	System Dependency Matrix	9-18
9-5	Component Test Assumptions	9-19
9-6	Component Maintenance Assumptions	9-19
9-7	Operator Actions and Misposition Analysis Summary	9-20
9-8	Common Cause Failure Analysis Summary	9-20
9-9	Fault Tree Basic Events for Core Makeup Tank Subsystem (Sheets 1 – 3)	9-21
10-1	List of System Fault Trees	10-5
10-2a	Fault Tree AC2AB Success Criteria Summary	10-6
10-2b	Fault Tree AC1A Success Criteria Summary	10-7
10-2c	Fault Tree ACBOTH Success Criteria Summary	10-8
10-3	Notes Related to System Fault Tree Assumptions	10-9
10-4	System Dependency Matrix	10-9
10-5	Component Test Assumptions	10-9
10-6	Component Maintenance Assumptions	10-10
10-7	Operator Actions and Misposition Analysis Summary	10-10
10-8	Common Cause Failure Analysis Summary	10-10
10-9	Fault Tree Basic Events for Accumulator Subsystem	10-11

LIST OF TABLES (Cont.)

Table No.	Title	Page
11-1a	List of ADS System Fault Trees (Sheets 1 – 2)	11-8
11-1b	List of ADS System Fault Trees (for Plant Damage States Analysis)	11-10
11-2a	ADS Success Criteria Versus Accident Conditions (Full Depressurization)	11-11
11-2b	ADS Success Criteria Versus Accident Conditions (Partial Depressurization)	11-12
11-2c	Automatic Depressurization System Fault Tree Summary (For Plant Damage States)	11-13
11-2d	Fault Tree "ADA" Success Criteria	11-13
11-2e	Fault Tree "ADAB" Success Criteria	11-14
11-2f	Fault Tree "ADAL" Success Criteria	11-15
11-2g	Fault Tree "ADB" Success Criteria	11-15
11-2h	Fault Tree "ADL" Success Criteria	11-16
11-2i	Fault Tree "ADM" Success Criteria	11-16
11-2j	Fault Tree "ADMA" Success Criteria	11-17
11-2k	Fault Tree "ADQ" Success Criteria	11-17
11-2l	Fault Tree "ADS" Success Criteria	11-18
11-2m	Fault Tree "ADT" Success Criteria	11-18
11-2n	Fault Tree "ADW" Success Criteria	11-19
11-2o	Fault Tree "AD1" Success Criteria	11-19
11-2p	Fault Tree "AD1A" Success Criteria	11-20
11-2q	Fault Tree "ADF" Success Criteria	11-20
11-2r	Fault Tree "ADR" Success Criteria	11-21
11-2s	Fault Tree "ADRA" Success Criteria	11-21
11-2t	Fault Tree "ADU" Success Criteria	11-22
11-2u	Fault Tree "ADUM" Success Criteria	11-22
11-2v	Fault Tree "ADV" Success Criteria	11-23
11-2w	Fault Tree "ADZ" Success Criteria	11-23
11-2x	Fault Tree "ADQLT" Data Summary	11-24
11-2y	Fault Tree "ADTLT" Success Criteria	11-24
11-3	Notes Related to ADS System Fault Tree Assumptions	11-25
11-4	System Dependencies Matrix	11-26
11-5	Component Test Assumptions	11-27
11-6	Component Maintenance Assumptions	11-27
11-7	Failure Probabilities Calculated	11-27
11-8	Operator Action Analysis Summary	11-28
11-9	Common Cause Failures Summary	11-28
11-10	Basic Events Data Base for the ADA System Fault Tree (Sheets 1 – 20)	11-29
12-1	List of System Fault Trees (FT)	12-10
12-2a	Fault Tree "IW2AB" Success Criteria Summary	12-11
12-2b	Fault Tree "IW2ABM" Success Criteria Summary	12-12
12-2c	Fault Tree "IW2ABA" Success Criteria Summary	12-13
12-2d	Fault Tree "IW2ABP" Success Criteria Summary	12-14
12-2e	Fault Tree "IW2ABPM" Success Criteria Summary	12-15

LIST OF TABLES (Cont.)

Table No.	Title	Page
12-2f	Fault Tree "IW2ABB" Success Criteria Summary	12-16
12-2g	Fault Tree "IW2ABBM" Success Criteria Summary	12-17
12-2h	Fault Tree "IW1A" Success Criteria Summary	12-18
12-2i	Fault Tree "IW1AM" Success Criteria Summary	12-19
12-2j	Fault Tree "IWF" Success Criteria Summary	12-20
12-2k	Fault Tree "RECIRC" Success Criteria Summary	12-21
12-2l	Fault Tree "RECIRCP" Success Criteria Summary	12-22
12-2m	Fault Tree "RECIRCB" Success Criteria Summary	12-23
12-2n	Fault Tree "RECIRC1" Success Criteria Summary	12-24
12-2o	Fault Tree "RECIRC1P" Success Criteria Summary	12-25
12-2p	Fault Tree "RECIRC1B" Success Criteria Summary	12-26
12-3	System Dependency Matrix	12-27
12-4	Component Test Assumptions	12-28
12-5	Component Maintenance Assumptions	12-28
12-6	Failure Probabilities Calculated	12-29
12-7	Operator Actions and Misposition Analysis Summary	12-29
12-8	Common Cause Failure Analysis Summary	12-30
12-9	Fault Tree Basic Events (Sheets 1 – 11)	12-31
13-1	List of System Fault Trees	13-7
13-2	Fault Tree PCT Success Criteria Summary	13-7
13-3	Notes Related to System Fault Trees Assumptions	13-7
13-4	System Dependency Matrix	13-8
13-5	Component Test Assumptions	13-8
13-6	Component Maintenance Assumptions	13-9
13-7	Operator Actions and Misposition Analysis Summary	13-9
13-8	Common Cause Failure Analysis Summary	13-9
13-9	Fault Tree Basic Events for Passive Containment Cooling System	13-10
14-1	List of System Fault Trees (At-Power)	14-8
14-2.a	Success Criteria Summary Fault Tree "FWT"	14-9
14-2.b	Success Criteria Summary Fault Tree "FWF"	14-10
14-2.c	Success Criteria Summary Fault Tree "SFWT"	14-11
14-2.d	Success Criteria Summary Fault Tree "SFW"	14-12
14-2.e	Success Criteria Summary Fault Tree "SFW1"	14-13
14-2.f	Success Criteria Summary Fault Tree "SFWP"	14-14
14-2.g	Success Criteria Summary Fault Tree "SFWM"	14-15
14-2.h	Success Criteria Summary Fault Tree "SFWA"	14-16
14-2.i	Success Criteria Summary Fault Tree "COND"	14-17
14-2.j	Success Criteria Summary Fault Tree "COND1"	14-18
14-2.k	Success Criteria Summary Fault Tree "CDS"	14-19
14-2.l	Success Criteria Summary Fault Tree "TCCW"	14-20
14-3	Notes to System Fault Tree Assumptions	14-21

LIST OF TABLES (Cont.)

Table No.	Title	Page
14-4	System Dependency Matrix (Sheets 1 – 2)	14-22
14-5	Component Test Assumptions	14-24
14-6	Component Maintenance Assumptions	14-25
14-7	Failure Probabilities Calculated in this Section	14-25
14-8	Operator Action Analysis Summary	14-26
14-9	Common Cause Failure (CCF) Summary	14-27
14-10	Fault Tree Basic Event for Main and Startup Feedwater System (Sheets 1 – 9)	14-28
15-1	List of System Fault Trees	15-9
15-2a	Fault Tree CSBOR1 Success Criteria Summary	15-10
15-2b	Fault Tree CVS1 Success Criteria Summary	15-11
15-2c	Fault Tree CSAX Success Criteria Summary	15-12
15-2d	Fault Tree SGHL Success Criteria Summary	15-13
15-2e	Fault Tree CSP Success Criteria Summary	15-14
15-3	Notes Related to System Fault Tree Assumptions	15-15
15-4	System Dependency Matrix	15-16
15-5	Component Test Assumptions	15-17
15-6	Component Maintenance Assumptions	15-18
15-7	Operator Actions and Misposition Analysis Summary	15-19
15-8	Common Cause Failure Analysis Summary	15-20
15-9	Fault Tree Basic Events for Chemical and Volume Control System (Sheets 1 – 4)	15-21
16-1	List of System Fault Trees	16-5
16-2	Fault Tree VLH Success Criteria Summary	16-5
16-3	Notes Related to System Fault Tree Assumptions	16-5
16-4	System Dependency Matrix	16-6
16-5	Component Test Assumptions	16-6
16-6	Component Maintenance Assumptions	16-6
16-7	Operator Actions and Misposition Analysis Summary	16-7
16-8	Common Cause Failure Analysis Summary	16-7
16-9	Fault Tree Basic Events for Containment Hydrogen Control System	16-8
17-1	List of System Fault Trees	17-7
17-2	Fault Tree Success Criteria Summary (Sheets 1 – 2)	17-8
17-3	Notes Related to System Fault Tree Assumptions	17-10
17-4	System Dependencies Matrix	17-11
17-5	Component Test Assumptions	17-12
17-6	Component Maintenance Assumptions	17-12
17-7	Operator Actions and System Misposition Analysis Summary	17-13
17-8	Common Cause Failure Summary	17-13
17-9	Fault Tree Basic Events for Normal Residual Heat Removal System (Sheets 1 – 5)	17-14

LIST OF TABLES (Cont.)

Table No.	Title	Page
18-1	List of System Fault Trees	18-6
18-2a	Fault Tree CCN Success Criteria Summary	18-6
18-2b	Fault Tree CCT Success Criteria Summary	18-7
18-2c	Fault Tree CCP Success Criteria Summary	18-7
18-3	Notes Related to System Fault Tree Assumptions	18-8
18-4	System Dependency Matrix	18-8
18-5	Component Test Assumptions	18-9
18-6	Component Maintenance Assumptions	18-9
18-7	Operator Actions and Misposition Analysis Summary	18-10
18-8	Common Cause Failure Analysis Summary	18-10
18-9	Fault Tree Basic Events for Component Cooling Water System (Sheets 1 – 2)	18-11
19-1	List of System Fault Trees	19-6
19-2a	Fault Tree SWN Success Criteria Summary	19-6
19-2b	Fault Tree SWT Success Criteria Summary	19-7
19-2c	Fault Tree SWP Success Criteria Summary	19-7
19-3	Notes Related to System Fault Tree Assumptions	19-8
19-4	System Dependency Matrix	19-9
19-5	Component Test Assumptions	19-10
19-6	Component Maintenance Assumptions	19-10
19-7	Operator Actions and Misposition Analysis Summary	19-11
19-8	Common Cause Failure Analysis Summary	19-11
19-9	Fault Tree Basic Events for Service Water System (Sheets 1 – 4)	19-12
20-1	List of System Fault Trees	20-5
20-2	Fault Tree VWH Success Criteria Summary	20-5
20-3	Notes Related to System Fault Tree Assumptions	20-5
20-4	System Dependency Matrix	20-6
20-5	Component Test Assumptions	20-7
20-6	Component Maintenance Assumptions	20-7
20-7	Operator Actions and Misposition Analysis Summary	20-8
20-8	Common Cause Failure Analysis Summary	20-8
20-9	Fault Tree Basic Events for Central Chilled Water System (Sheets 1 – 2)	20-9
21-1	List of System Fault Trees (Sheets 1 – 3)	21-9
21-2	Fault Tree Success Criteria Summary (Sheets 1 – 16)	21-12
21-3	Notes Related to System Fault Tree Assumptions (Sheets 1 – 3)	21-28
21-4	System Dependency Matrix	21-31
21-5	Component Test Assumptions	21-31
21-6	Component Maintenance Assumptions	21-32
21-7	Operator Actions and Misposition Analysis Summary	21-32
21-8	Common Cause Failure Analysis Summary	21-32
21-9	Fault Tree Basic Events for AC Power System (Sheets 1 – 22)	21-33

LIST OF TABLES (Cont.)

Table No.	Title	Page
22-1	List of System Fault Trees (Sheets 1 – 4)	22-6
22-2	Fault Tree Success Criteria Summary (Sheets 1 – 16)	22-10
22-3	Notes Related to System Fault Tree Assumptions	22-26
22-4	Systems Dependency Matrix	22-26
22-5	Component Test Assumptions	22-27
22-6	Component Maintenance Assumptions	22-27
22-7	Operator Actions and Misposition Analysis Summary	22-27
22-8	Common Cause Failure Analysis Summary	22-28
22-9	Fault Tree Basic Events for Class 1E DC and UPS System (Sheets 1 – 12)	22-29
22-10	System Power Requirements/Dependencies (Sheets 1 – 11)	22-41
23-1	List of System Fault Trees (Sheets 1 – 3)	23-6
23-2	Fault Tree Success Criteria Summary (Sheets 1 – 10)	23-9
23-3	Notes Related to System Fault Tree Assumptions	23-19
23-4	System Dependency Matrix	23-19
23-5	Component Test Assumptions	23-20
23-6	Component Maintenance Assumptions	23-20
23-7	Operator Actions and Misposition Analysis Summary	23-20
23-8	Common Cause Failure Analysis Summary	23-21
23-9	Fault Tree Basic Events for Non-Class 1E DC and UPS Power System (Sheets 1 – 20)	23-22
24-1	AP1000 Containment Penetration List (Sheets 1 – 4)	24-7
24-2	Screening Analysis Evaluation (Sheets 1 – 5)	24-16
24-3	Containment Penetrations Not Screened Out for Normal Operation at Power Analysis	24-21
24-4	List of System Fault Trees	24-21
24-5a	Fault Tree CIC Success Criteria Summary	24-22
24-5b	Fault Tree CIA Success Criteria Summary	24-22
24-5c	Fault Tree CIB Success Criteria Summary	24-23
24-6	Notes Related to System Fault Tree Assumptions	24-23
24-7	System Dependency Matrix (Sheets 1 – 3)	24-24
24-8	Component Test Assumptions	24-27
24-9	Component Maintenance Assumptions	24-27
24-10	Operator Actions and Misposition Analysis Summary	24-28
24-11	Common Cause Failure Analysis Summary	24-28
24-12	Fault Tree Basic Events for Containment Isolation System (Sheets 1 – 3)	24-29
25-1	List of System Fault Trees	25-8
25-2a	Fault Tree CAIAIR Success Criteria Summary	25-9
25-2b	Fault Tree CAIR Success Criteria Summary	25-9
25-2c	Fault Tree CAIAIRP Success Criteria Summary	25-10
25-2d	Fault Tree ENDCAIAI Success Criteria Summary	25-10

LIST OF TABLES (Cont.)

Table No.	Title	Page
25-2e	Fault Tree ENDCAIAP Success Criteria Summary	25-11
25-2f	Fault Tree CASF Success Criteria Summary	25-11
25-3	Notes Related to System Fault Tree Assumptions	25-12
25-4	System Dependency Matrix	25-12
25-5	Component Test Assumptions	25-12
25-6	Component Maintenance Assumptions	25-13
25-7	Operator Actions and Misposition Analysis Summary	25-13
25-8	Common Cause Failure Analysis Summary	25-13
25-9	Fault Tree Basic Events for Instrument Air Subsystem (Sheets 1 – 4)	25-14
26-1	List of System Fault Trees	26-25
26-2a	Fault Tree RTPMS, and RTPMS1 Success Criteria Summary	26-26
26-2b	Fault Tree RTSTP Success Criteria Summary	26-26
26-2c	Fault Tree RCL Success Criteria Summary	26-27
26-2d.1	Fault Tree RCT Success Criteria Summary	26-27
26-2d.2	Fault Tree RCN Success Criteria Summary	26-28
26-2e	I&C Subtree Success Criteria Summary (Sheets 1 – 98)	26-29
26-3a	PMS I&C Subtree Constructions (Sheets 1 – 19)	26-127
26-3b	Representative PMS I&C Subtree Plot Listing (Sheets 1 – 14)	26-146
26-4	PMS Dependency Matrix (Sheets 1 – 3)	26-160
26-5	PMS Components Test Assumptions	26-163
26-6	Component Maintenance Assumptions	26-163
26-7	Failure Probabilities Calculated in this Section (Sheets 1 – 5)	26-164
26-8	Operator Actions and System Misposition Analysis Summary (Sheets 1 – 3)	26-169
26-9	Common Cause Failure Analysis Summary (Sheets 1 – 2)	26-172
26-10a	Fault Tree Basic Events for Reactor Trip System (Sheets 1 – 4)	26-174
26-10b	Fault Tree Basic Events for the I&C Subsystem (Sheets 1 – 49)	26-178
26-11	Assumed List of I&C Instrumentation (Sheets 1 – 3)	26-227
27-1	List of System Fault Trees	27-9
27-2a	Fault Tree DAS Success Criteria Summary	27-9
27-2b	Fault Tree DAS1 Success Criteria Summary	27-9
27-3	Notes Related to System Fault Tree Assumptions	27-10
27-4	System Dependency Matrix	27-10
27-5	Component Test Assumptions	27-10
27-6	Component Maintenance Assumptions	27-10
27-7	Operator Actions and Misposition Analysis Summary	27-10
27-8	Common Cause Failure Analysis Summary	27-11
27-9	Fault Tree Basic Events for Diverse Actuation System	27-12
28-1	List of System Fault Trees	28-20
28-2	Fault Tree Success Criteria Summary (Sheets 1 – 22)	28-21
28-3	PLS I&C Subtree Constructions (Sheets 1 – 9)	28-43

LIST OF TABLES (Cont.)

Table No.	Title	Page
28-4	PLS Dependency Matrix (Sheets 1 – 2)	28-52
28-5	PLS Components Test Assumptions	28-54
28-6	Component Maintenance Assumptions	28-54
28-7	Failure Probabilities Calculated in this Section (Sheets 1 – 3)	28-55
28-8	Operator Actions and System Misposition Analysis Summary (Sheets 1 – 2)	28-58
28-9	Common Cause Failure Analysis Summary (Sheets 1 – 2)	28-60
28-10	Fault Tree Basic Events for I&C Subsystem (Sheets 1 – 68)	28-62
28-11	Assumed List of I&C Instrumentation (Sheets 1 – 3)	28-130
28-12	Assignments of Plant Systems to Logic Cabinets	28-133
28-13	Assignments of Plant Systems to the Control Group Cabinets	28-134
29-1	Electrical Components with Low CCF Rate	29-18
29-2	Common-Cause Failure Calculations (Sheets 1 – 5)	29-19
29-3	Simplification of Q_K/Q_T Equations	29-24
29A-1	Extreme Environmental Conditions (Generic Causes of Dependent Failures) Excerpted from the ANS/IEEE PRA Procedures Guide (NUREG-2300)	29A-11
29A-2	Common-Cause Failures Among Systems	29A-12
29A-3	Common-Cause Failure Equations for MGL Method	29A-13
30-1	AP1000 Human Error Probability Summary Results (Sheets 1 – 16)	30-75
30-2	Manual DAS Actuation (Sheets 1 – 2)	30-91
30-3	Dependency Level Evaluation Summary (Sheets 1 – 14)	30-93
30-4	Dependency Level Evaluation (Sheets 1 – 3)	30-107
30-5	List of Acronyms	30-110
30A-1	Analyst Responsibility Based on Sharp Steps	30A-10
30A-2	Summary of Screening Values	30A-11
30A-3	Example of Operator Action Definition	30A-12
30A-4	HEP Data Bank (Sheets 1 – 5)	30A-13
31-1	Summary of Event Tree Scalar Probabilities	31-12
32-1	Generic Data Base (Sheets 1 – 13)	32-5
32-2	Test and Maintenance Outage Generic Data	32-21
32-3	Test and Maintenance Unavailabilities Used in AP1000 Core Damage Quantification	32-22
32-4	Common Cause Factors (Sheets 1 – 5)	32-23
32-5	SIMON.OUT File (Sheets 1 – 21)	32-29
33-1	Summary of AP1000 System Fault Tree Failure Probabilities (Sheets 1 – 13)	33-7
33-2	Example Accident Sequence Definitions for Large LOCA	33-20
33-3	AP1000 PRA Dominant CDF Cutsets (Sheets 1 – 10)	33-21

LIST OF TABLES (Cont.)

Table No.	Title	Page
33-4	AP1000 PRA Dominant CDF Sequences (Sheets 1 – 18)	33-31
33-5	Contribution of Initiating Events to Plant Core Damage Frequency	33-49
33-6	List of Basic Events and Their Descriptions (Sheets 1 – 33)	33-50
34-1	Post-Accident Monitoring Equipment (Sheets 1 – 2)	34-23
34-2	Level 1 Accident Class	34-25
34-3	Summary of Release Categories	34-26
34-4	3BE-1 Event Summary	34-27
34-5	3BE-2 Event Summary	34-28
34-6	3BE-4 Event Summary	34-29
34-7	3BE-5 Event Summary	34-30
34-8	3BE-6 Event Summary	34-31
34-9	3BE-7 Event Summary	34-32
34-10	3BE-3 Event Summary	34-33
34-11	3BL-1 Event Summary	34-34
34-12	3BL-2 Event Summary	34-35
34-13	3BR-1 Event Summary	34-36
34-14	3BR-1a Event Summary	34-37
34-15	3C-1 Event Summary	34-38
34-16	3C-2 Event Summary	34-39
34-17	3D-1 Event Summary	34-40
34-18	3D-2 Event Summary	34-41
34-19	3D-3 Event Summary	34-42
34-20	3D-4 Event Summary	34-43
34-21	6E-1 Event Summary	34-44
34-22	6L-1 Event Summary	34-45
34-23	1AP-1 Event Summary	34-46
34-24	1AP-2 Event Summary	34-47
34-25	1A-1 Event Summary	34-48
34-26	1A-2 Event Summary	34-49
34-27	CFI Event Summary	34-50
34-28	CFL Event Summary	34-51
35-1	Functional Definitions of Level 1 Accident Classes	35-21
35-2	CET Initial Conditions for Level 1 Accident Classes	35-22
35-3	Containment Event Tree Nodal Questions	35-23
35-4	Summary of Release Category Definitions	35-24
35-5	Summary of Containment Event Tree Success Criteria (Sheets 1 – 3)	35-25
35-6	Summary of Operator Actions Credited on Containment Event Tree	35-28
36-1	Summary Table for RCS Depressurization (CET Node DP)	36-6
37-1	Summary Table for Containment Isolation (CET Node IS)	37-4

LIST OF TABLES (Cont.)

Table No.	Title	Page
38-1	Summary Table for Reflooding (CET Node RFL)	38-5
39-1	Material Inventories in AP1000 Reactor Vessel	39-21
39-2	Summary Table for Reactor Cavity Flooding (CET Node IR)	39-22
39-3	Summary Table for Debris Relocation to Cavity (CET Node VF)	39-22
39A-1	Core and Lower Internals Material Inventories in AP1000 Reactor Vessel	39A-14
39A-2a	Mass and Power Distributions of Debris Layers in Top-Skewed Power Shape Case	39A-15
39A-2b	Mass and Power Distributions of Debris Layers in Chopped Cosine Power Shape Case	39A-16
39A-3a	Results of Top-Skewed Power Shape Case	39A-17
39A-3b	Relocation Results of the Chopped Cosine Power Shape Case	39A-18
39A-4	Material Properties Used in In-Vessel Melting and Relocation Calculation	39A-19
39A-5	Debris Relocation Time Line	39A-20
40-1	Summary of Nodal Failure Probabilities	40-6
40-2	Nominal and Bounding Containment Failure Probability at 24 and 72 Hours	40-6
41-1	Containment Event Tree IG Nodal Failure Probability	41-33
41-2	Containment Event Tree Nodal Failure Probabilities	41-33
41-3	AP600 Scenario Dependencies for Early Detonation Analysis	41-34
41-4	Safety Margin Basis Containment Performance Requirement	41-35
41A-1	Summary of System Assumptions for AP1000 MAAP4.04 Hydrogen Analyses (Sheets 1 – 7)	41A-2
41A-2	Summary of Hydrogen Generation Results MAAP4 Hydrogen Mixing Analyses	41A-10
41A-3	Summary of Early Compartment Gas Composition Results For MAAP4 Hydrogen Mixing Analyses	41A-10
41A-4	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-11
41A-5	Summary of Hydrogen Generation Results MAAP4 Hydrogen Mixing Analyses	41A-11
41A-6	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-12
41A-7	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-12
41A-8	Summary of Hydrogen Generation Results MAAP4 Hydrogen Mixing Analyses	41A-13
41A-9	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-14
41A-10	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-15
41A-11	Summary of Hydrogen Generation Results MAAP4 Hydrogen Mixing Analyses	41A-15

LIST OF TABLES (Cont.)

Table No.	Title	Page
41A-12	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-16
41A-13	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-16
41A-14	Summary of Hydrogen Generation Results MAAP4 Hydrogen Mixing Analyses	41A-17
41A-15	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-17
41A-16	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-18
41A-17	Summary of Hydrogen Generation Results MAAP4 Hydrogen Mixing Analyses	41A-18
41A-18	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-19
41A-19	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-19
41A-20	Summary of Hydrogen Generation Results MAAP4 Hydrogen Mixing Analyses	41A-20
41A-21	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-20
41A-22	Summary of Early Compartment Gas Composition Results for MAAP4 Hydrogen Mixing Analyses	41A-21
41A-23	Sequence 1A-3a	41A-22
41A-24	Sequence 1A-4a	41A-23
41A-25	Sequence 1AP-3	41A-24
41A-26	Sequence 1AP-4	41A-25
41A-27	Sequence 3D-1	41A-26
41A-28	Sequence 3D-2	41A-27
41A-29	Sequence 3D-3	41A-28
41A-30	Sequence 3D-5	41A-29
41A-31	Sequence 3BL-1	41A-30
41A-32	Sequence 3BL-2	41A-31
41A-33	Sequence 3C-1	41A-32
41A-34	Sequence 3BR-1a	41A-33
41A-35	Sequence 3BE-1	41A-34
41A-36	Sequence 3BE-2	41A-35
41A-37	Sequence 3BE-4	41A-36
41A-38	Sequence 3BE-5	41A-37
41A-39	Sequence 3BE-6	41A-38
41A-40	Sequence 3BE-8	41A-39
41A-41	Sequence 3BE-9	41A-40
42-1	Parameters Used in the Construction of the AP1000 Conditional Containment Failure Probability Distribution for Containment Temperature = 400°F	42-9
42-2	Parameters Used in the Construction of the AP1000 Conditional Containment Failure Probability Distribution for Containment Temperature = 331°F	42-9

LIST OF TABLES (Cont.)

Table No.	Title	Page
42-3	Cumulative Containment Failure Probability, Temperature = 400°F	42-10
42-4	Cumulative Containment Failure Probability, Temperature = 331°F	42-11
43-1	Accident Class Frequencies	43-13
43-2	Boolean Expressions to Calculate Q1-Q29	43-14
43-3	CET Node Probabilities (Sheets 1 – 3)	43-15
43-4	Boolean Expressions for P1-P15	43-18
43-5	Contribution of PDS to LRF (Sheets 1 – 3)	43-19
43-6	Dominant CET Sequences Contributing to LRF (Sheets 1 – 69)	43-22
43-7	Summary of Release Frequency Calculations (Sheets 1 – 2)	43-91
43-8	LRF and Containment Effectiveness by Accident Class	43-93
43-9	Summary of AP1000 LRF Quantification for Internal Events At-Power	43-94
43-10	CET Event Tree Node Importances	43-95
43-11	Contribution of Initiating Events to Large Release	43-96
43-12	LRF Sensitivity Case – Non Credit for Standby Non-Safety Systems (Sheets 1 – 9)	43-97
43-13	LRF Cutsets for the Case – Sensitivity to Standby Systems With Credit for Manual DAS (Sheets 1 – 13)	43-106
43A-1	AP1000 PRA Dominant CDF Sequences for At-Power Events (Sheets 1 – 6)	43A-2
43A-2	AP1000 PRA PDS Frequencies for At-Power Events	43A-8
43B-1	Calculation of Failure Probability of DP for PDS 6 (Sheets 1 – 7)	43B-2
43C-1	Evaluation of CET-Related Operator Actions	43C-2
44-1	MAAP Model Benchmarks (Sheets 1 – 4)	44-8
45-1	Environmental Release Fractions at 24 Hours After Core Damage Per Release Category	45-5
45-2	Environmental Release Fractions at 72 Hours After Core Damage Per Release Category	45-6
49-1	AP1000 Source Terms from Level 2 Analysis (MAAP)	49-9
49-2	AP1000 Source Terms for Dose Evaluation (MACCS2)	49-10
49-3	Site Boundary Whole Body Dose [Effective Dose Equivalent (EDE)], Sieverts	49-11
49-4	Site Boundary Thyroid Dose, Sieverts	49-12
49-5	Population Whole Body Dose [Effective Dose Equivalent (EDE)], 0-80.5 km Person-Sieverts	49-13
49-6	Site Boundary Red Marrow Dose (Total Acute), Sieverts	49-14
49-7	Dose Summary	49-15
49-8	Site Boundary Whole Body EDE Dose Risk – 24 Hours	49-16

LIST OF TABLES (Cont.)

Table No.	Title	Page
49-9	Site Boundary Whole Body EDE Dose Risk – 72 Hours	49-17
49-10	Population Whole Body EDE Dose Risk – 24 Hours	49-18
49-11	Population Whole Body EDE Dose Risk – 72 Hours	49-19
50-1	Core Damage for At-Power Events Contribution of Initiating Events to Plant Core Damage Frequency	50-16
50-2	Core Damage for At-Power Events Conditional Core Damage Probability of Initiating Events	50-17
50-3	AP1000 PRA Core Damage for At-Power Events Accident Sequence Importances (Sheets 1 – 5)	50-18
50-4	Core Damage for At-Power Events End State Importances	50-23
50-5	Common Cause Importances – Risk Decrease (Sheets 1 – 2)	50-24
50-6	Common Cause Importances – Risk Increase (Sheets 1 – 3)	50-26
50-7	Human Error Risk Importances – Risk Decrease (Sheets 1 – 2)	50-29
50-8	Human Error Risk Importances – Risk Increase (Sheets 1 – 2)	50-31
50-9	Component Importances – Risk Decrease (Sheets 1 – 2)	50-33
50-10	Component Importances – Risk Increase (Sheets 1 – 4)	50-35
50-11	List of Systems for System Importance Analyses (Sheets 1 – 4)	50-39
50-12	System Importance Calculation Results (Sheets 1 – 2)	50-43
50-13	Systems Grouped by PRA System Importance	50-45
50-14	Operator Actions in "CMTOT.OUT" File	50-46
50-15	Contribution of IEVs to Core Damage Frequency	50-47
50-16	Case 29 – Top 50 Dominant Cutsets (Sheets 1 – 2)	50-48
50-17	Case 30 – Top 50 Dominant Cutsets (Sheets 1 – 2)	50-50
50-18	Case 31 – Top 50 Dominant Cutsets (Sheets 1 – 3)	50-52
50-19	Passive System Check Valves in "CMTOT.OUT" File	50-55
50-20	Sensitivity Case 36 – Contribution of Initiating Events to CDF	50-56
50-21	Sensitivity Case 36 – Top 50 CDF Cutsets (Sheets 1 – 8)	50-57
50-22	Risk Importances Sorted by Basic Event Identification (Sheets 1 – 13)	50-65
50-23	Risk Importances Sorted by Risk Increase (Sheets 1 – 15)	50-78
50-24	Risk Importances Sorted by Risk Decrease (Sheets 1 – 15)	50-93
50-25	Risk Increases Sorted by Slope (Birnbaum) Importance (Sheets 1 – 13)	50-108
51-1	Summary of Results of AP1000 PRA Uncertainty Analysis for Internal Initiating Events at Power	51-9
51-2	List of Input Cutset Files	51-10
51A-1	Basic Event Uncertainties (Sheets 1 – 32)	51A-3
54-1	AP1000 Initiating Event Frequencies During Shutdown Conditions	54-18
54-2	AP1000 Design Impact on AP600 Shutdown Model	54-19
54-3	Times for Loss of RNS at Mid-loop Without IRWST Injection	54-20
54-4	AP1000 & AP600 Initiating Event CDF Contributions	54-21

LIST OF TABLES (Cont.)

Table No.	Title	Page
54-5	AP600 Shutdown Level 1 PRA Top 200 Cutsets (Sheets 1 – 25)	54-22
54-6	AP1000 Shutdown Level 1 PRA Top 200 Cutsets (Sheets 1 – 25)	54-47
54-7	Basic Event Probabilities Revised in Case 1	54-72
54-8	Revised CCF Basic Event Probabilities (Sheets 1 – 2)	54-73
54-9	Contribution of Initiating Events to Plant CDF – Shutdown Sensitivity Case 1	54-75
54-10	AP1000 Shutdown PRA Sensitivity Case 2 CDF Cutsets (Sheets 1 – 5)	54-76
54-11	List of Basic Events "Dropped" to Make the Sensitivity Case 2	54-81
54-12	Contribution of Initiating Events to Plant CDF – Shutdown Sensitivity Case 2	54-82
54-13	Shutdown PRA Sensitivity Case 3 (Sheets 1 – 28)	54-83
54-14	Basic Events Whose Probabilities are Changed in Case 3	54-111
54-15	AP1000 Shutdown PRA Sensitivity Case 4 CDF Cutsets (Sheets 1 – 7)	54-112
54-16	List of Basic Events "Dropped" to Make the Sensitivity Case 4	54-119
54-17	Contribution of Initiating Events to Plant CDF – Shutdown Sensitivity Case 4	54-120
54-18	AP1000 Shutdown PRA Basic Event Risk Importances – RAW (Sheets 1 – 8)	54-121
54-19	AP1000 Shutdown PRA Basic Event Risk Importances – RRW (Sheets 1 – 3)	54-129
54-20	AP1000 Shutdown PRA Case 2 Basic Event Risk Importances – RAW (Sheets 1 – 4)	54-132
54-21	AP1000 Shutdown PRA Case 2 Basic Event Risk Importances – RRW (Sheets 1 – 2)	54-136
55-1	Seismic Margin HCLPF Values (Sheets 1 – 4)	55-21
55-2	Basic Event HCLPF Values (Sheets 1 – 3)	55-25
55-3	EQ-IEV-STRUC HCLPF	55-28
55-4	EQ-IEV-RVFA HCLPF	55-28
55-5	EQ-IEV-LLOCA HCLPF	55-29
55-6	EQ-IEV-SLOCA HCLPF	55-29
55-7	EQ-IEV-ATWS HCLPF	55-29
56-1	Flooding Analysis Initial Screening Results (Sheets 1 – 3)	56-50
56-2	At-Power Detailed Screening Results (Sheets 1 – 5)	56-53
56-3	At-Power Flooding-Induced Core Damage Frequency Quantification Summary Results (Sheets 1 – 6)	56-58
56-4	Power Upgrade Difference Between AP1000 and AP600	56-64
56-5	Shutdown Flooding PRA	56-65
56-6	Shutdown Initiating Event CCDPs	56-66
57-1	AP1000 Fire Areas Excluding the Containment (Sheets 1 – 6)	57-43
57-2	AP1000 Fire Areas in the Containment (Sheets 1 – 2)	57-49
57-3	Fire Ignition Frequencies for AP1000 Fire Areas (Sheets 1 – 4)	57-51
57-4	Fire Ignition Frequencies for AP1000 Containment Fire Area	57-58
57-5	Fire Barrier Failure Probabilities	57-61
57-6	Automatic Suppression System Reliability	57-62

LIST OF TABLES (Cont.)

Table No.	Title	Page
57-7	Summary of Qualitative Evaluation Results – Power Operation – Plant except Containment and Main Control Room (Sheets 1 – 15)	57-63
57-8	Summary of Qualitative Evaluation Results for Containment at Power Operation (Sheets 1 – 4)	57-82
57-9	Summary of Results (Sheets 1 – 5)	57-88
57-10	Distribution of Fire CDF Frequency by Three Major Plant Areas	57-93
57-11	Distribution of Fire CDF Frequency by Eight Plant Areas	57-94
57-12	Fire Areas Sorted by CDF (Sheets 1 – 5)	57-95
57-13	Fire Areas Sorted by CDF/FIEV (Sheets 1 – 5)	57-100
57-14	Credit for Manual Fire Suppression	57-105
57-15	Reduction of Hot Short Probability	57-106
57-16	Increase of Hot Short Probability	57-107
57-17	Sensitivity to Human Actions	57-108
57-18	Sensitivity to Fire Ignition Frequencies	57-109
57-19	Sensitivity to Actuation by DAS	57-110
57-20	Plant Fire CDF Without Hot Shorts	57-111
57-21	Contribution of the Plant Areas to CDF	57-112
57-22	Dominant Fire Scenarios (Sheets 1 – 4)	57-113
57-23	AP1000 Shutdown CCDPs	57-117
57-24	AP1000 Dominant Fire Sequences (Sheets 1 – 4)	57-118
57-25	Dominant Fire Scenarios from AP600 Shutdown Fire PRA	57-122
57-26	Summary of AP1000 Shutdown Fire Evaluation	57-123
57-27	Main Contributors for Shutdown Fire Risk	57-124
57A-1	Summary of Scenario CCDPs (Sheets 1 – 5)	57A-7
57A-2	AP1000 Base Case CCDPs for Initiating Events	57A-12
57A-3	DAS-ACT Fault Tree Cutsets Before Subtree Reduction	57A-13
57A-4	DAS-ACT Fault Tree Cutsets After Subtree Reduction (Sheets 1 – 10)	57A-14
57A-5	DAS-ACT Fault Tree Cutsets After Subtree Reduction (Sheets 1 – 9)	57A-24
57A-6	AP1000 Fire PRA Scenario CCDPs for Over-Conservative Cases (Sheets 1 – 3)	57A-33
57C-1	Data Used in Event Tree Scenario Frequency Calculations (Sheets 1 – 5)	57C-2
57C-2	CCDPs Used in Fire Event Trees (Sheets 1 – 5)	57C-7
59-1	Contribution of Initiating Events to Core Damage	59-39
59-2	Conditional Core Damage Probability of Initiating Events	59-40
59-3	Internal Initiating Events at Power Dominant Core Damage Sequences (Sheets 1 – 4)	59-41
59-4	Sequence 1 – Safety Injection Line Break Dominant Cutsets (SI-LB-07) (Sheets 1 – 3)	59-45
59-5	Sequence 2 – Large LOCA Dominant Cutsets (LLOCA-09)	59-48

LIST OF TABLES (Cont.)

Table No.	Title	Page
59-6	Sequence 3 – Spurious ADS Actuation Dominant Cutsets (SPADS-08) (Sheets 1 – 3)	59-49
59-7	Sequence 4 – Safety Injection Line Break Dominant Cutsets (SI-LB-08) (Sheets 1 – 3)	59-52
59-8	Sequence 5 – Reactor Vessel Rupture Cutset (RV-RP-02)	59-55
59-9	Sequence 6 – Small LOCA Dominant Cutsets (SLOCA-05) (Sheets 1 – 3)	59-56
59-10	Sequence 7 – Medium LOCA Dominant Cutsets (MLOCA-05) (Sheets 1 – 3)	59-59
59-11	Sequence 8 – Small LOCA Dominant Cutsets (SLOCA-12) (Sheets 1 – 3)	59-62
59-12	Sequence 9 – Medium LOCA Dominant Cutsets (MLOCA-12) (Sheets 1 – 3)	59-65
59-13	Sequence 10 – Spurious ADS Actuation Dominant Cutsets (SPADS-09) (Sheets 1 – 3)	59-68
59-14	Typical System Failure Probabilities, Showing Higher Reliabilities for Safety Systems	59-71
59-15	Summary of AP1000 PRA Results	59-72
59-16	Site Boundary Whole Body EDE Dose Risk – 24 Hours	59-73
59-17	Comparison of AP1000 PRA Results to Risk Goals	59-74
59-18	AP1000 PRA-Based Insights (Sheets 1 –24)	59-75

LIST OF FIGURES

Figure No.	Title	Page
2-1	Core Damage Logic Diagram for Internal Initiators (Sheets 1 – 4)	2-47
4A-1	Example Event Tree for Illustration of Terminology	4A-19
4A-2	Functional Event Tree	4A-20
4A-3	Illustration of A/B and A&B Notation	4A-21
4A-4	Illustration of Consequential Event and ATWS End States	4A-22
4A-5	AP1000 PRA Transients Template Event Tree (Sheets 1 – 3)	4A-23
4A-6	AP1000 PRA Small LOCA Template Event Tree (Sheets 1 – 2)	4A-26
4B-1	AP1000 Large LOCA Event Tree (Sheets 1 – 2)	4B-2
4B-2	AP1000 Large Spurious ADS Actuation Event Tree (Sheets 1 – 2)	4B-4
4B-3	AP1000 Medium LOCA Event Tree (Sheets 1 – 4)	4B-6
4B-4	AP1000 CMT Line Break Event Tree (Sheets 1 – 4)	4B-10
4B-5	AP1000 SI Line Break Event Tree (Sheets 1 – 3)	4B-14
4B-6	AP1000 Small LOCA Event Tree (Sheets 1 – 6)	4B-17
4B-7	AP1000 RCS Leak Event Tree	4B-23
4B-8	AP1000 Passive RHR Tube Rupture Event Tree	4B-24
4B-9a	AP1000 Steam Generator Tube Rupture Event Tree (Sheets 1 – 3)	4B-25
4B-9b	AP1000 SGTR Continues Event Tree (Sheets 1 – 6)	4B-28
4B-10	AP1000 Reactor Vessel Rupture Event Tree	4B-34
4B-11	AP1000 Interfacing Systems LOCA Event Tree	4B-35
4B-12	AP1000 Transients With Main Feedwater Event Tree (Sheets 1 – 4)	4B-36
4B-13	AP1000 Loss of Reactor Coolant Flow Event Tree (Sheets 1 – 4)	4B-40
4B-14	AP1000 Loss of Feedwater to One SG Tree (Sheets 1 – 4)	4B-44
4B-15	AP1000 Transients With Core Power Excursion Event Tree (Sheets 1 – 4)	4B-48
4B-16	AP1000 Transients With Loss of CCW/SW Event Tree (Sheets 1 – 4)	4B-52
4B-17	AP1000 Loss of MFW Event Tree (Sheets 1 – 4)	4B-56
4B-18	AP1000 Loss of Condenser Event Tree (Sheets 1 – 4)	4B-60
4B-19	AP1000 Loss of Main Compressed Air Event Tree (Sheets 1 – 4)	4B-64
4B-20	AP1000 Loss of Offsite Power Event Tree (Sheets 1 – 7)	4B-68
4B-21	Main Steam Line Break Downstream of MSIVs Event Tree (Sheets 1 – 5)	4B-75
4B-22	Main Steam Line Break Upstream of MSIVs Event Tree (Sheets 1 – 9)	4B-80
4B-23	Stuck Open Secondary Side Safety Valve Event Tree (Sheets 1 – 5)	4B-89
4B-24a	ATWS Precursor Without Main Feedwater	4B-94
4B-24b	AP1000 ATWS Precursor Without Main Feedwater Continues Event Tree (Sheets 1 – 6)	4B-95
4B-25	ATWS Precursor With SI (Sheets 1 – 6)	4B-101
4B-26	ATWS Precursor With MFW (Sheets 1 – 4)	4B-107
7-1	Power/Control Model for Large Loads (6900-vac/480-vac Pumps, Fans, and Motors)	7-33
7-2	Power/Control Model for Motor-Operated Valves	7-35
7-3	Power/Control Model for Air-Operated Valves	7-37

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
7-4	Power/Control Model for Variable Speed Motor	7-39
7-5	An Illustration of Fault Tree Basic Events for a Pump Following the Model Given in Figure 7-1	7-41
8-1	PRHR – Simplified Piping and Instrumentation Diagram	8-23
8-2	PRHR – Simplified Valve Control Diagram	8-25
9-1	Passive Core Cooling System Simplified Sketch	9-24
9-2	Passive Core Cooling System Piping and Instrumentation Diagram	9-25
10-1	Passive Core Cooling System – Accumulator Subsystem	10-12
11-1	Automatic Depressurization System Simplified Piping and Instrumentation Diagram	11-49
12-1	Simplified Piping & Instrumentation Diagram of the IRWST/Gravity Injection Subsystem	12-42
13-1	Passive Containment Cooling System Sketch	13-11
15-1	Chemical and Volume Control System Piping and Instrumentation Diagram (Sheets 1 – 2)	15-25
17-1	Normal Residual Heat Removal System Sketch	17-19
18-1	Component Cooling Water System Piping and Instrumentation Diagram	18-13
19-1	Service Water System Piping and Instrumentation Diagram	19-17
20-1	Central Chilled Water Low-Capacity Subsystem Piping and Instrumentation Diagram (Sheets 1 – 2)	20-11
21-1	AC Power System One-Line Diagram	21-55
22-1	Class 1E DC System One-Line Diagram (Sheets 1 – 2)	22-53
22-2	Class 1E UPS One-Line Diagram	22-57
25-1	Compressed & Instrument Air System Piping and Instrumentation Diagram	25-19
29-1	IRWST Valve Configuration	29-25
30-1	Human Reliability Analysis Quantification Model	30-111
30A-1	Links Between SHARP Steps	30A-18

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-1	Case 3BE-1: Reactor Coolant System and Steam Generator Pressure DVI Line Break, Containment Water Level	34-52
34-2	Case 3BE-1: ADS Stage 4 Flow Rates DVI Line Break, Containment Water Level	34-52
34-3	Case 3BE-1: Accumulator/CMT Water Mass DVI Line Break, Containment Water Level	34-53
34-4	Case 3BE-1: IRWST Injection Flow Rate DVI Line Break, Containment Water Level	34-53
34-5	Case 3BE-1: Break Flow Rate DVI Line Break, Containment Water Level	34-54
34-6	Case 3BE-1: Reactor Vessel Water Level DVI Line Break, Containment Water Level	34-54
34-7	Case 3BE-1: Core Temperatures DVI Line Break, Containment Water Level	34-55
34-8	Case 3BE-1: Containment Water Pool Elevations DVI Line Break, Containment Water Level	34-55
34-9	Case 3BE-1: Containment Pressure DVI Line Break, Containment Water Level	34-56
34-10	Case 3BE-1: Containment Gas Temperatures DVI Line Break, Containment Water Level	34-56
34-11	Case 3BE-1: Core Mass DVI Line Break, Containment Water Level	34-57
34-12	Case 3BE-1: Reactor Pressure Vessel to Cavity Water Heat Transfer DVI Line Break, Containment Water Level	34-57
34-13	Case 3BE-1: In-Vessel Hydrogen Generation DVI Line Break, Containment Water Level	34-58
34-14	Case 3BE-1: Mass Fraction of CsI Released to Containment DVI Line Break, Containment Water Level	34-58
34-15	Case 3BE-1: Mass Fraction of Noble Gases Released to Environment DVI Line Break, Containment Water Level	34-59
34-16	Case 3BE-1: Mass Fraction of Fission Products Released to Environment DVI Line Break, Containment Water Level	34-59
34-17	Case 3BE-1: Mass Fraction of SrO Released to Environment DVI Line Break, Containment Water Level	34-60
34-18	Case 3BE-2: Reactor Coolant System and Steam Generator Pressure DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-60
34-19	Case 3BE-2: ADS Stage 4 Flow Rates DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-61
34-20	Case 3BE-2: Accumulator/CMT Water Mass DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-61
34-21	Case 3BE-2: IRWST Injection Flow Rate DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-62
34-22	Case 3BE-2: Break Flow Rate DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-62

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-23	Case 3BE-2: Reactor Vessel Water Level DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-63
34-24	Case 3BE-2: Core Temperatures DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-63
34-25	Case 3BE-2: Containment Water Pool Elevations DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-64
34-26	Case 3BE-2: Containment Pressure DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-64
34-27	Case 3BE-2: Containment Gas Temperatures DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-65
34-28	Case 3BE-2: Core Mass DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-65
34-29	Case 3BE-2: Reactor Pressure Vessel to Cavity Water Heat Transfer DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-66
34-30	Case 3BE-2: In-Vessel Hydrogen Generation DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-66
34-31	Case 3BE-2: Mass Fraction of CsI Released to Containment DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-67
34-32	Case 3BE-2: Mass Fraction of Noble Gases Released to Environment DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-67
34-33	Case 3BE-2: Mass Fraction of Fission Products Released to Environment DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-68
34-34	Case 3BE-2: Mass Fraction of SrO Released to Environment DVI Line Break, Fail Gravity Injection, No DVI Flooding	34-68
34-35	Case 3BE-4: Reactor Coolant System and Steam Generator Pressure Spurious ADS, Failed Gravity Injection	34-69
34-36	Case 3BE-4: ADS Stage 4 Flow Rates Spurious ADS, Failed Gravity Injection	34-69
34-37	Case 3BE-4: Accumulator/CMT Water Mass Spurious ADS, Failed Gravity Injection	34-70
34-38	Case 3BE-4: IRWST Injection Flow Rate Spurious ADS, Failed Gravity Injection	34-70
34-39	Case 3BE-4: Break Flow Rate Spurious ADS, Failed Gravity Injection	34-71
34-40	Case 3BE-4: Reactor Vessel Water Level Spurious ADS, Failed Gravity Injection	34-71
34-41	Case 3BE-4: Core Temperatures Spurious ADS, Failed Gravity Injection	34-72
34-42	Case 3BE-4: Containment Water Pool Elevations Spurious ADS, Failed Gravity Injection	34-72
34-43	Case 3BE-4: Containment Pressure Spurious ADS, Failed Gravity Injection	34-73
34-44	Case 3BE-4: Containment Gas Temperatures Spurious ADS, Failed Gravity Injection	34-73
34-45	Case 3BE-4: Core Mass Spurious ADS, Failed Gravity Injection	34-74

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-46	Case 3BE-4: Reactor Pressure Vessel to Cavity Water Heat Transfer Spurious ADS, Failed Gravity Injection	34-74
34-47	Case 3BE-4: In-Vessel Hydrogen Generation Spurious ADS, Failed Gravity Injection	34-75
34-48	Case 3BE-4: Mass Fraction of CsI Released to Containment Spurious ADS, Failed Gravity Injection	34-75
34-49	Case 3BE-4: Mass Fraction of Noble Gases Released to Environment Spurious ADS, Failed Gravity Injection	34-76
34-50	Case 3BE-4: Mass Fraction of Fission Products Released to Environment Spurious ADS, Failed Gravity Injection	34-76
34-51	Case 3BE-4: Mass Fraction of SrO Released to Environment Spurious ADS, Failed Gravity Injection	34-77
34-52	Case 3BE-5: Reactor Coolant System and Steam Generator Pressure SBLOCA with Failed Gravity Injection	34-77
34-53	Case 3BE-5: ADS Stage 4 Flow Rates SBLOCA with Failed Gravity Injection	34-78
34-54	Case 3BE-5: Accumulator/CMT Water Mass SBLOCA with Failed Gravity Injection	34-78
34-55	Case 3BE-5: IRWST Injection Flow Rate SBLOCA with Failed Gravity Injection	34-79
34-56	Case 3BE-5: Break Flow Rate SBLOCA with Failed Gravity Injection	34-79
34-57	Case 3BE-5: Reactor Vessel Water Level SBLOCA with Failed Gravity Injection	34-80
34-58	Case 3BE-5: Core Temperatures SBLOCA with Failed Gravity Injection	34-80
34-59	Case 3BE-5: Containment Water Pool Elevations SBLOCA with Failed Gravity Injection	34-81
34-60	Case 3BE-5: Containment Pressure SBLOCA with Failed Gravity Injection	34-81
34-61	Case 3BE-5: Containment Gas Temperature SBLOCA with Failed Gravity Injection	34-82
34-62	Case 3BE-5: Core Mass SBLOCA with Failed Gravity Injection	34-82
34-63	Case 3BE-5: Reactor Pressure Vessel to Cavity Water Heat Transfer SBLOCA with Failed Gravity Injection	34-83
34-64	Case 3BE-5: In-Vessel Hydrogen Generation SBLOCA with Failed Gravity Injection	34-83
34-65	Case 3BE-5: Mass Fraction of CsI Released to Containment SBLOCA with Failed Gravity Injection	34-84
34-66	Case 3BE-5: Mass Fraction of Noble Gases Released to Environment SBLOCA with Failed Gravity Injection	34-84
34-67	Case 3BE-5: Mass Fraction of Fission Products Released to Environment SBLOCA with Failed Gravity Injection	34-85
34-68	Case 3BE-5: Mass Fraction of SrO Released to Environment SBLOCA with Failed Gravity Injection	34-85

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-69	Case 3BE-6: Reactor Coolant System and Steam Generator Pressure SBLOCA with Failed Gravity Injection	34-86
34-70	Case 3BE-6: ADS Stage 4 Flow Rates SBLOCA with Failed Gravity Injection	34-86
34-71	Case 3BE-6: Accumulator/CMT Water Mass SBLOCA with Failed Gravity Injection	34-87
34-72	Case 3BE-6: IRWST Injection Flow Rate SBLOCA with Failed Gravity Injection	34-87
34-73	Case 3BE-6: Break Flow Rate SBLOCA with Failed Gravity Injection	34-88
34-74	Case 3BE-6: Reactor Vessel Water Level SBLOCA with Failed Gravity Injection	34-88
34-75	Case 3BE-6: Core Temperatures SBLOCA with Failed Gravity Injection	34-89
34-76	Case 3BE-6: Containment Water Pool Elevations SBLOCA with Failed Gravity Injection	34-89
34-77	Case 3BE-6: Containment Pressure SBLOCA with Failed Gravity Injection	34-90
34-78	Case 3BE-6: Containment Gas Temperature SBLOCA with Failed Gravity Injection	34-90
34-79	Case 3BE-6: Core Mass SBLOCA with Failed Gravity Injection	34-91
34-80	Case 3BE-6: Reactor Pressure Vessel to Cavity Water Heat Transfer SBLOCA with Failed Gravity Injection	34-91
34-81	Case 3BE-6: In-Vessel Hydrogen Generation SBLOCA with Failed Gravity Injection	34-92
34-82	Case 3BE-6: Mass Fraction of CsI Released to Containment SBLOCA with Failed Gravity Injection	34-92
34-83	Case 3BE-6: Mass Fraction of Noble Gases Released to Environment SBLOCA with Failed Gravity Injection	34-93
34-84	Case 3BE-6: Mass Fraction of Fission Products Released to Environment SBLOCA with Failed Gravity Injection	34-93
34-85	Case 3BE-6: Mass Fraction of SrO Released to Environment SBLOCA with Failed Gravity Injection	34-94
34-86	Case 3BE-7: Reactor Coolant System and Steam Generator Pressure SBLOCA with Failed Gravity Injection	34-94
34-87	Case 3BE-7: ADS Stage 4 Flow Rates SBLOCA with Failed Gravity Injection	34-95
34-88	Case 3BE-7: Accumulator/CMT Water Mass SBLOCA with Failed Gravity Injection	34-95
34-89	Case 3BE-7: IRWST Injection Flow Rate SBLOCA with Failed Gravity Injection	34-96
34-90	Case 3BE-7: Break Flow Rate SBLOCA with Failed Gravity Injection	34-96
34-91	Case 3BE-7: Reactor Vessel Water Level SBLOCA with Failed Gravity Injection	34-97
34-92	Case 3BE-7: Core Temperatures SBLOCA with Failed Gravity Injection	34-97

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-93	Case 3BE-7: Containment Water Pool Elevations SBLOCA with Failed Gravity Injection	34-98
34-94	Case 3BE-7: Containment Pressure SBLOCA with Failed Gravity Injection	34-98
34-95	Case 3BE-7: Containment Gas Temperature SBLOCA with Failed Gravity Injection	34-99
34-96	Case 3BE-7: Core Mass SBLOCA with Failed Gravity Injection	34-99
34-97	Case 3BE-7: Reactor Pressure Vessel to Cavity Water Heat Transfer SBLOCA with Failed Gravity Injection	34-100
34-98	Case 3BE-7: In-Vessel Hydrogen Generation SBLOCA with Failed Gravity Injection	34-100
34-99	Case 3BE-7: Mass Fraction of CsI Released to Containment SBLOCA with Failed Gravity Injection	34-101
34-100	Case 3BE-7: Mass Fraction of Noble Gases Released to Environment SBLOCA with Failed Gravity Injection	34-101
34-101	Case 3BE-7: Mass Fraction of Fission Products Released to Environment SBLOCA with Failed Gravity Injection	34-102
34-102	Case 3BE-7: Mass Fraction of SrO Released to Environment SBLOCA with Failed Gravity Injection	34-102
34-103	Case 3BE-3: Reactor Coolant System and Steam Generator Pressure DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-103
34-104	Case 3BE-3: ADS Stage 4 Flow Rate DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-103
34-105	Case 3BE-3: Accumulator/CMT Water Mass DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-104
34-106	Case 3BE-3: IRWST Injection Flow Rate DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-104
34-107	Case 3BE-3: Break Flow Rate DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-105
34-108	Case 3BE-3: Reactor Vessel Water Level DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-105
34-109	Case 3BE-3: Core Temperatures DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-106
34-110	Case 3BE-3: Containment Water Pool Elevations DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-106
34-111	Case 3BE-3: Containment Pressure DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-107
34-112	Case 3BE-3: Containment Gas Temperature DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-107
34-113	Case 3BE-3: Core Mass DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-108
34-114	Case 3BE-3: Reactor Pressure Vessel to Cavity Water Heat Transfer DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-108

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-115	Case 3BE-3: In-Vessel Hydrogen Generation DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-109
34-116	Case 3BE-3: Mass Fraction of CsI Released to Containment DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-109
34-117	Case 3BE-3: Mass Fraction of Noble Gases Released to Environment DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-110
34-118	Case 3BE-3: Mass Fraction of Fission Products Released to Environment DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-110
34-119	Case 3BE-3: Mass Fraction of SrO Released to Environment DVI Line Break, Failed Gravity Injection, No PXS Flooding	34-111
34-120	Case 3BL-1: Reactor Coolant System and Steam Generator Pressure SBLOCA with Failed Gravity Injection	34-111
34-121	Case 3BL-1: ADS Stage 4 Flow Rates SBLOCA with Failed Gravity Injection	34-112
34-122	Case 3BL-1: Accumulator/CMT Water Mass SBLOCA with Failed Gravity Injection	34-112
34-123	Case 3BL-1: IRWST Injection Flow Rate SBLOCA with Failed Gravity Injection	34-113
34-124	Case 3BL-1: Break Flow Rate SBLOCA with Failed Gravity Injection	34-113
34-125	Case 3BL-1: Reactor Vessel Water Level SBLOCA with Failed Gravity Injection	34-114
34-126	Case 3BL-1: Core Temperatures SBLOCA with Failed Gravity Injection	34-114
34-127	Case 3BL-1: Containment Water Pool Elevations SBLOCA with Failed Gravity Injection	34-115
34-128	Case 3BL-1: Containment Pressure SBLOCA with Failed Gravity Injection	34-115
34-129	Case 3BL-1: Containment Gas Temperature SBLOCA with Failed Gravity Injection	34-116
34-130	Case 3BL-1: Core Mass SBLOCA with Failed Gravity Injection	34-116
34-131	Case 3BL-1: Reactor Pressure Vessel to Cavity Water Heat Transfer SBLOCA with Failed Gravity Injection	34-117
34-132	Case 3BL-1: In-Vessel Hydrogen Generation SBLOCA with Failed Gravity Injection	34-117
34-133	Case 3BL-1: Mass Fraction of CsI Released to Containment SBLOCA with Failed Gravity Injection	34-118
34-134	Case 3BL-1: Mass Fraction of Noble Gases Released to Environment SBLOCA with Failed Gravity Injection	34-118
34-135	Case 3BL-1: Mass Fraction of Fission Products Released to Environment SBLOCA with Failed Gravity Injection	34-119
34-136	Case 3BL-1: Mass Fraction of SrO Released to Environment SBLOCA with Failed Gravity Injection	34-119
34-137	Case 3BL-2: Reactor Coolant System and Steam Generator Pressure DVI Line Break with Failed Gravity Injection	34-120

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-138	Case 3BL-2: ADS Stage 4 Flow Rates DVI Line Break with Failed Gravity Injection	34-120
34-139	Case 3BL-2: Accumulator/CMT Water Mass DVI Line Break with Failed Gravity Injection	34-121
34-140	Case 3BL-2: IRWST Injection Flow Rate DVI Line Break with Failed Gravity Injection	34-121
34-141	Case 3BL-2: Break Flow Rate DVI Line Break with Failed Gravity Injection	34-122
34-142	Case 3BL-2: Reactor Vessel Water Level DVI Line Break with Failed Gravity Injection	34-122
34-143	Case 3BL-2: Core Temperatures DVI Line Break with Failed Gravity Injection	34-123
34-144	Case 3BL-2: Containment Water Pool Elevations DVI Line Break with Failed Gravity Injection	34-123
34-145	Case 3BL-2: Containment Pressure DVI Line Break with Failed Gravity Injection	34-124
34-146	Case 3BL-2: Containment Gas Temperature DVI Line Break with Failed Gravity Injection	34-124
34-147	Case 3BL-2: Core Mass DVI Line Break with Failed Gravity Injection	34-125
34-148	Case 3BL-2: Reactor Pressure Vessel to Cavity Water Heat Transfer DVI Line Break with Failed Gravity Injection	34-125
34-149	Case 3BL-2: In-Vessel Hydrogen Generation DVI Line Break with Failed Gravity Injection	34-126
34-150	Case 3BL-2: Mass Fraction of CsI Released to Containment DVI Line Break with Failed Gravity Injection	34-126
34-151	Case 3BL-2: Mass Fraction of Noble Gases Released to Environment DVI Line Break with Failed Gravity Injection	34-127
34-152	Case 3BL-2: Mass Fraction of Fission Products Released to Environment DVI Line Break with Failed Gravity Injection	34-127
34-153	Case 3BL-2: Mass Fraction of SrO Released to Environment DVI Line Break with Failed Gravity Injection	34-128
34-154	Case 3BR-1: Reactor Coolant System and Steam Generator Pressure CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-128
34-155	Case 3BR-1: ADS Stage 4 Flow Rates CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-129
34-156	Case 3BR-1: Accumulator/CMT Water Mass CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-129
34-157	Case 3BR-1: IRWST Injection Flow Rate CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-130
34-158	Case 3BR-1: Break Flow Rate CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-130
34-159	Case 3BR-1: Reactor Vessel Water Level CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-131

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-160	Case 3BR-1: Core Temperatures CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-131
34-161	Case 3BR-1: Containment Water Pool Elevations CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-132
34-162	Case 3BR-1: Containment Pressure CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-132
34-163	Case 3BR-1: Containment Gas Temperature CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-133
34-164	Case 3BR-1: Core Mass CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-133
34-165	Case 3BR-1: Reactor Pressure Vessel to Cavity Water Heat Transfer CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-134
34-166	Case 3BR-1: In-Vessel Hydrogen Generation CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-134
34-167	Case 3BR-1: Mass Fraction of CsI Released to Containment CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-135
34-168	Case 3BR-1: Mass Fraction of Noble Gases Released to Environment CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-135
34-169	Case 3BR-1: Mass Fraction of Fission Products Released to Environment CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-136
34-170	Case 3BR-1: Mass Fraction of SrO Released to Environment CL LBLOCA to Loop Compartment 2/2 Gravity Injection/Recirculation Lines	34-136
34-171	Case 3BR-1a: Reactor Coolant System and Steam Generator Pressure CL LBLOCA with Failed Accumulators	34-137
34-172	Case 3BR-1a: ADS Stage 4 Flow Rates CL LBLOCA with Failed Accumulators	34-137
34-173	Case 3BR-1a: Accumulator/CMT Water Mass CL LBLOCA with Failed Accumulators	34-138
34-174	Case 3BR-1a: IRWST Injection Flow Rate CL LBLOCA with Failed Accumulators	34-138
34-175	Case 3BR-1a: Break Flow Rate CL LBLOCA with Failed Accumulators	34-139
34-176	Case 3BR-1a: Reactor Vessel Water Level CL LBLOCA with Failed Accumulators	34-139
34-177	Case 3BR-1a: Core Temperatures CL LBLOCA with Failed Accumulators	34-140
34-178	Case 3BR-1a: Containment Water Pool Elevations CL LBLOCA with Failed Accumulators	34-140
34-179	Case 3BR-1a: Containment Pressure CL LBLOCA with Failed Accumulators	34-141

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-180	Case 3BR-1a: Containment Gas Temperature CL LBLOCA with Failed Accumulators	34-141
34-181	Case 3BR-1a: Core Mass CL LBLOCA with Failed Accumulators	34-142
34-182	Case 3BR-1a: Reactor Pressure Vessel to Cavity Water Heat Transfer CL LBLOCA with Failed Accumulators	34-142
34-183	Case 3BR-1a: In-Vessel Hydrogen Generation CL LBLOCA with Failed Accumulators	34-143
34-184	Case 3BR-1a: Mass Fraction of CsI Released to Containment CL LBLOCA with Failed Accumulators	34-143
34-185	Case 3BR-1a: Mass Fraction of Noble Gases Released to Environment CL LBLOCA with Failed Accumulators	34-144
34-186	Case 3BR-1a: Mass Fraction of Fission Products Released to Environment CL LBLOCA with Failed Accumulators	34-144
34-187	Case 3BR-1a: Mass Fraction of SrO Released to Environment CL LBLOCA with Failed Accumulators	34-145
34-188	Case 3C-1: Reactor Coolant System and Steam Generator Pressure Vessel Rupture	34-145
34-189	Case 3C-1: ADS Stage 4 Flow Rates Vessel Rupture	34-146
34-190	Case 3C-1: Accumulator/CMT Water Mass Vessel Rupture	34-146
34-191	Case 3C-1: IRWST Injection Flow Rate Vessel Rupture	34-147
34-192	Case 3C-1: Break Flow Rate Vessel Rupture	34-147
34-193	Case 3C-1: Reactor Vessel Water Level Vessel Rupture	34-148
34-194	Case 3C-1: Core Temperatures Vessel Rupture	34-148
34-195	Case 3C-1: Containment Water Pool Elevations Vessel Rupture	34-149
34-196	Case 3C-1: Containment Pressure Vessel Rupture	34-149
34-197	Case 3C-1: Containment Gas Temperature Vessel Rupture	34-150
34-198	Case 3C-1: Core Mass Vessel Rupture	34-150
34-199	Case 3C-1: Reactor Pressure Vessel to Cavity Water Heat Transfer Vessel Rupture	34-151
34-200	Case 3C-1: In-Vessel Hydrogen Generation Vessel Rupture	34-151
34-201	Case 3C-1: Mass Fraction of CsI Released to Containment Vessel Rupture	34-152
34-202	Case 3C-1: Mass Fraction of Noble Gas Released to Environment Vessel Rupture	34-152
34-203	Case 3C-1: Mass Fraction of Fission Products Released to Environment Vessel Rupture	34-153
34-204	Case 3C-1: Mass Fraction of SrO Released to Environment Vessel Rupture	34-153
34-205	Case 3C-2: Reactor Coolant System and Steam Generator Pressure Vessel Rupture with Containment Failure	34-154
34-206	Case 3C-2: ADS Stage 4 Flow Rates Vessel Rupture with Containment Failure	34-154
34-207	Case 3C-2: Accumulator/CMT Water Mass Vessel Rupture with Containment Failure	34-155

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-208	Case 3C-2: IRWST Injection Flow Rate Vessel Rupture with Containment Failure	34-155
34-209	Case 3C-2: Break Flow Rate Vessel Rupture with Containment Failure	34-156
34-210	Case 3C-2: Reactor Vessel Water Level Vessel Rupture with Containment Failure	34-156
34-211	Case 3C-2: Core Temperatures Vessel Rupture with Containment Failure	34-157
34-212	Case 3C-2: Containment Water Pool Elevations Vessel Rupture with Containment Failure	34-157
34-213	Case 3C-2: Containment Pressure Vessel Rupture with Containment Failure	34-158
34-214	Case 3C-2: Containment Gas Temperature Vessel Rupture with Containment Failure	34-158
34-215	Case 3C-2: Core Mass Vessel Rupture with Containment Failure	34-159
34-216	Case 3C-2: Reactor Pressure Vessel to Cavity Water Heat Transfer Vessel Rupture with Containment Failure	34-159
34-217	Case 3C-2: In-Vessel Hydrogen Generation Vessel Rupture with Containment Failure	34-160
34-218	Case 3C-2: Mass Fraction of CsI Released to Containment Vessel Rupture with Containment Failure	34-160
34-219	Case 3C-2: Mass Fraction of Noble Gases Released to Environment Vessel Rupture with Containment Failure	34-161
34-220	Case 3C-2: Mass Fraction of Fission Products Released to Environment Vessel Rupture with Containment Failure	34-161
34-221	Case 3C-2: Mass Fraction of SrO Released to Environment Vessel Rupture with Containment Failure	34-162
34-222	Case 3D-1: Reactor Coolant System and Steam Generator Pressure Spurious ADS-4 with Failed CMTs	34-162
34-223	Case 3D-1: ADS Stage 4 Flow Rates Spurious ADS-4 with Failed CMTs	34-163
34-224	Case 3D-1: Accumulator/CMT Water Mass Spurious ADS-4 with Failed CMTs	34-163
34-225	Case 3D-1: IRWST Injection Flow Rate Spurious ADS-4 with Failed CMTs	34-164
34-226	Case 3D-1: Break Flow Rate Spurious ADS-4 with Failed CMTs	34-164
34-227	Case 3D-1: Reactor Vessel Water Level Spurious ADS-4 with Failed CMTs	34-165
34-228	Case 3D-1: Core Temperatures Spurious ADS-4 with Failed CMTs	34-165
34-229	Case 3D-1: Containment Water Pool Elevations Spurious ADS-4 with Failed CMTs	34-166
34-230	Case 3D-1: Containment Pressure Spurious ADS-4 with Failed CMTs	34-166
34-231	Case 3D-1: Containment Gas Temperature Spurious ADS-4 with Failed CMTs	34-167
34-232	Case 3D-1: Core Mass Spurious ADS-4 with Failed CMTs	34-167

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-233	Case 3D-1: Reactor Pressure Vessel to Cavity Water Heat Transfer Spurious ADS-4 with Failed CMTs	34-168
34-234	Case 3D-1: In-Vessel Hydrogen Generation Spurious ADS-4 with Failed CMTs	34-168
34-235	Case 3D-1: Mass Fraction of CsI Released to Containment Spurious ADS-4 with Failed CMTs	34-169
34-236	Case 3D-1: Mass Fraction of Noble Gases Released to Environment Spurious ADS-4 with Failed CMTs	34-169
34-237	Case 3D-1: Mass Fraction of Fission Products Released to Environment Spurious ADS-4 with Failed CMTs	34-170
34-238	Case 3D-1: Mass Fraction of SrO Released to Environment Spurious ADS-4 with Failed CMTs	34-170
34-239	Case 3D-2: Reactor Coolant System and Steam Generator Pressure Spurious ADS-2 with Failed CMTs	34-171
34-240	Case 3D-2: ADS Stage 4 Flow Rates Spurious ADS-2 with Failed CMTs	34-171
34-241	Case 3D-2: Accumulator/CMT Water Mass Spurious ADS-2 with Failed CMTs	34-172
34-242	Case 3D-2: IRWST Injection Flow Rate Spurious ADS-2 with Failed CMTs	34-172
34-243	Case 3D-2: Break Flow Rate Spurious ADS-2 with Failed CMTs	34-173
34-244	Case 3D-2: Reactor Vessel Water Level Spurious ADS-2 with Failed CMTs	34-173
34-245	Case 3D-2: Core Temperatures Spurious ADS-2 with Failed CMTs	34-174
34-246	Case 3D-2: Containment Pool Water Elevations Spurious ADS-2 with Failed CMTs	34-174
34-247	Case 3D-2: Containment Pressure Spurious ADS-2 with Failed CMTs	34-175
34-248	Case 3D-2: Containment Gas Temperature Spurious ADS-2 with Failed CMTs	34-175
34-249	Case 3D-2: Core Mass Spurious ADS-2 with Failed CMTs	34-176
34-250	Case 3D-2: Reactor Pressure Vessel to Cavity Water Heat Transfer Spurious ADS-2 with Failed CMTs	34-176
34-251	Case 3D-2: In-Vessel Hydrogen Generation Spurious ADS-2 with Failed CMTs	34-177
34-252	Case 3D-2: Mass Fraction of CsI Released to Containment Spurious ADS-2 with Failed CMTs	34-177
34-253	Case 3D-2: Mass Fraction of Noble Gas Released to Environment Spurious ADS-2 with Failed CMTs	34-178
34-254	Case 3D-2: Mass Fraction of Fission Products Released to Environment Spurious ADS-2 with Failed CMTs	34-178
34-255	Case 3D-2: Mass Fraction of SrO Released to Environment Spurious ADS-2 with Failed CMTs	34-179
34-256	Case 3D-3: Reactor Coolant System and Steam Generator Pressure DVI Line Break with Failed ADS	34-179
34-257	Case 3D-3: ADS Stage 4 Flow Rates DVI Line Break with Failed ADS	34-180

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-258	Case 3D-3: Accumulator/CMT Water Mass DVI Line Break with Failed ADS	34-180
34-259	Case 3D-3: IRWST Injection Flow Rate DVI Line Break with Failed ADS	34-181
34-260	Case 3D-3: Break Flow Rate DVI Line Break with Failed ADS	34-181
34-261	Case 3D-3: Reactor Vessel Water Level DVI Line Break with Failed ADS	34-182
34-262	Case 3D-3: Core Temperatures DVI Line Break with Failed ADS	34-182
34-263	Case 3D-3: Containment Water Pool Elevations DVI Line Break with Failed ADS	34-183
34-264	Case 3D-3: Containment Pressure DVI Line Break with Failed ADS	34-183
34-265	Case 3D-3: Containment Gas Temperature DVI Line Break with Failed ADS	34-184
34-266	Case 3D-3: Core Mass DVI Line Break with Failed ADS	34-184
34-267	Case 3D-3: Reactor Pressure Vessel to Cavity Water Heat Transfer DVI Line Break with Failed ADS	34-185
34-268	Case 3D-3: In-Vessel Hydrogen Generation DVI Line Break with Failed ADS	34-185
34-269	Case 3D-3: Mass Fraction of CsI Released to Containment DVI Line Break with Failed ADS	34-186
34-270	Case 3D-3: Mass Fraction of Noble Gases Released to Environment DVI Line Break with Failed ADS	34-186
34-271	Case 3D-3: Mass Fraction of Fission Products Released to Environment DVI Line Break with Failed ADS	34-187
34-272	Case 3D-3: Mass Fraction of SrO Released to Environment DVI Line Break with Failed ADS	34-187
34-273	Case 3D-4: Reactor Coolant System and Steam Generator Pressure Spurious ADS-2, Failed CMTs, Diffusion Flame	34-188
34-274	Case 3D-4: ADS Stage 4 Flow Rates Spurious ADS-2, Failed CMTs, Diffusion Flame	34-188
34-275	Case 3D-4: Accumulator/CMT Water Mass Spurious ADS-2, Failed CMTs, Diffusion Flame	34-189
34-276	Case 3D-4: IRWST Injection Flow Rate Spurious ADS-2, Failed CMTs, Diffusion Flame	34-189
34-277	Case 3D-4: Break Flow Rate Spurious ADS-2, Failed CMTs, Diffusion Flame	34-190
34-278	Case 3D-4: Reactor Vessel Water Level Spurious ADS-2, Failed CMTs, Diffusion Flame	34-190
34-279	Case 3D-4: Core Temperatures Spurious ADS-2, Failed CMTs, Diffusion Flame	34-191
34-280	Case 3D-4: Containment Water Pool Elevations Spurious ADS-2, Failed CMTs, Diffusion Flame	34-191
34-281	Case 3D-4: Containment Pressure Spurious ADS-2, Failed CMTs, Diffusion Flame	34-192

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-282	Case 3D-4: Containment Gas Temperature Spurious ADS-2, Failed CMTs, Diffusion Flame	34-192
34-283	Case 3D-4: Core Mass Spurious ADS-2, Failed CMTs, Diffusion Flame	34-193
34-284	Case 3D-4: Reactor Pressure Vessel to Cavity Water Heat Transfer Spurious ADS-2, Failed CMTs, Diffusion Flame	34-193
34-285	Case 3D-4: In-Vessel Hydrogen Generation Spurious ADS-2, Failed CMTs, Diffusion Flame	34-194
34-286	Case 3D-4: Mass Fraction of CsI Released to Containment Spurious ADS-2, Failed CMTs, Diffusion Flame	34-194
34-287	Case 3D-4: Mass Fraction of Noble Gases Released to Environment Spurious ADS-2, Failed CMTs, Diffusion Flame	34-195
34-288	Case 3D-4: Mass Fraction of Fission Products Released to Environment Spurious ADS-2, Failed CMTs, Diffusion Flame	34-195
34-289	Case 3D-4: Mass Fraction of SrO Release to Environment Spurious ADS-2, Failed CMTs, Diffusion Flame	34-196
34-290	Case 6E-1: Reactor Coolant System and Steam Generator Pressure SGTR Early Core Melt	34-196
34-291	Case 6E-1: ADS Stage 4 Flow Rates SGTR Early Core Melt	34-197
34-292	Case 6E-1: Accumulator/CMT Water Mass SGTR Early Core Melt	34-197
34-293	Case 6E-1: IRWST Injection Flow Rate SGTR Early Core Melt	34-198
34-294	Case 6E-1: Break Flow Rate SGTR Early Core Melt	34-198
34-295	Case 6E-1: Reactor Vessel Water Level SGTR Early Core Melt	34-199
34-296	Case 6E-1: Core Temperatures SGTR Early Core Melt	34-199
34-297	Case 6E-1: Containment Water Pool Elevations SGTR Early Core Melt	34-200
34-298	Case 6E-1: Containment Pressure SGTR Early Core Melt	34-200
34-299	Case 6E-1: Containment Gas Temperature SGTR Early Core Melt	34-201
34-300	Case 6E-1: Core Mass SGTR Early Core Melt	34-201
34-301	Case 6E-1: Reactor Pressure Vessel to Cavity Water Heat Transfer SGTR Early Core Melt	34-202
34-302	Case 6E-1: In-Vessel Hydrogen Generation SGTR Early Core Melt	34-202
34-303	Case 6E-1: Mass Fraction of CsI Released to Containment SGTR Early Core Melt	34-203
34-304	Case 6E-1: Mass Fraction of Noble Gases Released to Environment SGTR Early Core Melt	34-203
34-305	Case 6E-1: Mass Fraction of Fission Products Released to Environment SGTR Early Core Melt	34-204
34-306	Case 6E-1: Mass Fraction of SrO Released to Environment SGTR Early Core Melt	34-204
34-307	Case 6L-1: Reactor Coolant System and Steam Generator Pressure SGTR Core Melt Failure at Recirculation	34-205
34-308	Case 6L-1: ADS Stage 4 Flow Rates SGTR Core Melt Failure at Recirculation	34-205

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-309	Case 6L-1: Accumulator/CMT Water Mass SGTR Core Melt Failure at Recirculation	34-206
34-310	Case 6L-1: IRWST Injection Flow Rate SGTR Core Melt Failure at Recirculation	34-206
34-311	Case 6L-1: Break Flow Rate SGTR Core Melt Failure at Recirculation	34-207
34-312	Case 6L-1: Reactor Vessel Water Level SGTR Core Melt Failure at Recirculation	34-207
34-313	Case 6L-1: Core Temperatures SGTR Core Melt Failure at Recirculation	34-208
34-314	Case 6L-1: Containment Water Pool Elevations SGTR Core Melt Failure at Recirculation	34-208
34-315	Case 6L-1: Containment Pressure SGTR Core Melt Failure at Recirculation	34-209
34-316	Case 6L-1: Containment Gas Temperature SGTR Core Melt Failure at Recirculation	34-209
34-317	Case 6L-1: Core Mass SGTR Core Melt Failure at Recirculation	34-210
34-318	Case 6L-1: Reactor Pressure Vessel to Cavity Water Heat Transfer SGTR Core Melt Failure at Recirculation	34-210
34-319	Case 6L-1: In-Vessel Hydrogen Generation SGTR Core Melt Failure at Recirculation	34-211
34-320	Case 6L-1: Mass Fraction of CsI Released to Containment SGTR Core Melt Failure at Recirculation	34-211
34-321	Case 6L-1: Mass Fraction of Noble Gases Released to Environment SGTR Core Melt Failure at Recirculation	34-212
34-322	Case 6L-1: Mass Fraction of Fission Products Released to Environment SGTR Core Melt Failure at Recirculation	34-212
34-323	Case 6L-1: Mass Fraction of SrO Released to Environment SGTR Core Melt Failure at Recirculation	34-213
34-324	Case 1AP-1: Reactor Coolant System and Steam Generator Pressure SBLOCA with PRHR, CMTs Failed	34-213
34-325	Case 1AP-1: ADS Stage 4 Flow Rates SBLOCA with PRHR, CMTs Failed	34-214
34-326	Case 1AP-1: Accumulator/CMT Water Mass SBLOCA with PRHR, CMTs Failed	34-214
34-327	Case 1AP-1: IRWST Injection Flow Rate SBLOCA with PRHR, CMTs Failed	34-215
34-328	Case 1AP-1: Break Flow Rate SBLOCA with PRHR, CMTs Failed	34-215
34-329	Case 1AP-1: Reactor Vessel Water Level SBLOCA with PRHR, CMTs Failed	34-216
34-330	Case 1AP-1: Core Temperatures SBLOCA with PRHR, CMTs Failed	34-216
34-331	Case 1AP-1: Containment Pool Water Elevations SBLOCA with PRHR, CMTs Failed	34-217
34-332	Case 1AP-1: Containment Pressure SBLOCA with PRHR, CMTs Failed	34-217
34-333	Case 1AP-1: Containment Gas Temperature SBLOCA with PRHR, CMTs Failed	34-218

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-334	Case 1AP-1: Core Mass SBLOCA with PRHR, CMTs Failed	34-218
34-335	Case 1AP-1: Reactor Pressure Vessel to Cavity Water Heat Transfer SBLOCA with PRHR, CMTs Failed	34-219
34-336	Case 1AP-1: In-Vessel Hydrogen Generation SBLOCA with PRHR, CMTs Failed	34-219
34-337	Case 1AP-1: Mass Fraction of CsI Released to Containment SBLOCA with PRHR, CMTs Failed	34-220
34-338	Case 1AP-1: Mass Fraction of Noble Gases Released to Environment SBLOCA with PRHR, CMTs Failed	34-220
34-339	Case 1AP-1: Mass Fraction of Fission Products Released to Environment SBLOCA with PRHR, CMTs Failed	34-221
34-340	Case 1AP-1: Mass Fraction of SrO Released to Environment SBLOCA with PRHR, CMTs Failed	34-221
34-341	Case 1AP-2: Reactor Coolant System and Steam Generator Pressure SBLOCA with PRHR, CMTs Failed	34-222
34-342	Case 1AP-2: ADS Stage 4 Flow Rates SBLOCA with PRHR, CMTs Failed	34-222
34-343	Case 1AP-2: Accumulator/CMT Water Mass SBLOCA with PRHR, CMTs Failed	34-223
34-344	Case 1AP-2: IRWST Injection Flow Rate SBLOCA with PRHR, CMTs Failed	34-223
34-345	Case 1AP-2: Break Flow Rate SBLOCA with PRHR, CMTs Failed	34-224
34-346	Case 1AP-2: Reactor Vessel Water Level SBLOCA with PRHR, CMTs Failed	34-224
34-347	Case 1AP-2: Core Temperatures SBLOCA with PRHR, CMTs Failed	34-225
34-348	Case 1AP-2: Containment Water Pool Elevations SBLOCA with PRHR, CMTs Failed	34-225
34-349	Case 1AP-2: Containment Pressure SBLOCA with PRHR, CMTs Failed	34-226
34-350	Case 1AP-2: Containment Gas Temperature SBLOCA with PRHR, CMTs Failed	34-226
34-351	Case 1AP-2: Core Mass SBLOCA with PRHR, CMTs Failed	34-227
34-352	Case 1AP-2: Reactor Pressure Vessel to Cavity Water Heat Transfer SBLOCA with PRHR, CMTs Failed	34-227
34-353	Case 1AP-2: In-Vessel Hydrogen Generation SBLOCA with PRHR, CMTs Failed	34-228
34-354	Case 1AP-2: Mass Fraction of CsI Released to Containment SBLOCA with PRHR, CMTs Failed	34-228
34-355	Case 1AP-2: Mass Fraction of Noble Gases Released to Environment SBLOCA with PRHR, CMTs Failed	34-229
34-356	Case 1AP-2: Mass Fraction of Fission Products Released to Environment SBLOCA with PRHR, CMTs Failed	34-229
34-357	Case 1AP-2: Mass Fraction of SrO Released to Environment SBLOCA with PRHR, CMTs Failed	34-230

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-358	Case 1A-1: Reactor Coolant System and Steam Generator Pressure Transient with Creep of SG Tubes	34-230
34-359	Case 1A-1: ADS Stage 4 Flow Rates Transient with Creep of SG Tubes	34-231
34-360	Case 1A-1: Accumulator/CMT Water Mass Transient with Creep of SG Tubes	34-231
34-361	Case 1A-1: IRWST Injection Flow Rate Transient with Creep of SG Tubes	34-232
34-362	Case 1A-1: Break Flow Rate Transient with Creep of SG Tubes	34-232
34-363	Case 1A-1: Reactor Vessel Water Level Transient with Creep of SG Tubes	34-233
34-364	Case 1A-1: Core Temperatures Transient with Creep of SG Tubes	34-233
34-365	Case 1A-1: Containment Pool Water Elevations Transient with Creep of SG Tubes	34-234
34-366	Case 1A-1: Containment Pressure Transient with Creep of SG Tubes	34-234
34-367	Case 1A-1: Containment Gas Temperature Transient with Creep of SG Tubes	34-235
34-368	Case 1A-1: Core Mass Transient with Creep of SG Tubes	34-235
34-369	Case 1A-1: Reactor Pressure Vessel to Cavity Water Heat Transfer Transient with Creep of SG Tubes	34-236
34-370	Case 1A-1: In-Vessel Hydrogen Generation Transient with Creep of SG Tubes	34-236
34-371	Case 1A-1: Mass Fraction of CsI Released to Containment Transient with Creep of SG Tubes	34-237
34-372	Case 1A-1: Mass Fraction of Noble Gases Released to Environment Transient with Creep of SG Tubes	34-237
34-373	Case 1A-1: Mass Fraction of Fission Products Released to Environment Transient with Creep of SG Tubes	34-238
34-374	Case 1A-1: Mass Fraction of SrO Released to Environment Transient with Creep of SG Tubes	34-238
34-375	Case 1A-2: Reactor Coolant System and Steam Generator Pressure Transient with Creep of SG Tubes	34-239
34-376	Case 1A-2: ADS Stage 4 Flow Rates Transient with Creep of SG Tubes	34-239
34-377	Case 1A-2: Accumulator/CMT Water Mass Transient with Creep of SG Tubes	34-240
34-378	Case 1A-2: IRWST Injection Flow Rate Transient with Creep of SG Tubes	34-240
34-379	Case 1A-2: Break Flow Rate Transient with Creep of SG Tubes	34-241
34-380	Case 1A-2: Reactor Vessel Water Level Transient with Creep of SG Tubes	34-241
34-381	Case 1A-2: Core Temperatures Transient with Creep of SG Tubes	34-242
34-382	Case 1A-2: Containment Water Pool Elevations Transient with Creep of SG Tubes	34-242
34-383	Case 1A-2: Containment Pressure Transient with Creep of SG Tubes	34-243
34-384	Case 1A-2: Containment Gas Temperature Transient with Creep of SG Tubes	34-243
34-385	Case 1A-2: Core Mass Transient with Creep of SG Tubes	34-244

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-386	Case 1A-2: Reactor Pressure Vessel to Cavity Water Heat Transfer Transient with Creep of SG Tubes	34-244
34-387	Case 1A-2: In-Vessel Hydrogen Generation Transient with Creep of SG Tubes	34-245
34-388	Case 1A-2: Mass Fraction of CsI Released to Containment Transient with Creep of SG Tubes	34-245
34-389	Case 1A-2: Mass Fraction of Noble Gases Released to Environment Transient with Creep of SG Tubes	34-246
34-390	Case 1A-2: Mass Fraction of Fission Products Released to Environment Transient with Creep of SG Tubes	34-246
34-391	Case 1A-2: Mass Fraction of SrO Released to Environment Transient with Creep of SG Tubes	34-247
34-392	Case 3BE-1: Containment Pressure DDT Intermediate Containment Failure	34-247
34-393	Case 3BE-1: Containment Gas Temperature DDT Intermediate Containment Failure	34-248
34-394	Case 3BE-1: Containment Hydrogen Concentration DDT Intermediate Containment Failure	34-248
34-395	Case 3BE-1: Noble Gases Release Fraction DDT Intermediate Containment Failure	34-249
34-396	Case 3BE-1: CsI and RbI Release Fraction DDT Intermediate Containment Failure	34-249
34-397	Case 3BE-1: $Te0_2$ Release Fraction DDT Intermediate Containment Failure	34-250
34-398	Case 3BE-1: Sr0 Release Fraction DDT Intermediate Containment Failure	34-250
34-399	Case 3BE-1: $Mo0_2$ Release Fraction DDT Intermediate Containment Failure	34-251
34-400	Case 3BE-1: Cs0H and Rb0H Release Fraction DDT Intermediate Containment Failure	34-251
34-401	Case 3BE-1: Ba0 Release Fraction DDT Intermediate Containment Failure	34-252
34-402	Case 3BE-1: La_20_3 Release Fraction DDT Intermediate Containment Failure	34-252
34-403	Case 3BE-1: $Ce0_2$ Release Fraction DDT Intermediate Containment Failure	34-253
34-404	Case 3BE-1: Sb Release Fraction DDT Intermediate Containment Failure	34-253
34-405	Case 3BE-1: Te_2 Release Fraction DDT Intermediate Containment Failure	34-254
34-406	Case 3BE-1: $U0_2$ Release Fraction DDT Intermediate Containment Failure	34-254
34-407	Case 3BE-1: RCS Pressure No PCS Water Cooling and Late Containment Failure	34-255
34-408	Case 3BE-1: Reactor Vessel Mixture Level No PCS Water Cooling and Late Containment Failure	34-255
34-409	Case 3BE-1: Core-Exit Temperature No PCS Water Cooling and Late Containment Failure	34-256
34-410	Case 3BE-1: In-Vessel Hydrogen Generation No PCS Water Cooling and Late Containment Failure	34-256
34-411	Case 3BE-1: Containment Pressure No PCS Water Cooling and Late Containment Failure	34-257

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
34-412	Case 3BE-1: Containment Gas Temperature No PCS Water Cooling and Late Containment Failure	34-257
34-413	Case 3BE-1: Containment Hydrogen Concentration No PCS Water Cooling and Late Containment Failure	34-258
34-414	Case 3BE-1: Noble Gas Release Fraction No PCS Water Cooling and Late Containment Failure	34-258
34-415	Case 3BE-1: CsI and RbI Release Fraction No PCS Water Cooling and Late Containment Failure	34-259
34-416	Case 3BE-1: $Te0_2$ Release Fraction No PCS Water Cooling and Late Containment Failure	34-259
34-417	Case 3BE-1: Sr0 Release Fraction No PCS Water Cooling and Late Containment Failure	34-260
34-418	Case 3BE-1: $Mo0_2$ Release Fraction No PCS Water Cooling and Late Containment Failure	34-260
34-419	Case 3BE-1: Cs0H and Rb0H Release Fraction No PCS Water Cooling and Late Containment Failure	34-261
34-420	Case 3BE-1: Ba0 Release Fraction No PCS Water Cooling and Late Containment Failure	34-261
34-421	Case 3BE-1: La_20_3 Release Fraction No PCS Water Cooling and Late Containment Failure	34-262
34-422	Case 3BE-1: $Ce0_2$ Release Fraction No PCS Water Cooling and Late Containment Failure	34-262
34-423	Case 3BE-1: Sb Release Fraction No PCS Water Cooling and Late Containment Failure	34-263
34-424	Case 3BE-1: Te_2 Release Fraction No PCS Water Cooling and Late Containment Failure	34-263
34-425	Case 3BE-1: $U0_2$ Release Fraction No PCS Water Cooling and Late Containment Failure	34-264
35-1	Containment Event Tree	35-29
36-1	AP1000 Accident Class 1A Base Case for Node DP Success – RCS Pressure	36-7
36-2	AP1000 Accident Class 1A Base Case for Node DP Success – Core-Exit Gas Temperature	36-8
36-3	AP1000 Accident Class 1A Base Case for Node DP Success – Steam Generator Tube Creep Damage	36-9
36-4	AP1000 Steam Generator Tube Rupture with PRHR and Stuck-Open SV – Passive RHR Heat Removal	36-10
36-5	AP1000 Steam Generator Tube Rupture with PRHR and Stuck-Open SV – Core Makeup Tank Flow (one tank)	36-11
36-6	AP1000 Steam Generator Tube Rupture with PRHR and Stuck-Open SV – Reactor Coolant System Pressure	36-12

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
36-7	AP1000 Steam Generator Tube Rupture with PRHR and Stuck-Open SV – Core-Exit Gas Temperature	36-13
39-1	AP1000 Base Case In-Vessel Retention of Molten Core Debris	39-23
39-2	AP1000 Core Shroud	39-24
39-3	Comparison of ULPU-2000 Configuration III and ULPU-2000 Configuration IV	39-25
39-4	Effect of Water Level on Water Circulation During IVR	39-26
39-5	ULPU-2000 Configuration IV Results (Reference 39-4)	39-27
39-6	AP1000 In-Vessel Retention of Molten Core Debris Quantification Zirconium Oxidation Fraction Input Probability Distribution	39-28
39-7	AP1000 In-Vessel Retention of Molten Core Debris Quantification Mass of Steel in Debris Input Probability Distribution	39-29
39-8	AP1000 In-Vessel Retention of Molten Core Debris Quantification Time of Final Bounding State Input Probability Distribution	39-30
39-9	AP1000 In-Vessel Retention of Molten Core Debris Quantification Height of the Oxide Layer	39-31
39-10	AP1000 In-Vessel Retention of Molten Core Debris Quantification Height of the Metal Layer	39-32
39-11	AP1000 In-Vessel Retention of Molten Core Debris Quantification Power Density in Oxide Debris	39-33
39-12	AP1000 In-Vessel Retention of Molten Core Debris Quantification Internal Rayleigh Number in the Oxide Layer	39-34
39-13	AP1000 In-Vessel Retention of Molten Core Debris Quantification External Rayleigh Number in the Metal Layer	39-35
39-14	AP1000 In-Vessel Retention of Molten Core Debris Quantification Normalized Heat Fluxes	39-36
39-15	AP1000 Passive Core Cooling System	39-37
39-16	Containment Floodable Region	39-38
39-17	Containment Floodable Region – Exploded View	39-39
39-18	AP1000 Cavity Flooding Rate	39-40
39-19	Schematic of the AP1000 Reactor Vessel, Vessel Cavity, Vessel Insulation, and Vents	39-41
39A-1	AP1000 Reactor Pressure Vessel, Core and Lower Internals	39A-21
39A-2	Core Shroud	39A-22
39A-3	Bottom of Core Shroud, Core Barrel, and Lower Core Support Plate (Not to Scale)	39A-23
39A-4	Axial Power Shapes Used for Core Relocation Analysis	39A-24
39A-5	Radial Power Shape Used for Core Relocation Analysis	39A-25
39A-6	Cross Section Geometry of Finite Difference Computational Model	39A-26
39A-7	Computational Mesh for Finite Difference Computational Model	39A-27
39A-8	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape Reactor – Coolant System Pressure	39A-28

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
39A-9	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape – Containment and Reactor Coolant System Pressure	39A-28
39A-10	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape – Reactor Vessel Mixture Level	39A-29
39A-11	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape – Hottest Temperature in Core	39A-29
39A-12	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape – Mass of Hydrogen Generated in Core	39A-30
39A-13	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape Temperature of Core Shroud/Barrel (Core Elevation 1.7 – 2.0 m)	39A-30
39A-14	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape Temperature of Core Shroud/Barrel (Core Elevation 2.0 – 2.3 m)	39A-31
39A-15	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape – Mass of Core Shroud/Barrel	39A-31
39A-16	MAAP4 AP1000 Core Melting and Relocation, Top-Skewed Power Shape Volume of Debris in Reactor Vessel Lower Plenum	39A-32
39A-17	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape – Reactor Coolant System Pressure	39A-32
39A-18	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape – Containment and Reactor Coolant System Pressure	39A-33
39A-19	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape – Reactor Vessel Mixture Level	39A-33
39A-20	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape – Hottest Temperature in Core	39A-34
39A-21	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape – Mass of Hydrogen Generated in Core	39A-34
39A-22	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape Temperature of Core Shroud/Barrel (Core Elevation 1.1 – 1.4 m)	39A-35
39A-23	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape Temperature of Core Shroud/Barrel (Core Elevation 1.4 – 1.7 m)	39A-35
39A-24	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape – Mass of Core Shroud/Barrel	39A-36
39A-25	MAAP4 AP1000 Core Melting and Relocation, Chopped Cosine Power Shape Volume of Debris in Reactor Vessel Lower Plenum	39A-36
39A-26	Initial Oxide Relocation to Lower Plenum	39A-37
39A-27	Finite Difference Result for Top-Skewed Power Shape at Level 5	39A-38
39A-28	Finite Difference Temperature Map Level 5 at 5380 Seconds for Top-Skewed Power Shape Case	39A-38
39A-29	MAAP4 Core Temperature Profile for Top-Skewed Power Shape Core Elevation = 2.0 – 2.3 m Above Bottom of Active Fuel (Core Axial Row 12)	39A-39
39A-30	Relocation of Corium	39A-39
39A-31	Model for Relocation to Lower Plenum	39A-40

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
40-1	AP1000 Passive Containment Cooling System	40-7
40-2	Schematic of Passive Containment Cooling System Piping	40-8
40-3	AP1000 Containment Venting Pressure Response	40-9
40-4	AP1000 Containment Venting Loss of Containment Air	40-10
40-5	AP1000 Dry PCS Containment Pressure Response	40-11
40-6	AP1000 Dry PCS Containment Temperature Response	40-12
41-1	IRWST Hydrogen Venting	41-36
41-2	Accident Class 3BE Early Detonation Decomposition Event Tree – Given RFL Success	41-37
41-3	Accident Class 3BE Early Detonation Decomposition Event Tree – Given RFL Failure	41-38
41-4	Accident Class 3BL Early Detonation Decomposition Event Tree	41-39
41-5	Accident Class 3C/3BR Early Detonation Decomposition Event Tree	41-40
41-6	Accident Class 3D/1D Early Detonation Decomposition Event Tree	41-41
41-7	Accident Class AP Early Detonation Decomposition Event Tree	41-42
41-8	Boil-Off Hydrogen Generation Probability Density Function	41-43
41-9	No Reflood Pre-Burn Containment Pressure Probability Density Function	41-44
41-10	No-Reflood Hydrogen Deflagration Peak Pressure Probability	41-45
41-11	Early Reflood Hydrogen Generation Probability Density Function	41-46
41-12	Early Reflood Pre-Burn Containment Pressure Probability Density Function	41-47
41-13	Early Reflood Hydrogen Deflagration Peak Pressure Probability	41-48
41-14	Late Reflood Hydrogen Generation Probability Density Function	41-49
41-15	Late Reflood Pre-Burn Containment Pressure Probability Density Function	41-50
41-16	Late Reflood Hydrogen Deflagration Peak Pressure Probability	41-51
41-17	Accident Class 3BE Intermediate Detonation Decomposition Event Tree – Given RFL Success	41-52
41-18	Accident Class 3BE Intermediate Detonation Decomposition Event Tree – Given RFL Failure	41-53
41-19	Accident Class 3BL Intermediate Detonation Decomposition Event Tree	41-54
41-20	Accident Class 3C/3BR Intermediate Detonation Decomposition Event Tree	41-55
41-21	Accident Class 3D/1D Intermediate Detonation Decomposition Event Tree	41-56
41-22	Accident Class 1AP Intermediate Detonation Decomposition Event Tree	41-57
41A-1	Case 3BE-1: Reactor Coolant System Pressure DVI Line Break for Containment Water Level	41A-41
41A-2	Case 3BE-1: Core-Exit Gas Temperature DVI Line Break for Containment Water Level	41A-41
41A-3	Case 3BE-1: Reactor Vessel Mixture Level DVI Line Break for Containment Water Level	41A-42
41A-4	Case 3BE-1: Hydrogen Generated In-Vessel DVI Line Break for Containment Water Level	41A-42

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-5	Case 3BE-1: Containment Pressure DVI Line Break for Containment Water Level	41A-43
41A-6	Case 3BE-1: Containment Gas Temperature DVI Line Break for Containment Water Level	41A-43
41A-7	Case 3BE-1: Containment Compartments Water Level DVI Line Break for Containment Water Level	41A-44
41A-8	Case 3BE-1: Well-Mixed Compartment Hydrogen Concentration DVI Line Break for Containment Water Level	41A-44
41A-9	Case 3BE-1: Well-Mixed Compartment Steam Concentration DVI Line Break for Containment Water Level	41A-45
41A-10	Case 3BE-1: Well-Mixed Compartment Oxygen Concentration DVI Line Break for Containment Water Level	41A-45
41A-11	Case 3BE-1: Confined Compartment Hydrogen Concentration DVI Line Break for Containment Water Level	41A-46
41A-12	Case 3BE-1: Confined Compartment Steam Concentration DVI Line Break for Containment Water Level	41A-46
41A-13	Case 3BE-1: Confined Compartment Oxygen Concentration DVI Line Break for Containment Water Level	41A-47
41A-14	Case 3BE-1: Equivalence Ratio in SG Room DVI Line Break for Containment Water Level	41A-47
41A-15	Case 3BE-1: Equivalence Ratio in CMT Room DVI Line Break for Containment Water Level	41A-48
41A-16	Case 3BE-1: Equivalence Ratio in IRWST DVI Line Break for Containment Water Level	41A-48
41A-17	Case 3BE-1: Equivalence Ratio in PXS DVI Line Break for Containment Water Level	41A-49
41A-18	Case 3BE-2: Reactor Coolant System Pressure DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-49
41A-19	Case 3BE-2: Core-Exit Gas Temperature DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-50
41A-20	Case 3BE-2: Reactor Vessel Mixture Level DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-50
41A-21	Case 3BE-2: Hydrogen Generated In-Vessel DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-51
41A-22	Case 3BE-2: Containment Pressure DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-51
41A-23	Case 3BE-2: Containment Gas Temperature DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-52
41A-24	Case 3BE-2: Containment Compartments Water Level DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-52
41A-25	Case 3BE-2: Well-Mixed Compartment Hydrogen Concentration DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-53

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-26	Case 3BE-2: Well-Mixed Compartment Steam Concentration DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-53
41A-27	Case 3BE-2: Well-Mixed Compartment Oxygen Concentration DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-54
41A-28	Case 3BE-2: Confined Compartment Hydrogen Concentration DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-54
41A-29	Case 3BE-2: Confined Compartment Steam Concentration DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-55
41A-30	Case 3BE-2: Confined Compartment Oxygen Concentration DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-55
41A-31	Case 3BE-2: Equivalence Ratio in SG Room DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-56
41A-32	Case 3BE-2: Equivalence Ratio in CMT Room DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-56
41A-33	Case 3BE-2: Equivalence Ratio in IRWST DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-57
41A-34	Case 3BE-2: Equivalence Ratio in PXS DVI Line Break with Failed Gravity Injection and No PXS Flooding	41A-57
41A-35	Case 3BE-4: Reactor Coolant System Pressure Spurious ADS, Failed Gravity Injection	41A-58
41A-36	Case 3BE-4: Core-Exit Gas Temperature Spurious ADS, Failed Gravity Injection	41A-58
41A-37	Case 3BE-4: Reactor Vessel Mixture Level Spurious ADS, Failed Gravity Injection	41A-59
41A-38	Case 3BE-4: Hydrogen Generated In-Vessel Spurious ADS, Failed Gravity Injection	41A-59
41A-39	Case 3BE-4: Containment Pressure Spurious ADS, Failed Gravity Injection	41A-60
41A-40	Case 3BE-4: Containment Gas Temperature Spurious ADS, Failed Gravity Injection	41A-60
41A-41	Case 3BE-4: Containment Compartments Water Level Spurious ADS, Failed Gravity Injection	41A-61
41A-42	Case 3BE-4: Well-Mixed Compartment Hydrogen Concentration Spurious ADS, Failed Gravity Injection	41A-61
41A-43	Case 3BE-4: Well-Mixed Compartment Steam Concentration Spurious ADS, Failed Gravity Injection	41A-62
41A-44	Case 3BE-4: Well-Mixed Compartment Oxygen Concentration Spurious ADS, Failed Gravity Injection	41A-62
41A-45	Case 3BE-4: Confined Compartment Hydrogen Concentration Spurious ADS, Failed Gravity Injection	41A-63
41A-46	Case 3BE-4: Confined Compartment Steam Concentration Spurious ADS, Failed Gravity Injection	41A-63
41A-47	Case 3BE-4: Confined Compartment Oxygen Concentration Spurious ADS, Failed Gravity Injection	41A-64

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-48	Case 3BE-4: Equivalence Ratio in SG Room Spurious ADS, Failed Gravity Injection	41A-64
41A-49	Case 3BE-4: Equivalence Ratio in CMT Room Spurious ADS, Failed Gravity Injection	41A-65
41A-50	Case 3BE-4: Equivalence Ratio in IRWST Spurious ADS, Failed Gravity Injection	41A-65
41A-51	Case 3BE-4: Equivalence Ratio in PXS Spurious ADS, Failed Gravity Injection	41A-66
41A-52	Case 3BE-5: Reactor Coolant System Pressure SBLOCA with Failed Gravity Injection	41A-66
41A-53	Case 3BE-5: Core-Exit Gas Temperature SBLOCA with Failed Gravity Injection	41A-67
41A-54	Case 3BE-5: Reactor Vessel Mixture Level SBLOCA with Failed Gravity Injection	41A-67
41A-55	Case 3BE-5: Hydrogen Generated In-Vessel SBLOCA with Failed Gravity Injection	41A-68
41A-56	Case 3BE-5: Containment Pressure SBLOCA with Failed Gravity Injection	41A-68
41A-57	Case 3BE-5: Containment Gas Temperature SBLOCA with Failed Gravity Injection	41A-69
41A-58	Case 3BE-5: Containment Compartments Water Level SBLOCA with Failed Gravity Injection	41A-69
41A-59	Case 3BE-5: Well-Mixed Compartment Hydrogen Concentration SBLOCA with Failed Gravity Injection	41A-70
41A-60	Case 3BE-5: Well-Mixed Compartment Steam Concentration SBLOCA with Failed Gravity Injection	41A-70
41A-61	Case 3BE-5: Well-Mixed Compartment Oxygen Concentration SBLOCA with Failed Gravity Injection	41A-71
41A-62	Case 3BE-5: Confined Compartment Hydrogen Concentration SBLOCA with Failed Gravity Injection	41A-71
41A-63	Case 3BE-5: Confined Compartment Steam Concentration SBLOCA with Failed Gravity Injection	41A-72
41A-64	Case 3BE-5: Confined Compartment Oxygen Concentration SBLOCA with Failed Gravity Injection	41A-72
41A-65	Case 3BE-5: Equivalence Ratio in SG Room SBLOCA with Failed Gravity Injection	41A-73
41A-66	Case 3BE-5: Equivalence Ratio in CMT Room SBLOCA with Failed Gravity Injection	41A-73
41A-67	Case 3BE-5: Equivalence Ratio in IRWST SBLOCA with Failed Gravity Injection	41A-74
41A-68	Case 3BE-5: Equivalence Ratio in PXS SBLOCA with Failed Gravity Injection	41A-74
41A-69	Case 3BE-6: Reactor Coolant System Pressure SBLOCA with Failed Gravity Injection	41A-75

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-70	Case 3BE-6: Core-Exit Gas Temperature SBLOCA with Failed Gravity Injection	41A-75
41A-71	Case 3BE-6: Reactor Vessel Mixture Level SBLOCA with Failed Gravity Injection	41A-76
41A-72	Case 3BE-6: Hydrogen Generated In-Vessel SBLOCA with Failed Gravity Injection	41A-76
41A-73	Case 3BE-6: Containment Pressure SBLOCA with Failed Gravity Injection	41A-77
41A-74	Case 3BE-6: Containment Gas Temperature SBLOCA with Failed Gravity Injection	41A-77
41A-75	Case 3BE-6: Containment Compartments Water Level SBLOCA with Failed Gravity Injection	41A-78
41A-76	Case 3BE-6: Well-Mixed Compartment Hydrogen Concentration SBLOCA with Failed Gravity Injection	41A-78
41A-77	Case 3BE-6: Well-Mixed Compartment Steam Concentration SBLOCA with Failed Gravity Injection	41A-79
41A-78	Case 3BE-6: Well-Mixed Compartment Oxygen Concentration SBLOCA with Failed Gravity Injection	41A-79
41A-79	Case 3BE-6: Confined Compartment Hydrogen Concentration SBLOCA with Failed Gravity Injection	41A-80
41A-80	Case 3BE-6: Confined Compartment Steam Concentration SBLOCA with Failed Gravity Injection	41A-80
41A-81	Case 3BE-6: Confined Compartment Oxygen Concentration SBLOCA with Failed Gravity Injection	41A-81
41A-82	Case 3BE-6: Equivalence Ratio in SG Room SBLOCA with Failed Gravity Injection	41A-81
41A-83	Case 3BE-6: Equivalence Ratio in CMT Room SBLOCA with Failed Gravity Injection	41A-82
41A-84	Case 3BE-6: Equivalence Ratio in IRWST SBLOCA with Failed Gravity Injection	41A-82
41A-85	Case 3BE-6: Equivalence Ratio in PXS SBLOCA with Failed Gravity Injection	41A-83
41A-86	Case 3BE-8: Reactor Coolant System Pressure SGTR	41A-83
41A-87	Case 3BE-8: Core-Exit Gas Temperature SGTR	41A-84
41A-88	Case 3BE-8: Reactor Vessel Mixture Level SGTR	41A-84
41A-89	Case 3BE-8: Hydrogen Generated In-Vessel SGTR	41A-85
41A-90	Case 3BE-8: Containment Pressure SGTR	41A-85
41A-91	Case 3BE-8: Containment Gas Temperature SGTR	41A-86
41A-92	Case 3BE-8: Containment Compartments Water Level SGTR	41A-86
41A-93	Case 3BE-8: Well-Mixed Compartment Hydrogen Concentration SGTR	41A-87
41A-94	Case 3BE-8: Well-Mixed Compartment Steam Concentration SGTR	41A-87
41A-95	Case 3BE-8: Well-Mixed Compartment Oxygen Concentration SGTR	41A-88
41A-96	Case 3BE-8: Confined Compartment Hydrogen Concentration SGTR	41A-88
41A-97	Case 3BE-8: Confined Compartment Steam Concentration SGTR	41A-89

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-98	Case 3BE-8: Confined Compartment Oxygen Concentration SGTR	41A-89
41A-99	Case 3BE-8: Equivalence Ratio in SG Room SGTR	41A-90
41A-100	Case 3BE-8: Equivalence Ratio in CMT Room SGTR	41A-90
41A-101	Case 3BE-8: Equivalence Ratio in IRWST SGTR	41A-91
41A-102	Case 3BE-8: Equivalence Ratio in PXS SGTR	41A-91
41A-103	Case 3BE-9: Reactor Coolant System Pressure SGTR	41A-92
41A-104	Case 3BE-9: Core-Exit Gas Temperature SGTR	41A-92
41A-105	Case 3BE-9: Reactor Vessel Mixture Level SGTR	41A-93
41A-106	Case 3BE-9: Hydrogen Generated In-Vessel SGTR	41A-93
41A-107	Case 3BE-9: Containment Pressure SGTR	41A-94
41A-108	Case 3BE-9: Containment Gas Temperature SGTR	41A-94
41A-109	Case 3BE-9: Containment Compartments Water Level SGTR	41A-95
41A-110	Case 3BE-9: Well-Mixed Compartment Hydrogen Concentration SGTR	41A-95
41A-111	Case 3BE-9: Well-Mixed Compartment Steam Concentration SGTR	41A-96
41A-112	Case 3BE-9: Well-Mixed Compartment Oxygen Concentration SGTR	41A-96
41A-113	Case 3BE-9: Confined Compartment Hydrogen Concentration SGTR	41A-97
41A-114	Case 3BE-9: Confined Compartment Steam Concentration SGTR	41A-97
41A-115	Case 3BE-9: Confined Compartment Oxygen Concentration SGTR	41A-98
41A-116	Case 3BE-9: Equivalence Ratio in SG Room SGTR	41A-98
41A-117	Case 3BE-9: Equivalence Ratio in CMT Room SGTR	41A-99
41A-118	Case 3BE-9: Equivalence Ratio in IRWST SGTR	41A-99
41A-119	Case 3BE-9: Equivalence Ratio in PXS SGTR	41A-100
41A-120	Case 3BL-1: Reactor Coolant System Pressure SBLOCA with Failed Gravity Recirculation	41A-100
41A-121	Case 3BL-1: Core-Exit Gas Temperature SBLOCA with Failed Gravity Recirculation	41A-101
41A-122	Case 3BL-1: Reactor Vessel Mixture Level SBLOCA with Failed Gravity Recirculation	41A-101
41A-123	Case 3BL-1: Hydrogen Generated In-Vessel SBLOCA with Failed Gravity Recirculation	41A-102
41A-124	Case 3BL-1: Containment Pressure SBLOCA with Failed Gravity Recirculation	41A-102
41A-125	Case 3BL-1: Containment Gas Temperature SBLOCA with Failed Gravity Recirculation	41A-103
41A-126	Case 3BL-1: Containment Compartments Water Level SBLOCA with Failed Gravity Recirculation	41A-103
41A-127	Case 3BL-1: Well-Mixed Compartment Hydrogen Concentration SBLOCA with Failed Gravity Recirculation	41A-104
41A-128	Case 3BL-1: Well-Mixed Compartment Steam Concentration SBLOCA with Failed Gravity Recirculation	41A-104
41A-129	Case 3BL-1: Well-Mixed Compartment Oxygen Concentration SBLOCA with Failed Gravity Recirculation	41A-105

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-130	Case 3BL-1: Confined Compartment Hydrogen Concentration SBLOCA with Failed Gravity Recirculation	41A-105
41A-131	Case 3BL-1: Confined Compartment Steam Concentration SBLOCA with Failed Gravity Recirculation	41A-106
41A-132	Case 3BL-1: Confined Compartment Oxygen Concentration SBLOCA with Failed Gravity Recirculation	41A-106
41A-133	Case 3BL-1: Equivalence Ratio in SG Room SBLOCA with Failed Gravity Recirculation	41A-107
41A-134	Case 3BL-1: Equivalence Ratio in CMT Room SBLOCA with Failed Gravity Recirculation	41A-107
41A-135	Case 3BL-1: Equivalence Ratio in IRWST SBLOCA with Failed Gravity Recirculation	41A-108
41A-136	Case 3BL-1: Equivalence Ratio in PXS SBLOCA with Failed Gravity Recirculation	41A-108
41A-137	Case 3BL-2: Reactor Coolant System Pressure DVI Line Break with Failed Gravity Recirculation	41A-109
41A-138	Case 3BL-2: Core-Exit Gas Temperature DVI Line Break with Failed Gravity Recirculation	41A-109
41A-139	Case 3BL-2: Reactor Vessel Mixture Level DVI Line Break with Failed Gravity Recirculation	41A-110
41A-140	Case 3BL-2: Hydrogen Generated In-Vessel DVI Line Break with Failed Gravity Recirculation	41A-110
41A-141	Case 3BL-2: Containment Pressure DVI Line Break with Failed Gravity Recirculation	41A-111
41A-142	Case 3BL-2: Containment Gas Temperature DVI Line Break with Failed Gravity Recirculation	41A-111
41A-143	Case 3BL-2: Containment Compartments Water Level DVI Line Break with Failed Gravity Recirculation	41A-112
41A-144	Case 3BL-2: Well-Mixed Compartment Hydrogen Concentration DVI Line Break with Failed Gravity Recirculation	41A-112
41A-145	Case 3BL-2: Well-Mixed Compartment Steam Concentration DVI Line Break with Failed Gravity Recirculation	41A-113
41A-146	Case 3BL-2: Well-Mixed Compartment Oxygen Concentration DVI Line Break with Failed Gravity Recirculation	41A-113
41A-147	Case 3BL-2: Confined Compartment Hydrogen Concentration DVI Line Break with Failed Gravity Recirculation	41A-114
41A-148	Case 3BL-2: Confined Compartment Steam Concentration DVI Line Break with Failed Gravity Recirculation	41A-114
41A-149	Case 3BL-2: Confined Compartment Oxygen Concentration DVI Line Break with Failed Gravity Recirculation	41A-115
41A-150	Case 3BL-2: Equivalence Ratio in SG Room DVI Line Break with Failed Gravity Recirculation	41A-115

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-151	Case 3BL-2: Equivalence Ratio in CMT Room DVI Line Break with Failed Gravity Recirculation	41A-116
41A-152	Case 3BL-2: Equivalence Ratio in IRWST DVI Line Break with Failed Gravity Recirculation	41A-116
41A-153	Case 3BL-2: Equivalence Ratio in PXS DVI Line Break with Failed Gravity Recirculation	41A-117
41A-154	Case 3BR-1: Reactor Coolant System Pressure CL LBLOCA with Accumulator Failure	41A-117
41A-155	Case 3BR-1: Core-Exit Gas Temperature CL LBLOCA with Accumulator Failure	41A-118
41A-156	Case 3BR-1: Reactor Vessel Mixture Level CL LBLOCA with Accumulator Failure	41A-118
41A-157	Case 3BR-1: Hydrogen Generated In-Vessel CL LBLOCA with Accumulator Failure	41A-119
41A-158	Case 3BR-1: Containment Pressure CL LBLOCA with Accumulator Failure	41A-119
41A-159	Case 3BR-1: Containment Gas Temperature CL LBLOCA with ccumulator Failure	41A-120
41A-160	Case 3BR-1: Containment Compartments Water Level CL LBLOCA with Accumulator Failure	41A-120
41A-161	Case 3BR-1: Well-Mixed Compartment Hydrogen Concentration CL LBLOCA with Accumulator Failure	41A-121
41A-162	Case 3BR-1: Well-Mixed Compartment Steam Concentration CL LBLOCA with Accumulator Failure	41A-121
41A-163	Case 3BR-1: Well-Mixed Compartment Oxygen Concentration CL LBLOCA with Accumulator Failure	41A-122
41A-164	Case 3BR-1: Confined Compartment Hydrogen Concentration CL LBLOCA with Accumulator Failure	41A-122
41A-165	Case 3BR-1: Confined Compartment Steam Concentration CL LBLOCA with Accumulator Failure	41A-123
41A-166	Case 3BR-1: Confined Compartment Oxygen Concentration CL LBLOCA with Accumulator Failure	41A-123
41A-167	Case 3BR-1: Equivalence Ratio in SG Room CL LBLOCA with Accumulator Failure	41A-124
41A-168	Case 3BR-1: Equivalence Ratio in CMT Room CL LBLOCA with Accumulator Failure	41A-124
41A-169	Case 3BR-1: Equivalence Ratio in IRWST CL LBLOCA with Accumulator Failure	41A-125
41A-170	Case 3BR-1: Equivalence Ratio in PXS CL LBLOCA with Accumulator Failure	41A-125
41A-171	Case 3BR-1a: Reactor Coolant System Pressure CL LBLOCA with Accumulator Failure	41A-126

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-172	Case 3BR-1a: Core-Exit Gas Temperature CL LBLOCA with Accumulator Failure	41A-126
41A-173	Case 3BR-1a: Reactor Vessel Mixture Level CL LBLOCA with Accumulator Failure	41A-127
41A-174	Case 3BR-1a: Hydrogen Generated In-Vessel CL LBLOCA with Accumulator Failure	41A-127
41A-175	Case 3BR-1a: Containment Pressure CL LBLOCA with Accumulator Failure	41A-128
41A-176	Case 3BR-1a: Containment Gas Temperature CL LBLOCA with Accumulator Failure	41A-128
41A-177	Case 3BR-1a: Containment Compartments Water Level CL LBLOCA with Accumulator Failure	41A-129
41A-178	Case 3BR-1a: Well-Mixed Compartment Hydrogen Concentration CL LBLOCA with Accumulator Failure	41A-129
41A-179	Case 3BR-1a: Well-Mixed Compartment Steam Concentration CL LBLOCA with Accumulator Failure	41A-130
41A-180	Case 3BR-1a: Well-Mixed Compartment Oxygen Concentration CL LBLOCA with Accumulator Failure	41A-130
41A-181	Case 3BR-1a: Confined Compartment Hydrogen Concentration CL LBLOCA with Accumulator Failure	41A-131
41A-182	Case 3BR-1a: Confined Compartment Steam Concentration CL LBLOCA with Accumulator Failure	41A-131
41A-183	Case 3BR-1a: Confined Compartment Oxygen Concentration CL LBLOCA with Accumulator Failure	41A-132
41A-184	Case 3BR-1a: Equivalence Ratio in SG Room CL LBLOCA with Accumulator Failure	41A-132
41A-185	Case 3BR-1a: Equivalence Ratio in CMT Room CL LBLOCA with Accumulator Failure	41A-133
41A-186	Case 3BR-1a: Equivalence Ratio in IRWST CL LBLOCA with Accumulator Failure	41A-133
41A-187	Case 3BR-1a: Equivalence Ratio in PXS CL LBLOCA with Accumulator Failure	41A-134
41A-188	Case 3C-1: Reactor Coolant System Pressure Vessel Rupture	41A-134
41A-189	Case 3C-1: Core-Exit Gas Temperature Vessel Rupture	41A-135
41A-190	Case 3C-1: Reactor Vessel Mixture Level Vessel Rupture	41A-135
41A-191	Case 3C-1: Hydrogen Generated In-Vessel Vessel Rupture	41A-136
41A-192	Case 3C-1: Containment Pressure Vessel Rupture	41A-136
41A-193	Case 3C-1: Containment Gas Temperature Vessel Rupture	41A-137
41A-194	Case 3C-1: Containment Compartments Water Level Vessel Rupture	41A-137
41A-195	Case 3C-1: Well-Mixed Compartment Hydrogen Concentration Vessel Rupture	41A-138
41A-196	Case 3C-1: Well-Mixed Compartment Steam Concentration Vessel Rupture	41A-138

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-197	Case 3C-1: Well-Mixed Compartment Oxygen Concentration Vessel Rupture	41A-139
41A-198	Case 3C-1: Confined Compartment Hydrogen Concentration Vessel Rupture	41A-139
41A-199	Case 3C-1: Confined Compartment Steam Concentration Vessel Rupture	41A-140
41A-200	Case 3C-1: Confined Compartment Oxygen Concentration Vessel Rupture	41A-140
41A-201	Case 3C-1: Equivalence Ratio in SG Room Vessel Rupture	41A-141
41A-202	Case 3C-1: Equivalence Ratio in CMT Room Vessel Rupture	41A-141
41A-203	Case 3C-1: Equivalence Ratio in IRWST Vessel Rupture	41A-142
41A-204	Case 3C-1: Equivalence Ratio in PXS Vessel Rupture	41A-142
41A-205	Case 3D-1: Reactor Coolant System Pressure Spurious ADS-4 with Failed CMTs	41A-143
41A-206	Case 3D-1: Core-Exit Gas Temperature Spurious ADS-4 with Failed CMTs	41A-143
41A-207	Case 3D-1: Reactor Vessel Mixture Level Spurious ADS-4 with Failed CMTs	41A-144
41A-208	Case 3D-1: Hydrogen Generated In-Vessel Spurious ADS-4 with Failed CMTs	41A-144
41A-209	Case 3D-1: Containment Pressure Spurious ADS-4 with Failed CMTs	41A-145
41A-210	Case 3D-1: Containment Gas Temperature Spurious ADS-4 with Failed CMTs	41A-145
41A-211	Case 3D-1: Containment Compartments Water Level Spurious ADS-4 with Failed CMTs	41A-146
41A-212	Case 3D-1: Well-Mixed Compartment Hydrogen Concentration Spurious ADS-4 with Failed CMTs	41A-146
41A-213	Case 3D-1: Well-Mixed Compartment Steam Concentration Spurious ADS-4 with Failed CMTs	41A-147
41A-214	Case 3D-1: Well-Mixed Compartment Oxygen Concentration Spurious ADS-4 with Failed CMTs	41A-147
41A-215	Case 3D-1: Confined Compartment Hydrogen Concentration Spurious ADS-4 with Failed CMTs	41A-148
41A-216	Case 3D-1: Confined Compartment Steam Concentration Spurious ADS-4 with Failed CMTs	41A-148
41A-217	Case 3D-1: Confined Compartment Oxygen Concentration Spurious ADS-4 with Failed CMTs	41A-149
41A-218	Case 3D-1: Equivalence Ratio in SG Room Spurious ADS-4 with Failed CMTs	41A-149
41A-219	Case 3D-1: Equivalence Ratio in CMT Room Spurious ADS-4 with Failed CMTs	41A-150
41A-220	Case 3D-1: Equivalence Ratio in IRWST Spurious ADS-4 with Failed CMTs	41A-150

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-221	Case 3D-1: Equivalence Ratio in PXS Spurious ADS-4 with Failed CMTs	41A-151
41A-222	Case 3D-2: Reactor Coolant System Pressure Spurious ADS-2, Failed CMTs	41A-151
41A-223	Case 3D-2: Core-Exit Gas Temperature Spurious ADS-2, Failed CMTs	41A-152
41A-224	Case 3D-2: Reactor Vessel Mixture Level Spurious ADS-2, Failed CMTs	41A-152
41A-225	Case 3D-2: Hydrogen Generated In-Vessel Spurious ADS-2, Failed CMTs	41A-153
41A-226	Case 3D-2: Containment Pressure Spurious ADS-2, Failed CMTs	41A-153
41A-227	Case 3D-2: Containment Gas Temperature Spurious ADS-2, Failed CMTs	41A-154
41A-228	Case 3D-2: Containment Compartments Water Level Spurious ADS-2, Failed CMTs	41A-154
41A-229	Case 3D-2: Well-Mixed Compartment Hydrogen Concentration Spurious ADS-2, Failed CMTs	41A-155
41A-230	Case 3D-2: Well-Mixed Compartment Steam Concentration Spurious ADS-2, Failed CMTs	41A-155
41A-231	Case 3D-2: Well-Mixed Compartment Oxygen Concentration Spurious ADS-2, Failed CMTs	41A-156
41A-232	Case 3D-2: Confined Compartment Hydrogen Concentration Spurious ADS-2, Failed CMTs	41A-156
41A-233	Case 3D-2: Confined Compartment Steam Concentration Spurious ADS-2, Failed CMTs	41A-157
41A-234	Case 3D-2: Confined Compartment Oxygen Concentration Spurious ADS-2, Failed CMTs	41A-157
41A-235	Case 3D-2: Equivalence Ratio in SG Room Spurious ADS-2, Failed CMTs	41A-158
41A-236	Case 3D-2: Equivalence Ratio in CMT Room Spurious ADS-2, Failed CMTs	41A-158
41A-237	Case 3D-2: Equivalence Ratio in IRWST Spurious ADS-2, Failed CMTs	41A-159
41A-238	Case 3D-2: Equivalence Ratio in PXS Spurious ADS-2, Failed CMTs	41A-159
41A-239	Case 3D-3: Reactor Coolant System Pressure DVI Line Break with no ADS	41A-160
41A-240	Case 3D-3: Core-Exit Gas Temperature DVI Line Break with no ADS	41A-160
41A-241	Case 3D-3: Reactor Vessel Mixture Level DVI Line Break with no ADS	41A-161
41A-242	Case 3D-3: Hydrogen Generated In-Vessel DVI Line Break with no ADS	41A-161
41A-243	Case 3D-3: Containment Pressure DVI Line Break with no ADS	41A-162

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-244	Case 3D-3: Containment Gas Temperature DVI Line Break with no ADS	41A-162
41A-245	Case 3D-3: Containment Compartments Water Level DVI Line Break with no ADS	41A-163
41A-246	Case 3D-3: Well-Mixed Compartment Hydrogen Concentration DVI Line Break with no ADS	41A-163
41A-247	Case 3D-3: Well-Mixed Compartment Steam Concentration DVI Line Break with no ADS	41A-164
41A-248	Case 3D-3: Well-Mixed Compartment Oxygen Concentration DVI Line Break with no ADS	41A-164
41A-249	Case 3D-3: Confined Compartment Hydrogen Concentration DVI Line Break with no ADS	41A-165
41A-250	Case 3D-3: Confined Compartment Steam Concentration DVI Line Break with no ADS	41A-165
41A-251	Case 3D-3: Confined Compartment Oxygen Concentration DVI Line Break with no ADS	41A-166
41A-252	Case 3D-3: Equivalence Ratio in SG Room DVI Line Break with no ADS	41A-166
41A-253	Case 3D-3: Equivalence Ratio in CMT Room DVI Line Break with no ADS	41A-167
41A-254	Case 3D-3: Equivalence Ratio in IRWST DVI Line Break with no ADS	41A-167
41A-255	Case 3D-3: Equivalence Ratio in PXS DVI Line Break with no ADS	41A-168
41A-256	Case 3D-5: Reactor Coolant System Pressure Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-168
41A-257	Case 3D-5: Core-Exit Gas Temperature Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-169
41A-258	Case 3D-5: Reactor Vessel Mixture Level Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-169
41A-259	Case 3D-5: Hydrogen Generated In-Vessel Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-170
41A-260	Case 3D-5: Containment Pressure Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-170
41A-261	Case 3D-5: Containment Gas Temperature Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-171
41A-262	Case 3D-5: Containment Compartments Water Level Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-171
41A-263	Case 3D-5: Well-Mixed Compartment Hydrogen Concentration Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-172
41A-264	Case 3D-5: Well-Mixed Compartment Steam Concentration Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-172
41A-265	Case 3D-5: Well-Mixed Compartment Oxygen Concentration Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-173

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-266	Case 3D-5: Confined Compartment Hydrogen Concentration Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-173
41A-267	Case 3D-5: Confined Compartment Steam Concentration Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-174
41A-268	Case 3D-5: Confined Compartment Oxygen Concentration Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-174
41A-269	Case 3D-5: Equivalence Ratio in SG Room Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-175
41A-270	Case 3D-5: Equivalence Ratio in CMT Room Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-175
41A-271	Case 3D-5: Equivalence Ratio in IRWST Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-176
41A-272	Case 3D-5: Equivalence Ratio in PXS Spurious ADS-2, Failed CMTs, Diffusion Flame	41A-176
41A-273	Case 1A-3: Reactor Coolant System Pressure FW Failure with Creep of SG Tubes	41A-177
41A-274	Case 1A-3: Core-Exit Gas Temperature FW Failure with Creep of SG Tubes	41A-177
41A-275	Case 1A-3: Reactor Vessel Mixture Level FW Failure with Creep of SG Tubes	41A-178
41A-276	Case 1A-3: Hydrogen Generated In-Vessel FW Failure with Creep of SG Tubes	41A-178
41A-277	Case 1A-3: Containment Pressure FW Failure with Creep of SG Tubes	41A-179
41A-278	Case 1A-3: Containment Gas Temperature FW Failure with Creep of SG Tubes	41A-179
41A-279	Case 1A-3: Containment Compartments Water Level FW Failure with Creep of SG Tubes	41A-180
41A-280	Case 1A-3: Well-Mixed Compartment Hydrogen Concentration FW Failure with Creep of SG Tubes	41A-180
41A-281	Case 1A-3: Well-Mixed Compartment Steam Concentration FW Failure with Creep of SG Tubes	41A-181
41A-282	Case 1A-3: Well-Mixed Compartment Oxygen Concentration FW Failure with Creep of SG Tubes	41A-181
41A-283	Case 1A-3: Confined Compartment Hydrogen Concentration FW Failure with Creep of SG Tubes	41A-182
41A-284	Case 1A-3: Confined Compartment Steam Concentration FW Failure with Creep of SG Tubes	41A-182
41A-285	Case 1A-3: Confined Compartment Oxygen Concentration FW Failure with Creep of SG Tubes	41A-183
41A-286	Case 1A-3: Equivalence Ratio in SG Room FW Failure with Creep of SG Tubes	41A-183
41A-287	Case 1A-3: Equivalence Ratio in CMT Room FW Failure with Creep of SG Tubes	41A-184

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-288	Case 1A-3: Equivalence Ratio in IRWST FW Failure with Creep of SG Tubes	41A-184
41A-289	Case 1A-3: Equivalence Ratio in PXS FW Failure with Creep of SG Tubes	41A-185
41A-290	Case 1A-3a: Reactor Coolant System Pressure Transient with Creep of SG Tubes	41A-185
41A-291	Case 1A-3a: Core-Exit Gas Temperature Transient with Creep of SG Tubes	41A-186
41A-292	Case 1A-3a: Reactor Vessel Mixture Level Transient with Creep of SG Tubes	41A-186
41A-293	Case 1A-3a: Hydrogen Generated In-Vessel Transient with Creep of SG Tubes	41A-187
41A-294	Case 1A-3a: Containment Pressure Transient with Creep of SG Tubes	41A-187
41A-295	Case 1A-3a: Containment Gas Temperature Transient with Creep of SG Tubes	41A-188
41A-296	Case 1A-3a: Containment Compartments Water Level Transient with Creep of SG Tubes	41A-188
41A-297	Case 1A-3a: Well-Mixed Compartment Hydrogen Concentration Transient with Creep of SG Tubes	41A-189
41A-298	Case 1A-3a: Well-Mixed Compartment Steam Concentration Transient with Creep of SG Tubes	41A-189
41A-299	Case 1A-3a: Well-Mixed Compartment Oxygen Concentration Transient with Creep of SG Tubes	41A-190
41A-300	Case 1A-3a: Confined Compartment Hydrogen Concentration Transient with Creep of SG Tubes	41A-190
41A-301	Case 1A-3a: Confined Compartment Steam Concentration Transient with Creep of SG Tubes	41A-191
41A-302	Case 1A-3a: Confined Compartment Oxygen Concentration Transient with Creep of SG Tubes	41A-191
41A-303	Case 1A-3a: Approximate Detonation Cell Width in SG Room Transient with Creep of SG Tubes	41A-192
41A-304	Case 1A-3a: Approximate Detonation Cell Width in CMT Room Transient with Creep of SG Tubes	41A-192
41A-305	Case 1A-3a: Equivalence Ratio in IRWST Transient with Creep of SG Tubes	41A-193
41A-306	Case 1A-3a: Approximate Detonation Cell Width in PXS Transient with Creep of SG Tubes	41A-193
41A-307	Case 1A-4: Reactor Coolant System Pressure FW Failure with Creep of SG Tubes	41A-194
41A-308	Case 1A-4: Core-Exit Gas Temperature FW Failure with Creep of SG Tubes	41A-194
41A-309	Case 1A-4: Reactor Vessel Mixture Level FW Failure with Creep of SG Tubes	41A-195
41A-310	Case 1A-4: Hydrogen Generated In-Vessel FW Failure with Creep of SG Tubes	41A-195

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-311	Case 1A-4: Containment Pressure FW Failure with Creep of SG Tubes	41A-196
41A-312	Case 1A-4: Containment Gas Temperature FW Failure with Creep of SG Tubes	41A-196
41A-313	Case 1A-4: Containment Compartments Water Level FW Failure with Creep of SG Tubes	41A-197
41A-314	Case 1A-4: Well-Mixed Compartment Hydrogen Concentration FW Failure with Creep of SG Tubes	41A-197
41A-315	Case 1A-4: Well-Mixed Compartment Steam Concentration FW Failure with Creep of SG Tubes	41A-198
41A-316	Case 1A-4: Well-Mixed Compartment Oxygen Concentration FW Failure with Creep of SG Tubes	41A-198
41A-317	Case 1A-4: Confined Compartment Hydrogen Concentration FW Failure with Creep of SG Tubes	41A-199
41A-318	Case 1A-4: Confined Compartment Steam Concentration FW Failure with Creep of SG Tubes	41A-199
41A-319	Case 1A-4: Confined Compartment Oxygen Concentration FW Failure with Creep of SG Tubes	41A-200
41A-320	Case 1A-4: Equivalence Ratio in SG Room FW Failure with Creep of SG Tubes	41A-200
41A-321	Case 1A-4: Equivalence Ratio in CMT Room FW Failure with Creep of SG Tubes	41A-201
41A-322	Case 1A-4: Equivalence Ratio in IRWST FW Failure with Creep of SG Tubes	41A-201
41A-323	Case 1A-4: Equivalence Ratio in PXS FW Failure with Creep of SG Tubes	41A-202
41A-324	Case 1A-4a: Reactor Coolant System Pressure Transient with Creep of SG Tubes	41A-202
41A-325	Case 1A-4a: Core-Exit Gas Temperature Transient with Creep of SG Tubes	41A-203
41A-326	Case 1A-4a: Reactor Vessel Mixture Level Transient with Creep of SG Tubes	41A-203
41A-327	Case 1A-4a: Hydrogen Generated In-Vessel Transient with Creep of SG Tubes	41A-204
41A-328	Case 1A-4a: Containment Pressure Transient with Creep of SG Tubes	41A-204
41A-329	Case 1A-4a: Containment Gas Temperature Transient with Creep of SG Tubes	41A-205
41A-330	Case 1A-4a: Containment Compartments Water Level Transient with Creep of SG Tubes	41A-205
41A-331	Case 1A-4a: Well-Mixed Compartment Hydrogen Concentration Transient with Creep of SG Tubes	41A-206
41A-332	Case 1A-4a: Well-Mixed Compartment Steam Concentration Transient with Creep of SG Tubes	41A-206
41A-333	Case 1A-4a: Well-Mixed Compartment Oxygen Concentration Transient with Creep of SG Tubes	41A-207

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-334	Case 1A-4a: Confined Compartment Hydrogen Concentration Transient with Creep of SG Tubes	41A-207
41A-335	Case 1A-4a: Confined Compartment Steam Concentration Transient with Creep of SG Tubes	41A-208
41A-336	Case 1A-4a: Confined Compartment Oxygen Concentration Transient with Creep of SG Tubes	41A-208
41A-337	Case 1A-4a: Approximate Detonation Cell Width in SG Room Transient with Creep of SG Tubes	41A-209
41A-338	Case 1A-4a: Equivalence Ratio in CMT Room Transient with Creep of SG Tubes	41A-209
41A-339	Case 1A-4a: Equivalence Ratio in IRWST Transient with Creep of SG Tubes	41A-210
41A-340	Case 1A-4a: Equivalence Ratio in PXS Transient with Creep of SG Tubes	41A-210
41A-341	Case 1AP-3: Reactor Coolant System Pressure SBLOCA, Failed PRHR and CMTs	41A-211
41A-342	Case 1AP-3: Core-Exit Gas Temperature SBLOCA, Failed PRHR and CMTs	41A-211
41A-343	Case 1AP-3: Reactor Vessel Mixture Level SBLOCA, Failed PRHR and CMTs	41A-212
41A-344	Case 1AP-3: Hydrogen Generated In-Vessel SBLOCA, Failed PRHR and CMTs	41A-212
41A-345	Case 1AP-3: Containment Pressure SBLOCA, Failed PRHR and CMTs	41A-213
41A-346	Case 1AP-3: Containment Gas Temperature SBLOCA, Failed PRHR and CMTs	41A-213
41A-347	Case 1AP-3: Containment Compartments Water Level SBLOCA, Failed PRHR and CMTs	41A-214
41A-348	Case 1AP-3: Well-Mixed Compartment Hydrogen Concentration SBLOCA, Failed PRHR and CMTs	41A-214
41A-349	Case 1AP-3: Well-Mixed Compartment Steam Concentration SBLOCA, Failed PRHR and CMTs	41A-215
41A-350	Case 1AP-3: Well-Mixed Compartment Oxygen Concentration SBLOCA, Failed PRHR and CMTs	41A-215
41A-351	Case 1AP-3: Confined Compartment Hydrogen Concentration SBLOCA, Failed PRHR and CMTs	41A-216
41A-352	Case 1AP-3: Confined Compartment Steam Concentration SBLOCA, Failed PRHR and CMTs	41A-216
41A-353	Case 1AP-3: Confined Compartment Oxygen Concentration SBLOCA, Failed PRHR and CMTs	41A-217
41A-354	Case 1AP-3: Equivalence Ratio in SG Room SBLOCA, Failed PRHR and CMTs	41A-217
41A-355	Case 1AP-3: Equivalence Ratio in CMT Room SBLOCA, Failed PRHR and CMTs	41A-218

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41A-356	Case 1AP-3: Equivalence Ratio in IRWST SBLOCA, Failed PRHR and CMTs	41A-218
41A-357	Case 1AP-3: Equivalence Ratio in PXS SBLOCA, Failed PRHR and CMTs	41A-219
41A-358	Case 1AP-4: Reactor Coolant System Pressure SBLOCA with Failed PRHR and ADS	41A-219
41A-359	Case 1AP-4: Core-Exit Gas Temperature SBLOCA with Failed PRHR and ADS	41A-220
41A-360	Case 1AP-4: Reactor Vessel Mixture Level SBLOCA with Failed PRHR and ADS	41A-220
41A-361	Case 1AP-4: Hydrogen Generated In-Vessel SBLOCA with Failed PRHR and ADS	41A-221
41A-362	Case 1AP-4: Containment Pressure SBLOCA with Failed PRHR and ADS	41A-221
41A-363	Case 1AP-4: Containment Gas Temperature SBLOCA with Failed PRHR and ADS	41A-222
41A-364	Case 1AP-4: Containment Compartments Water Level SBLOCA with Failed PRHR and ADS	41A-222
41A-365	Case 1AP-4: Well-Mixed Compartment Hydrogen Concentration SBLOCA with Failed PRHR and ADS	41A-223
41A-366	Case 1AP-4: Well-Mixed Compartment Steam Concentration SBLOCA with Failed PRHR and ADS	41A-223
41A-367	Case 1AP-4: Well-Mixed Compartment Oxygen Concentration SBLOCA with Failed PRHR and ADS	41A-224
41A-368	Case 1AP-4: Confined Compartment Hydrogen Concentration SBLOCA with Failed PRHR and ADS	41A-224
41A-369	Case 1AP-4: Confined Compartment Steam Concentration SBLOCA with Failed PRHR and ADS	41A-225
41A-370	Case 1AP-4: Confined Compartment Oxygen Concentration SBLOCA with Failed PRHR and ADS	41A-225
41A-371	Case 1AP-4: Equivalence Ratio in SG Room SBLOCA with Failed PRHR and ADS	41A-226
41A-372	Case 1AP-4: Equivalence Ratio in CMT Room SBLOCA with Failed PRHR and ADS	41A-226
41A-373	Case 1AP-4: Equivalence Ratio in IRWST SBLOCA with Failed PRHR and ADS	41A-227
41A-374	Case 1AP-4: Equivalence Ratio in PXS SBLOCA with Failed PRHR and ADS	41A-227
41B-1	Case 3BR – LLOCA with Accumulator Failure Reactor Coolant System Pressure	41B-3
41B-2	Case 3BR – LLOCA with Accumulator Failure Reactor Vessel Mixture Level	41B-3

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
41B-3	Case 3BR – LLOCA with Accumulator Failure Core-Exit Gas Temperature	41B-4
41B-4	Case 3BR – LLOCA with Accumulator Failure Hydrogen Generated In-Vessel	41B-4
41B-5	Case 3BR – LLOCA with Accumulator Failure Containment Pressure	41B-5
41B-6	Case 3BR – LLOCA with Accumulator Failure Containment Gas Temperature	41B-5
41B-7	Case 3BR – LLOCA with Accumulator Failure Containment Compartment Hydrogen Concentration	41B-6
41B-8	Case 3BR – LLOCA with Accumulator Failure Hydrogen Flow Rate Through Break	41B-6
41B-9	Case 3BR – LLOCA with Accumulator Failure Well-Mixed Compartment Hydrogen Concentration	41B-7
41B-10	Case 3BR – LLOCA with Accumulator Failure Well-Mixed Compartment Oxygen Concentration	41B-7
41B-11	Case 3BR – LLOCA with Accumulator Failure Well-Mixed Compartment Steam Concentration	41B-8
41B-12	Case 3BR – LLOCA with Accumulator Failure Approximate Detonation Cell Width in Steam Generator Compartment	41B-8
41B-13	Case 3BR – LLOCA with Accumulator Failure Containment Compartments Water Level	41B-9
41B-14	Case 3BR – LLOCA with Accumulator Failure Hydrogen Flow Rate Through ADS to IRWST	41B-9
41B-15	Case 3BR – LLOCA with Accumulator Failure Confined Compartment Hydrogen Concentration	41B-10
41B-16	Case 3BR – LLOCA with Accumulator Failure Confined Compartment Oxygen Concentration	41B-10
41B-17	Case 3BR – LLOCA with Accumulator Failure Confined Compartment Steam Concentration	41B-11
42-1	AP1000 Containment Fragility at Containment Temperature of 400°F	42-12
42-2	AP1000 Containment Fragility at Containment Temperature of 331°F	42-13
43-1	Plant Damage State Contributions to CDF	43-119
43-2	Containment Event Tree – CET (Sheets 1 – 3)	43-120
43-3	3BE CET (Sheets 1 – 3)	43-123
43-4	3BL CET (Sheets 1 – 3)	43-126
43-5	3BR CET (Sheets 1 – 3)	43-129
43-6	1A CET (Sheets 1 – 3)	43-132
43-7	1AP CET (Sheets 1 – 3)	43-135
43-8	3A CET (Sheets 1 – 3)	43-138
43-9	3C CET (Sheets 1 – 3)	43-141
43-10	3D CET (Sheets 1 – 3)	43-144
43-11	6 CET (Sheets 1 – 3)	43-147

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
43-12	Contribution of PDS to LRF	43-150
43-13	Summary of CET Quantification (Sheets 1 – 2)	43-151
44-1	MAAP4 AP1000 Containment Nodalization	44-12
45-1	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Noble Gases	45-7
45-2	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Cesium Iodide	45-7
45-3	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Tellurium Dioxide	45-8
45-4	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Strontium Oxide	45-8
45-5	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Molybdenum Dioxide	45-9
45-6	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Cesium Hydroxide	45-9
45-7	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Barium Oxide	45-10
45-8	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Dilanthanum Trioxide	45-10
45-9	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Cerium Dioxide	45-11
45-10	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Tin	45-11
45-11	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Tellurium	45-12
45-12	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection: Release Fraction of Uranium Dioxide	45-12
45-13	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Noble Gases	45-13
45-14	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Cesium Iodide	45-13
45-15	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Tellurium Dioxide	45-14
45-16	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Strontium Oxide	45-14
45-17	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Molybdenum Dioxide	45-15
45-18	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Cesium Hydroxide	45-15
45-19	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Barium Oxide	45-16

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
45-20	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Dilanthanum Trioxide	45-16
45-21	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Cerium Dioxide	45-17
45-22	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Tin	45-17
45-23	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Tellurium	45-18
45-24	Release Category BP, Case 6E-1 – SGTR with Stuck Open SG Safety Valve: Release Fraction of Uranium Dioxide	45-18
45-25	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Noble Gases	45-19
45-26	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Cesium Iodide	45-19
45-27	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Tellurium Dioxide	45-20
45-28	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Strontium Oxide	45-20
45-29	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Molybdenum Dioxide	45-21
45-30	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Cesium Hydroxide	45-21
45-31	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Barium Oxide	45-22
45-32	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Dilanthanum Trioxide	45-22
45-33	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Cerium Dioxide	45-23
45-34	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Tin	45-23
45-35	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Tellurium	45-24
45-36	Release Category CI, Case 3C-2 – Vessel Rupture with Containment Failure: Release Fraction of Uranium Dioxide	45-24
45-37	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Noble Gases	45-25
45-38	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Cesium Iodide	45-25
45-39	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Tellurium Dioxide	45-26
45-40	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Strontium Oxide	45-26

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
45-41	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Molybdenum Dioxide	45-27
45-42	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Cesium Hydroxide	45-27
45-43	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Barium Oxide	45-28
45-44	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Dilanthanum Trioxide	45-28
45-45	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Cerium Dioxide	45-29
45-46	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Tin	45-29
45-47	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Tellurium	45-30
45-48	Release Category CFE, Case 3D-4 – Spurious ADS-2, Failed CMTs, Diffusion Flame: Release Fraction of Uranium Dioxide	45-30
45-49	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Noble Gases	45-31
45-50	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Cesium Iodide	45-31
45-51	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Tellurium Dioxide	45-32
45-52	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Strontium Oxide	45-32
45-53	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Molybdenum Dioxide	45-33
45-54	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Cesium Hydroxide	45-33
45-55	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Barium Oxide	45-34
45-56	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Dilanthanum Trioxide	45-34
45-57	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Cerium Dioxide	45-35
45-58	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Tin	45-35
45-59	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Tellurium	45-36
45-60	Release Category CFI, Case 3BE-3 – DVI Line Break, Failed Gravity Injection, No PXS Flooding: Release Fraction of Uranium Dioxide	45-36
45-61	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Noble Gases	45-37

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
45-62	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Cesium Iodide	45-37
45-63	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Tellurium Dioxide	45-38
45-64	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Strontium Oxide	45-38
45-65	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Molybdenum Dioxide	45-39
45-66	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Cesium Hydroxide	45-39
45-67	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Barium Oxide	45-40
45-68	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Dilanthanum Trioxide	45-40
45-69	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Cerium Dioxide	45-41
45-70	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Tin	45-41
45-71	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Tellurium	45-42
45-72	Release Category CFL, Case 3BE-7 – SBLOCA with Failed Gravity Injection: Release Fraction of Uranium Dioxide	45-42
45-73	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Noble Gases	45-43
45-74	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Cesium Iodide	45-43
45-75	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Tellurium Dioxide	45-44
45-76	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Strontium Oxide	45-44
45-77	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Molybdenum Dioxide	45-45
45-78	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Cesium Hydroxide	45-45
45-79	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Barium Oxide	45-46
45-80	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Dilanthanum Trioxide	45-46
45-81	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Cerium Dioxide	45-47
45-82	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Tin	45-47

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
45-83	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Tellurium	45-48
45-84	Release Category IC, Case 3BE-5 – SBLOCA with Failed Gravity Injection Direct-Release Sensitivity: Release Fraction of Uranium Dioxide	45-48
45A-1	AP1000 Fission Product Release Fractions for Release Category CFE – Noble Gases	45A-3
45A-2	AP1000 Fission Product Release Fractions for Release Category CFE – CsI and RbI	45A-3
45A-3	AP1000 Fission Product Release Fractions for Release Category CFE – TeO_2	45A-4
45A-4	AP1000 Fission Product Release Fractions for Release Category CFE – SrO	45A-4
45A-5	AP1000 Fission Product Release Fractions for Release Category CFE – MoO_2	45A-5
45A-6	AP1000 Fission Product Release Fractions for Release Category CFE – CsOH and RbOH	45A-5
45A-7	AP1000 Fission Product Release Fractions for Release Category CFE – BaO	45A-6
45A-8	AP1000 Fission Product Release Fractions for Release Category CFE – La_2O_3	45A-6
45A-9	AP1000 Fission Product Release Fractions for Release Category CFE – CeO_2	45A-7
45A-10	AP1000 Fission Product Release Fractions for Release Category CFE – Sb	45A-7
45A-11	AP1000 Fission Product Release Fractions for Release Category CFE – Te_2	45A-8
45A-12	AP1000 Fission Product Release Fractions for Release Category CFE – UO_2	45A-8
45A-13	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – RCS Pressure	45A-9
45A-14	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Reactor Vessel Mixture Level	45A-9
45A-15	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Core-Exit Temperature	45A-10
45A-16	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – In-Vessel Hydrogen Generation	45A-10
45A-17	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Containment Pressure	45A-11
45A-18	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Containment Gas Temperature	45A-11
45A-19	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Containment Hydrogen Concentration	45A-12
45A-20	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Noble Gases Release Fraction	45A-12

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
45A-21	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – CsI and RbI Release Fraction	45A-13
45A-22	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – TeO_2 Release Fraction	45A-13
45A-23	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – SrO Release Fraction	45A-14
45A-24	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – MoO_2 Release Fraction	45A-14
45A-25	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – CsOH and RbOH Release Fraction	45A-15
45A-26	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – BaO Release Fraction	45A-15
45A-27	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – La_2O_3 Release Fraction	45A-16
45A-28	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – CeO_2 Release Fraction	45A-16
45A-29	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Sb Release Fraction	45A-17
45A-30	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – Te_2 Release Fraction	45A-17
45A-31	AP1000 3BE-1 Case with Intermediate DDT Containment Failure – UO_2 Release Fraction	45A-18
45A-32	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – Containment Pressure	45A-18
45A-33	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – Noble Gases Release Fraction	45A-19
45A-34	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – CsI and RbI Release Fraction	45A-19
45A-35	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – TeO_2 Release Fraction	45A-20
45A-36	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – SrO Release Fraction	45A-20
45A-37	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – MoO_2 Release Fraction	45A-21
45A-38	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – CsOH and RbOH Release Fraction	45A-21
45A-39	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – BaO Release Fraction	45A-22
45A-40	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – La_2O_3 Release Fraction	45A-22
45A-41	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – CeO_2 Release Fraction	45A-23

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
45A-42	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – Sb Release Fraction	45A-23
45A-43	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – Te_2 Release Fraction	45A-24
45A-44	AP1000 3BE-1 Case with no PCS Water Cooling and Late Containment Failure – UO_2 Release Fraction	45A-24
49-1	Population Whole Body Dose – BP Source Term, 24 Hours	49-20
49-2	Population Whole Body Dose – BP Source Term 72 Hours	49-20
49-3	Site Boundary Whole Body Dose – BP Source Term, 24 Hours	49-21
49-4	Site Boundary Whole Body Dose – BP Source Term, 72 Hours	49-21
49-5	Site Boundary Red Bone Marrow Dose – BP Source Term, 24 Hours	49-22
49-6	Site Boundary Red Bone Marrow Dose – BP Source Term, 72 Hours	49-22
49-7	Site Boundary Thyroid Dose – BP Source Term, 24 Hours	49-23
49-8	Site Boundary Thyroid Dose – BP Source Term, 72 Hours	49-23
49-9	Population Whole Body Dose – CFE Source Term, 24 Hours	49-24
49-10	Population Whole Body Dose – CFE Source Term, 72 Hours	49-24
49-11	Site Boundary Whole Body Dose – CFE Source Term, 24 Hours	49-25
49-12	Site Boundary Whole Body Dose – CFE Source Term, 72 Hours	49-25
49-13	Site Boundary Red Bone Marrow Dose – CFE Source Term, 24 Hours	49-26
49-14	Site Boundary Red Bone Marrow Dose – CFE Source Term, 72 Hours	49-26
49-15	Site Boundary Thyroid Dose – CFE Source Term, 24 Hours	49-27
49-16	Site Boundary Thyroid Dose – CFE Source Term, 72 Hours	49-27
49-17	Population Whole Body Dose – CFI Source Term, 24 Hours	49-28
49-18	Population Whole Body Dose – CFI Source Term, 72 Hours	49-28
49-19	Site Boundary Whole Body Dose – CFI Source Term, 24 Hours	49-29
49-20	Site Boundary Whole Body Dose – CFI Source Term, 72 Hours	49-29
49-21	Site Boundary Red Bone Marrow Dose – CFI Source Term, 24 Hours	49-30
49-22	Site Boundary Red Bone Marrow Dose – CFI Source Term, 72 Hours	49-30
49-23	Site Boundary Thyroid Dose – CFI Source Term, 24 Hours	49-31
49-24	Site Boundary Thyroid Dose – CFI Source Term, 72 Hours	49-31
49-25	Population Whole Body Dose – CFL Source Term, 24 Hours	49-32
49-26	Population Whole Body Dose – CFL Source Term, 72 Hours	49-32
49-27	Site Boundary Whole Body Dose – CFL Source Term, 24 Hours	49-33
49-28	Site Boundary Whole Body Dose – CFL Source Term, 72 Hours	49-33
49-29	Site Boundary Red Bone Marrow Dose – CFL Source Term, 24 Hours	49-34
49-30	Site Boundary Red Bone Marrow Dose – CFL Source Term, 72 Hours	49-34
49-31	Site Boundary Thyroid Dose – CFL Source Term, 24 Hours	49-35
49-32	Site Boundary Thyroid Dose – CFL Source Term, 72 Hours	49-35
49-33	Population Whole Body Dose – CI Source Term, 24 Hours	49-36
49-34	Population Whole Body Dose – CI Source Term, 72 Hours	49-36
49-35	Site Boundary Whole Body Dose – CI Source Term, 24 Hours	49-37
49-36	Site Boundary Whole Body Dose – CI Source Term, 72 Hours	49-37

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
49-37	Site Boundary Red Bone Marrow Dose – CI Source Term, 24 Hours	49-38
49-38	Site Boundary Red Bone Marrow Dose – CI Source Term, 72 Hours	49-38
49-39	Site Boundary Thyroid Dose – CI Source Term, 24 Hours	49-39
49-40	Site Boundary Thyroid Dose – CI Source Term, 72 Hours	49-39
49-41	Population Whole Body Dose – DIRECT Source Term, 24 Hours	49-40
49-42	Population Whole Body Dose – DIRECT Source Term, 72 Hours	49-40
49-43	Site Boundary Whole Body Dose – DIRECT Source Term, 24 Hours	49-41
49-44	Site Boundary Whole Body Dose – DIRECT Source Term, 72 Hours	49-41
49-45	Site Boundary Red Bone Marrow Dose – DIRECT Source Term, 24 Hours	49-42
49-46	Site Boundary Red Bone Marrow Dose – DIRECT Source Term, 72 Hours	49-42
49-47	Site Boundary Thyroid Dose – DIRECT Source Term, 24 Hours	49-43
49-48	Site Boundary Thyroid Dose – DIRECT Source Term, 72 Hours	49-43
49-49	Population Whole Body Dose – IC Source Term, 24 Hours	49-44
49-50	Population Whole Body Dose – IC Source Term, 72 Hours	49-44
49-51	Site Boundary Whole Body Dose – IC Source Term, 24 Hours	49-45
49-52	Site Boundary Whole Body Dose – IC Source Term, 72 Hours	49-45
49-53	Site Boundary Red Bone Marrow Dose – IC Source Term, 24 Hours	49-46
49-54	Site Boundary Red Bone Marrow Dose – IC Source Term, 72 Hours	49-46
49-55	Site Boundary Thyroid Dose – IC Source Term, 24 Hours	49-47
49-56	Site Boundary Thyroid Dose – IC Source Term, 72 Hours	49-47
49-57	Overall Dose Risk – Site Boundary Whole Body EDE Dose, 24 Hours	49-48
49-58	Overall Dose Risk – Site Boundary Red Bone Marrow Dose (Acute), 24 Hours	49-49
51-1	AP1000 Base Core Damage Frequency Uncertainty Analysis	51-11
51-2	AP1000 Sensitivity Case Uncertainty Analysis	51-11
51B-1	Distribution for Plant Core Damage Frequency	51B-2
51B-2	Safety Injection Line Break	51B-2
51B-3	Large LOCA	51B-3
51B-4	Large Spurious ADS Actuation	51B-3
51B-5	Small LOCA	51B-4
51B-6	Medium LOCA	51B-4
51B-7	Reactor Vessel Rupture	51B-5
51B-8	Steam Generator Tube Rupture	51B-5
51B-9	Safety Injection Line Break – Sequence 7	51B-6
51B-10	Large LOCA – Sequence 9	51B-6
51B-11	Spurious ADS – Sequence 8	51B-7
51B-12	Safety Injection Line Break – Sequence 8d	51B-7
51B-13	Reactor Vessel Rupture – Sequence 2	51B-8
51B-14	Small LOCA – Sequence 5	51B-8
51B-15	Medium LOCA – Sequence 5	51B-9
51B-16	Small LOCA – Sequence 12	51B-9
51B-17	Medium LOCA – Sequence 12	51B-10

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
51B-18	Spurious ADS – Sequence 9	51B-10
51B-19	Spurious ADS – Sequence 7	51B-11
51B-20	Safety Injection Line Break – Sequence 3	51B-11
51B-21	SGTR Event – Sequence 41	51B-12
51B-22	ATWS Precursor with no MFW – Sequence 23	51B-12
51B-23	Small LOCA – Sequence 9	51B-13
51B-24	Medium LOCA – Sequence 9	51B-13
51B-25	SGTR Event – Sequence 13	51B-14
51B-26	Large LOCA – Sequence 8	51B-14
51B-27	CMT Line Break – Sequence 5	51B-15
54-1	Loss of Offsite Power During Hot/Cold Shutdown (RCS Filled) Event Tree (Sheets 1 – 2)	54-138
54-2	Loss of RNS During Hot/Cold Shutdown (RCS Filled) Event Tree	54-140
54-3	Loss of CCW/SW During Hot/Cold Shutdown (RCS Filled) Event Tree	54-141
54-4	LOCA/RNS-V024 Opens During Hot/Cold Shutdown (RCS Filled) Event Tree	54-142
54-5	LOCA/RNS Pipe Rupture During Hot/Cold Shutdown (RCS Filled) Event Tree	54-143
54-6	Overdraining of Reactor Coolant System During Draindown to Mid-loop Event Tree	54-144
54-7	Loss of Offsite Power During RCS drained Condition Event Tree	54-145
54-8	Loss of RNS During RCS drained Condition Event Tree	54-146
54-9	Loss of CCW/SW During RCS drained Condition Event Tree	54-147
54-10	LOCA/RNS-V024 Opens During RCS drained Condition Event Tree	54-148
55-1	Seismic Initiating Event Hierarchy Tree	55-30
57-1	Example Event Tree Model	57-125
57-2	Contribution of Plant Areas to Fire CDF	57-126
57-3	Contribution of Fire Area to Fire CDF	57-127
57A-1	DAS-ACT Fault Tree	57A-37
57C-1	0000 AF 00 Yard Building (Including Transformer Yard)	57C-12
57C-2	1200 AF 01 RCA of Auxiliary Building (All Zones)	57C-13
57C-3	1200 AF 02 New Fuel and Used Fuel Storage, Waste Disposal Container (All Zones)	57C-14
57C-4	1200 AF 03 Corridors 100′ & 117′ 6″	57C-15
57C-5	1201 AF 02 Division B Batteries/DC Equipment Room/Instrumentation and Control	57C-16
57C-6	1201 AF 03 Division D DC Equipment/I&C	57C-17
57C-7	1201 AF 04 Division B/D VBS Equipment	57C-18
57C-8	1201 AF 05 MSIV Compartment A	57C-19
57C-9	1201 AF 06 MSIV Compartment B	57C-20

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
57C-10	1202 AF 02 Northeast Elevator Shaft	57C-21
57C-11	1202 AF 03 Division C Batteries/DC Equipment/I&C Room/ RCP Trip Switchgear Room/I&C Penetration Room	57C-22
57C-12	1202 AF 04 Division A Electrical Equipment/Battery Room/I&C Room	57C-23
57C-13	1204 AF 01 RNS Pump Room B	57C-24
57C-14	1204 AF 03 South Shield Building Elevator Shaft	57C-25
57C-15	1205 AF 02 Southeast Elevator Shaft	57C-26
57C-16	1210 AF 01 Corridor/Spare Battery Room/Spare Room/Spare Battery Charger Room	57C-27
57C-17	1220 AF 01 Division B RCP Trip Switchgear/Spare Room/Corridor 82' 6"	57C-28
57C-18	1220 AF 02 Lower Annulus Valve Area	57C-29
57C-19	1230 AF 01 Corridor Division A, B, C, D and Remote Shutdown Workstation	57C-30
57C-20	1230 AF 02 Non-Class 1E Electrical Compartment - 100'	57C-31
57C-21	1232 AF 01 Remote Shutdown Workstation	57C-32
57C-22	1240 AF 01 Non-Class 1E Electrical Compartment - 117'	57C-33
57C-23	1242 AF 02 Division A Penetration Area	57C-34
57C-24	1243 AF 01 Reactor Trip Switchgear I	57C-35
57C-25	1243 AF 02 Reactor Trip Switchgear II	57C-36
57C-26	1250 AF 01 Nonradioactive Ventilation System	57C-37
57C-27	2000 AF 01 Turbine Building Floor	57C-38
57C-28	2003 AF 01 Auxiliary Boiler Equipment Room	57C-39
57C-29	2009 AF 02 Elevator Machine Room	57C-40
57C-30	2033 AF 02 Motor-Driven Fire Pump Room	57C-41
57C-31	2040 AF 01 Clean and Dirty Lube Oil Storage	57C-42
57C-32	2043 AF 01 Chemical Laboratory	57C-43
57C-33	2050 AF 01 Lube Oil Conditioner Room	57C-44
57C-34	2052 AF 01 Southwest 6.9KV Switchgear Room	57C-45
57C-35	2053 AF 01 Electrical Equipment Room	57C-46
57C-36	2053 AF 02 Northwest 6.9KV Switchgear Room	57C-47
57C-37	4003 AF 01 Demineralized Water Deoxygenating Room/ Air Handling Equipment Rooms	57C-48
57C-38	4031 AF 01 Battery Room and Battery Charger Room 1	57C-49
57C-39	4031 AF 02 Battery Room and Battery Charger Room 2/ Computer Room B/Shift Turnover Room	57C-50
57C-40	4031 AF 05 Corridor/Spare Battery Room/Spare Room/ Spare Battery Charger Room	57C-51
57C-41	4031 AF 06 Central Alarm Station/Security Room 1	57C-52
57C-42	4032 AF 01 Decontamination Room, Non-Radiological and Radiological Controlled Area Entry/Exit Area	57C-53
57C-43	4032 AF 02 Containment Access Corridor Elevation 107' 2"	57C-54
57C-44	4033 AF 01 Hot Machine Shop	57C-55
57C-45	4034 AF 01 General Offices	57C-56
57C-46	4041 AF 01 Conference Rooms/Computer Room A/Corridor	57C-57

LIST OF FIGURES (Cont.)

Figure No.	Title	Page
57C-47	4041 AF 02 Corridor/Restroom	57C-58
57C-48	4042 AF 01 Non-Class 1E Switchgear #1	57C-59
57C-49	4042 AF 02 Non-Class 1E Switchgear #2	57C-60
57C-50	4052 AF 01 Staging and Storage Area/Containment Air Filtration Exhaust Rooms A & B	57C-61
57C-51	5031 AF 01 Radwaste Building	57C-62
57C-52	6030 AF 01 Diesel Generator Room A	57C-63
57C-53	6030 AF 02 Diesel Generator Room B	57C-64
57C-54	6030 AF 03 Fuel Oil Day Tank Room A	57C-65
57C-55	6030 AF 04 Fuel Oil Day Take Room B	57C-66
57C-56	1100 AF 11204 Reactor Coolant Drain Tank Room	57C-67
57C-57	1100 AF 11206 Accumulator Room A	57C-68
57C-58	1100 AF 11207 Accumulator Room B	57C-69
57C-59	1100 AF 11208 RNS Valve Room	57C-70
57C-60	1100 AF 11300A Maintenance Floor (SE Quadrant Access)	57C-71
57C-61	1100 AF 11300B Maintenance Floor (NNE Quadrant) and RCDT Access	57C-72
57C-62	1100 AF 11301 SG Compartment 1	57C-73
57C-63	1100 AF 11302 SG Compartment 2	57C-74
57C-64	1100 AF 11303 Pressurizer Compartment	57C-75
57C-65	1100 AF 11303A ADS Lower Valve Area	57C-76
57C-66	1100 AF 11303B ADS Upper Valve Area	57C-77
57C-67	1100 AF 11500 Operating Deck	57C-78
57C-68	1200 AF 12341 Middle Annulus	57C-79
57C-69	1200 AF 12555 Main Control Room Emergency Habitability System Air Storage/Operating Deck Staging Area	57C-80
59-1	Contribution of Initiating Events to Core Damage	59-99
59-2	24-Hour Site Boundary Dose Cumulative Frequency Distribution	59-100

REVISION 1 CHANGE ROADMAP

Section	Page No.	Type of Change[1]
AP1000 Document Cover Sheet		Editorial
Probabilistic Risk Assessment, Title Page		Editorial
T of C	i through c	Editorial
Revision 1 Change Roadmap	ci through civ	Editorial
1	1-6	Editorial
3	3-4	Editorial
Attachment 4B	4B-24	720.027
Attachment 4B	4B-74	Editorial
6	6-9	720.025 (720.029)
6	6-12	720.025 (720.029) Editorial
6	6-16	Editorial
6	6-17	720.026
6	6-19 through 6-53	720.023 (720.024) (720.097)
6	6-62	720.031
6	6-69	720.025 (720.029)
6	6-71	720.025 (720.029)
8	8-23 and 8-25	Editorial
12	12-6	720.033
12	12-30	720.033
26	26-11 and 26-12	Editorial
28	28-10 and 28-11	Editorial
29	29-17	720.033
29	29-21	720.033

REVISION 1 CHANGE ROADMAP (Cont.)

Section	Page No.	Type of Change[1]
30	30-35 and 30-36	720.068
30	30-66 and 30-67	720.068
30	30-110	Editorial
34	34-1	720.042
34	34-4 and 34-5	720.042
34	34-6 and 34-7	720.042 Editorial
34	34-8 through 34-243	720.042
35	35-28	720.043
39	39-4	720.073 Editorial
39	39-5	720.088 (720.048, 720.074, 720.083, 720.089)
39	39-6	720.088 720.073 (720.048, 720.074, 720.083, and 720.089)
39	39-12	Editorial
39	39-19	Editorial
39	39-20	720.073
39	39-21	Editorial 720.088
Attachment 39A	39A-1 through 39A-40	720.088 (720.048, 720.074, 720.083, and 720.089)
41	41-6	720.042
41	41-15	720.093
41	41-20	720.054
41	41-31	Editorial
Attachment 41A	41A-1 through 41A-228	720.042
Attachment 41B	41B-1 through 41B-11	720.093
43	43-126 and 43-127	Editorial
Attachment 43C	43C-1 and 43C-2	720.043
44	44-7	Editorial

REVISION 1 CHANGE ROADMAP (Cont.)

Section	Page No.	Type of Change[1]
45	45-1 through 45-3	470.013 (470.012)
45	45-4	470.013 (470.012) Editorial
45	45-5 through 45-48	470.013 (470.012)
49	49-1	720.056
49	49-4 through 49-6	720.056
49	49-9 through 49-49	720.056
50	50-14	720.034
55	55-5	DSER OI 19A.2-5 (R1)
55	55-7	DSER OI 19A.2-4 (R1) DSER OI 19A.2-5 (R1) DSER OI 19A.2-6 (R1)
55	55-20	DSER OI 19A.2-6 (R1)
57	57-1 through 57-109	Letter DCP/NRC1515
Attachment 57A	57A-1 through 57A-37	Letter DCP/NRC1515
Attachment 57B	57B-1 through 57B-6	Letter DCP/NRC1515
Attachment 57C	57C-1 through 57C-80	Letter DCP/NRC1515
Attachment 57D	57D-1 through 57D-7	Letter DCP/NRC1515
59	59-20 and 59-21	Editorial
59	59-23 through 59-25	Letter DCP/NRC1515
59	59-26	720.056
59	59-28	Editorial
59	59-29 through 59-32	720.038
59	59-34 through 59-38	720.038
59	59-72	Editorial
59	59-73	Technical
59	59-83	Editorial
59	59-75 through 59-96	720.038
59	59-97	720.038 720.066
59	59-98	720.038
59	59-100	Technical

REVISION 1 CHANGE ROADMAP (Cont.)

Section	Page No.	Type of Change[1]
Appendix A	A-1 through A-166	720.007 720.010 720.011 720.012 720.013 720.015 720.016
Appendix B	B-6	720.058
Appendix B	B-13	720.076
Appendix D	D-14 and D-15	720.078
Appendix D	D-31	720.078
Appendix D	D-35 and D-36	Technical
Appendix D	D-37 through D-58	720.078

1. Changes incorporated as a result of Westinghouse responses to NRC Request for Additional Information (RAI) identified by RAI number. RAI number in parenthesis contains a reference to RAI response listed above.

REVISION 2 CHANGE ROADMAP

Section	Page No.	Type of Change[1]
AP1000 Document Cover Sheet		Editorial
Probabilistic Risk Assessment, Title Page		Editorial
T of C	i through c	Editorial
Revision 2 Change Roadmap	cv through cvii	Editorial
6	6-17	720.026 (R1)
6	6-28	720.024 (R1)
6	6-32 and 6-33	720.024 (R1)
6	6-37 through 6-39	720.024 (R1)
6	6-41	720.024 (R1)
6	6-50 through 6-53	720.024 (R1)
6	6-69	720.029 (R1)
24	24-17	720.046 (R1)
24	24-22 and 24-23	720.046 (R1)
24	24-27	720.046 (R1)
30	30-26a through 30-28	720.029 (R1)
35	35-28	720.043 (R1)
43	43-9 and 43-9a	720.039 (R2)
43	43-9b	Editorial
43	43-10a	720.039 (R2)
43	43-10b	Editorial
43	43-93a through 43-93w	720.039 (R2)
43	93-93x	Editorial
Attachment 43C	43C-2	720.043 (R1)
50	50-1	
50	50-1a and 50-1b	Editorial
50	50-14	720.039 (R2)
50	50-14a	720.039 (R2)
50	50-14b	Editorial
54	54-1 through 54-131	720.038 (R2)

REVISION 2 CHANGE ROADMAP (Cont.)

Section	Page No.	Type of Change[1]
56	56-1	720.038 (R1) Editorial
56	56-9	Editorial
56	56-17 and 56-18	Editorial
56	56-20	Editorial
56	56-36 and 56-37	Editorial
56	56-38	Editorial 720.038 (R1)
56	56-38a through 56-38k	720.038 (R1)
56	56-38l	Editorial
56	56-47 through 56-49	Editorial
56	56-51	Editorial
56	56-54 and 56-55	720.038 (R1)
57	57-14 and 57-15	280.011 (R1)
57	57-15a and 57-15b	Editorial
59	59-23 and 59-23a	720.038 (R1)
59	59-23b	Editorial
59	59-34	720.038 (R1)
59	59-72	720.038 (R1)
Appendix A	A-12	Editorial
Appendix A	A-24 through A-26	440.014 (R1)
Appendix A	A-26a	440.014 (R1) 720.024 (R1)
Appendix A	A-26b	Editorial
Appendix A	A-27	720.012 (R1)
Appendix A	A-31	720.012 (R1)
Appendix A	A-33	720.010 (R1)
Appendix A	A-33a and A-33b	Editorial
Appendix A	A-44	Editorial
Appendix A	A-57 through A-61	720.012 (R1)
Appendix A	A-63	720.012 (R1)
Appendix A	A-66	720.012 (R1)
Appendix A	A-103a through A-103b	440.014 (R1)
Appendix A	A-103c and A-103d	720.012 (R1)
Appendix A	A-151 and A-152	720.013 (R1)
Appendix A	A-165 and A-166	720.013 (R1)

REVISION 2 CHANGE ROADMAP (Cont.)

Section	Page No.	Type of Change(1)
Appendix D	D-13 and D-14	720.080 (R1)
Appendix D	D-35 and D-36	720.080 (R1)

1. Changes incorporated as a result of Westinghouse responses to NRC Request for Additional Information (RAI) identified by RAI number.

REVISION 3 CHANGE ROADMAP

Section	Page No.	Type of Change[1]
AP1000 Document Cover Sheet		Editorial
Probabilistic Risk Assessment, Title Page		Editorial
T of C	i through cii	Editorial
Revision 3 Change Roadmap	cx	Editorial
Attachment 45A	45A-1 through 45A-24	Technical
57	57-1 and 57-2	Editorial
57	57-4	Editorial
57	57-11 and 57-12	Editorial
57	57-17	Editorial
57	57-22 and 57-23	Editorial
57	57-30 through 57-39	720.038 (R1)
57	57-40	720.038 (R1) Editorial
57	57-41 and 57-42	720.038 (R1)
57	57-78	Editorial
57	57-117 through 57-124	720.038 (R1)
Appendix A	A-23 through A-25	720.009 (R2)
Appendix A	A-105 through A-111	720.009 (R2)

1. Changes incorporated as a result of Westinghouse responses to NRC Request for Additional Information (RAI) identified by RAI number.

REVISION 4 CHANGE ROADMAP

Section	Page No.	Type of Change[1]
AP1000 Document Cover Sheet		Editorial
Probabilistic Risk Assessment, Title Page		Editorial
T of C	i through ciii	Editorial
Revision 4 Change Roadmap	cxii and cxiii	Editorial
34	34-4	Editorial
34	34-16	DSER OI 19.1.10.3-1 (R1)
34	34-19 through 34-21	DSER OI 19.1.10.3-1 (R1)
34	34-50 and 34-51	DSER OI 19.1.10.3-1 (R1)
34	34-247 through 34-264	DSER OI 19.1.10.3-1 (R1)
42	42-3	DSER OI 19.2.6-1 (R1)
42	42-6	DSER OI 19.2.6-3
42	42-7 and 42-8	Editorial
43	43-10	Editorial
43	43-13	Editorial
Attachment 43D	43D-1	DSER OI 19.1.3.2-1
Attachment 43E	43E-1 and 43E-2	DSER OI 19.1.3.2-2
45	45-2	DSER OI 19.1.10.3-1 (R1)
45	45-5 and 45-6	DSER OI 19.1.10.3-1 (R1)
45	45-13 through 45-18	DSER OI 19.1.10.3-1 (R1)
45	45-31 through 45-42	DSER OI 19.1.10.3-1 (R1)
Attachment 45A	45A-1 through 45A-24	Deleted per DSER OI 19.1.10.3-1 (R1)
49	49-6	DSER OI 19.1.10.3-1 (R1)
49	49-9 through 49-49	DSER OI 19.1.10.3-1 (R1)
50	50-1	Editorial
54	54-9	DSER OI 19.1.10.2-3
54	54-12	DSER OI 19.1.10.2-3
54	54-13	Editorial
54	54-22 through 54-71	Editorial
54	54-76 through 54-80	DSER OI 19.1.10.2-5 Editorial

REVISION 4 CHANGE ROADMAP (Cont.)

Section	Page No.	Type of Change[1]
54	54-83 through 54-110	DSER OI 19.1.10.2-5 Editorial
54	54-112 through 54-118	DSER OI 19.1.10.2-5 Editorial
54	54-121 through 54-137	DSER OI 19.1.10.2-3
55	55-5	DSER OI 19A.2-5 (R1)
55	55-7	DSER OI 19A.2-4 (R1) DSER OI 19A.2-5 (R1) DSER OI 19A.2-6 (R1) Editorial
55	55-16 through 55-18	Editorial
55	55-20	DSER OI 19A.2-6 (R1)
55	55-25 through 55-29	Editorial
56	56-46	DSER OI 19.3.10-1
59	59-26	DSER OI 19.1.10.3-1 (R1)
59	59-37	DSER OI 19A.3-2 (R1)
59	59-45 through 59-70	Editorial
59	59-73	DSER OI 19.1.10.3-1 (R1)
59	59-74	Editorial
59	59-100	DSER OI 19.1.10.3-1 (R1)

1. Changes incorporated as a result of Draft Safety Evaluation Report (DSER) Open Item (OI) Response identified by DSER OI number.

CHAPTER 49

OFFSITE DOSE RISK QUANTIFICATION

49.1 Introduction

The potential ground-level exposure, expressed as both effective dose equivalent (EDE) whole-body dose and acute red bone marrow dose, resulting from the possible accidental release of radioactive fission products is discussed in this chapter. Chapter 45 provides the estimated source term information; that is, the accidental release conditions. These conditions are:

- The amount of released material
- Release energy
- Duration
- Location

for the six identified release categories.

This information is used here, along with data provided in the Electric Power Research Institute (EPRI) Advanced Light Water Reactor Utility Requirements Document (Reference 49-1), to perform the atmospheric dispersion analyses. These analyses are conducted to estimate the EDE whole-body dose and acute red bone marrow dose, both at the site boundary (0.5 miles). The population whole-body dose out to 80.5 kilometers and the downwind, centerline, ground-level thyroid dose at the site boundary (0.5 miles) are also calculated for information. The estimated site boundary whole-body dose and the acute red bone marrow dose are compared to the Westinghouse goal of <25 rems (0.25 sieverts), at a frequency not to exceed $1x10^{-6}$ per year. This is consistent with the goal provided in Reference 49-1.

It should be noted that Reference 49-1 recommends evaluation of the whole-body dose. However, it does not clearly identify whether this dose analysis should be based on an acute or committed dose (EDE) basis. Consequence codes such as the MELCOR Accident Consequence Code System (MACCS and MACCS2) and their predecessor CRAC2 (codes are recommended by Reference 49-1) can only calculate the EDE whole-body dose, therefore the committed dose has been used in previous ALWR analyses. It is felt however, that the whole-body acute centerline dose is more appropriate for this 25 rem dose calculation since the purpose of this calculation is to establish a margin to the Nuclear Regulatory Commission (NRC) safety goals and the NRC staff safety goal implementation requirement. In this context, it is acute health effects versus long term effects from a committed dose that are of significance. For consequence codes such as MACCS2, the acute red bone marrow dose may be used to represent the acute whole-body dose. These doses are determined at the site boundary (0.5-mile radius).

The thyroid (site boundary) and whole-body (population) doses are also calculated during the first 24 and 72 hours following the onset of core damage, based on the probabilistic atmospheric dispersion analysis of the dose associated with each release category, coupled with multiple meteorological conditions. The thyroid and population doses are provided for information.

49.2 Conformance with Regulatory Requirements

MACCS2 version 1.12 (Reference 49-2) is used for the analysis. The NRC sponsored the development of this code. The code performs probabilistic estimates of offsite consequences from potential accidental releases in conformance with Chapter 9 of the probabilistic risk assessment (PRA) guidelines described in NUREG/CR-2300 (Reference 49-3).

The analysis was based on the Westinghouse design goals, which are consistent with the guidelines provided in Reference 49-1, as discussed above. This reference document also identifies use of the MACCS2 code for offsite consequence analysis.

49.3 Assumptions

This section discusses the information, including assumptions, required to perform the dose evaluation. The primary information required for the dose evaluation includes the release source terms; the site meteorological data; population distribution data; site economic data; agricultural and land use data; and food uptake, ingestion, and retention factors. Additionally, available data on site emergency plans, such as sheltering and evacuation, and site decontamination and interdiction plans, may be included in the dose evaluation. Since the Westinghouse design goal specifies the site boundary dose as the only consequence of concern, the population, land use, sheltering, evacuation, decontamination, and interdiction data are not required for this calculation.

The advanced light water reactor reference site information described in Reference 49-1 provides the meteorological and population data for the analysis. Since the advanced light water reactor site data does not provide sufficient topographical data to define the MACCS2 site input file, the site land use and crop data are based on representative data from the Surry Plant Site. These data are provided in Reference 49-2. Due to the proximity of the Surry Site to the ocean, those site sectors that are ocean were arbitrarily changed to land. This was done to allow use of the advanced light water reactor reference site population data (without having people assigned to ocean sectors). These changes to the land and crop characteristics are made to provide an acceptable MACCS2 input file. They have no effect on the calculated dose at the plant site boundary.

49.4 Methodology

The dose evaluation uses the MACCS2 accident consequence code to estimate the potential offsite effects of the postulated accidental releases, developed by the Level 2 analysis. The MACCS2 code performs multiple air dispersion analyses, based on the yearly meteorological data, to estimate the air and ground-level concentrations of the released nuclides of concern. Multiple dispersion analyses allow the application of statistical analysis to the full range of results, based on the probability of the meteorological sequences that caused those results. This accounts for the possibility of an accident occurring at any time during the year. The air and ground-level concentrations are then converted to exposure dose, per nuclide, for the following pathways: cloudshine, groundshine, inhalation (direct and resuspended material), and ingestion. For the potential exposure during the initial 24 and 72 hours, the calculated dose does not consider the ingestion pathway.

The MACCS2 code permits evaluation of the effects associated with direct exposure to the radioactive cloud (that is, cloudshine, groundshine, and inhalation), during the period initially following the accident (up to 1 week), and the long-term (over many years) effects due to exposure to contaminated land (ingestion of local farm products, ground shine, resuspension inhalation). It also examines accident costs, which might include permanent relocation and/or decontamination. The code also permits the modeling of the protective effects of sheltering and/or evacuation of the population during the acute exposure phase.

The Westinghouse goal only requires dose determination for exposure resulting from the first 24 hours following the initiation of core damage. Additionally, the Westinghouse goal requires only the total dose to a hypothetical individual located at the site boundary, which is assumed to be one-half mile, directly downwind, during the entire exposure period. Therefore, dose calculations related to the actual site population distribution are not required, nor are calculation of potential health effects, such as deaths and cancers. Finally, the calculation of the site boundary dose ignores any potential mitigating effects, including sheltering and evacuation.

Therefore, the consequence level evaluated in this analysis includes the whole-body effective dose equivalent dose and the acute red bone marrow dose resulting from the first 24-hour exposure versus distance from the reactor.

Statistical evaluation is applied to the multiple dispersion analysis results so that the consequences are presented in terms of a mean value, a peak value, and as complementary cumulative distribution functions. These functions present the value of the consequence level (whole-body effective dose equivalent dose) versus the probability of exceeding this level. The Westinghouse goal and the Reference 49-1 guidelines provide a value for the site boundary dose, not to exceed 25 rems whole-body dose at a frequency not to exceed $1x10^{-6}$ events per year.

A brief description of the code follows.

The MACCS2 code performs its processing in three steps, or modules: ATMOS, EARLY, and CHRONC. The description of the source term and the dispersion calculations occur in the first module, i.e., the ATMOS module. The EARLY module performs the calculations relating to the initial exposure dose and can also account for sheltering or evacuation schemes. The CHRONC module performs the calculations relating to the long-term exposure dose (for many years) and can account for decontamination or food uptake parameters. Only the ATMOS and EARLY modules are used for this analysis.

The MACCS2 code models the atmospheric transport of fission products that are released from containment, as defined by the source term characteristics, using a Gaussian plume model, and calculates the air and ground-level concentrations for the radionuclides of concern. Vertical plume rise depends on the release energy. Plume motion depends on the available meteorological conditions; that is, wind speed, wind direction, and atmospheric stability. The code includes models for radioactive decay and daughter product buildup, wet and dry deposition of the nuclides due to gravity settling, and washout due to precipitation. Noble gases are not removed by deposition.

The MACCS2 code first reviews the hourly meteorological data for one year and sorts the data into predefined and user-defined meteorological categories. This allows MACCS2 to assess the frequency of occurrence of the different meteorological types, and to provide a realistic representation of a full year of site weather. It does this without overlooking those meteorological conditions that, although infrequent, may be instrumental in producing peak impacts. The probability of each meteorological category is also determined by this analysis.

In performing the dispersion analysis for a specific source term, the code samples each of the meteorological categories several times. The number of sampling per category is specified by the user. Each sample consists of starting the postulated release during one of the 8,760 hours during the year, which is identified with the meteorological type being sampled. This is done for each of the meteorological types. For example, if the user specifies four samples per meteorological category, and there are 30 defined meteorological categories, and if the database has at least four hours of meteorological samples per category, then 4 times 30, or 120, dispersion analyses are performed by MACCS2.

Once the release start time is selected, then the actual meteorological data is used to model the subsequent dispersion. That is, the meteorological data are allowed to change as the material moves downwind. The calculation continues until the material reaches the boundary of the spatial grid (receptor grid) defined by the user. Each dispersion simulation, therefore, results in calculated, integrated air and ground concentrations, (plume centerline, ground level) as a function of downwind distance. Each analysis is then weighted by the probability of occurrence of the meteorological condition. As each calculation is performed, the results are accumulated to provide an average estimate of the downwind integrated air and ground concentrations, including effects from all possible meteorological types. The MACCS2 code also notes the peak downwind concentration at each receptor distance and the associated meteorological condition that produced the peak.

The MACCS2 code then performs conversion calculations to estimate the radiation doses based on the air and ground concentrations. The radiation doses received by individuals are due to the passing radioactive cloud and the material deposited on the ground. Radiation doses received from the cloud result from direct radiation (cloudshine) and inhalation of material suspended in the air (inhalation). These processes occur only during the time that the cloud passes over the affected population. Radiation doses associated with the material deposited to the ground include direct radiation of the nuclides on the ground (groundshine) and inhalation of materials that are resuspended into the air (resuspension). The MACCS2 code simulates these dose paths. Therefore, the code estimates the dose levels for each nuclide and for each dispersion analysis performed.

Six release categories are identified for evaluation of potential offsite doses. These categories are discussed in detail in Chapter 45, and are summarized as the following:

- IC – Containment integrity is maintained throughout the accident, and the release of radiation to the environment is due to nominal leakage.

- BP – Fission products are released from the reactor coolant system to the environment via the secondary system or other interfacing system bypass. Containment failure occurs prior to onset of core damage.

- CI – Fission product release occurs through a failure of the system or valves that close the penetrations between containment and the environment. Containment failure occurs prior to onset of core damage.

- CFE – Fission product release occurs through a containment failure caused by some dynamic severe accident phenomena occurring after the onset of core damage but prior to core relocation. Such phenomena include: hydrogen detonation, hydrogen diffusion flame, steam explosions, and vessel failures.

- CFI – Fission product release occurs through a containment failure caused by some dynamic severe accident phenomena occurring after core relocation but before 24 hours. Such phenomena include: hydrogen detonation and hydrogen deflagration.

- CFL – Fission product release occurs through a containment failure caused by some dynamic severe accident phenomena occurring after 24 hours. Such phenomena include the failure of containment heat removal (failure of passive containment cooling).

Additionally, one sensitivity evaluation (called DIRECT) is performed. The DIRECT release case is a modification of the IC release category in which no credit is assumed for aerosol nuclide deposition in the middle annulus. This case is conservative.

Based on the analysis described in Chapter 45, source terms are generated for each of the release categories. The source terms provide the necessary parameters to describe the conditions of the release. Tables 49-1 and 49-2 contain listings of the source terms and their parameters considered in this analysis. Table 49-1 summarizes the output provided by the Modular Accident Analysis Program (MAAP) code, while Table 49-2 presents the conversion of this data into MACCS2 input categories.

There are nine source terms, six release categories, and one sensitivity study defined for this analysis. To conservatively estimate the ground-level dose exposure at the site boundary, it is assumed that all the release categories occur at ground level. Finally, it is conservatively assumed that 5 percent of the iodine released from containment is volatile and would not deposit. Reference 49-1 provides a guideline of 3 percent volatile iodine.

Reference 49-1 provides some of the MACCS2 input data, including the site, and meteorological data. The dose data conversion file provided with the MACCS2 PC Code, version 1.12 (Reference 49-2) is used for this analysis. This file is required to convert the predicted nuclide concentrations to dose values.

49.5 Dose Evaluation Results and Discussion

Doses are determined for the early exposure effects resulting from the initial 24 and 72 hours following the core damage initiation. The dose evaluation provides the conditional probability distributions for the consequence measures, which includes the whole-body dose and the acute red bone marrow dose for this analysis. These consequence probability distributions are based on the assumption that the accident that produced the source term has occurred. Therefore, the consequence probability distributions presented result from the variation in dose levels due to the various meteorological conditions. Hence, the actual

probability of the identified dose levels would be the probability of the release category that produced the source term occurring multiplied by the probability of the dose level. The actual probability of the identified dose levels is presented in Section 49.7.

Tables 49-3 through 49-6 present the summary of the dose evaluations (the MACCS2 output) for the six source terms and the DIRECT sensitivity. The information is provided in the following columns: the mean dose; the 50, 90, 95, 99, and 99.5 percent confidence values that the dose will not exceed; and the peak dose produced by any dispersion analysis. The dose (one sievert equals 100 rem) is presented for the following source terms: IC, BP, CFI, CFE, CFL, CI and DIRECT release sensitivity. Table 49-7 summarizes the calculated mean and peak dose values for the source terms evaluated.

Figures 49-1 through 49-56 present plots of the complementary cumulative distribution functions for the population whole-body, the site boundary whole-body effective dose equivalent, the acute red bone marrow and thyroid doses resulting from the following source terms: CFI, CFE, CFL, IC, BP, CI, and the DIRECT release sensitivity study.

Results in Table 49-7 show that for the release categories CFL, IC, and DIRECT sensitivity study, the mean whole-body EDE dose at the site boundary in 24 hours is less than 6 rem. For all other release categories – BP, CI, CFE, and CFI – the mean dose at the site boundary in 24 hours is greater than 25 rem. The sum of the probabilities of the release categories, including an intact containment excess leakage category, is approximately 2.4×10^{-7} events per year for at power conditions. Therefore, for the CFL, IC, and DIRECT release categories, there is a large margin in both the dose as well as the probability for meeting the Westinghouse design goal of limiting the frequency of exceeding the 25 rem whole-body effective dose equivalent for an individual at the site boundary 24 hours after core damage to 1×10^{-6} events per year, without any emergency protective action. For the other release categories – BP, CI, CFE, and CFI – there is a large margin in the probability for meeting the Westinghouse design goal.

Results in Table 49-7 also show that for the release categories CFL, IC, and DIRECT sensitivity study, the acute red bone marrow dose at the site boundary in 24 hours is less than 1 rem. For all other release categories – BP, CI, CFE, and CFI – the mean dose at the site boundary in 24 hours is greater than 25 rem. Again, the sum of the probabilities of the release categories including an intact containment excess leakage category is approximately 2.4×10^{-7} events per year for at power conditions. Therefore, for the CFL, IC, and DIRECT release categories, there is a large margin in both the dose as well as the probability for meeting the Westinghouse design goal of limiting the frequency of exceeding the 25 rem whole-body effective dose equivalent for an individual at the site boundary 24 hours after core damage to 1×10^{-6} events per year, without any emergency protective action. For the other release categories – BP, CI, CFE, and CFI – there is a large margin in the probability for meeting the Westinghouse design goal.

49.6 Quantification of Site Risk

This section documents the calculation of total radiation dose risk at the site boundary and to the surrounding population for internal, at power, initiating events. Results are quantified based on both a 24-hour and a 72-hour exposure.

The dose risks are quantified by multiplying the calculated fission product release category frequency vector by the release category mean dose vectors. The frequencies for each of the six release categories are quantified in Chapter 45, while the mean doses for each release category are identified in this section. The total dose risk for each case is calculated as:

$$D_n = \Sigma_i (R_i \times d_{i,n})$$

where:

D_n = Total dose risk for case n=1,2,3,4 (site-24-hr, site-72-hr, population-24-hr, population-72-hr),
R_i = Release frequency for category i,
$d_{i,n}$ = mean dose for release category i for case n.

As previously described, the six release categories analyzed in this calculation are designated: IC, BP, CI, CFI, CFE, and CFL.

Tables 49-8 through 49-11 present the results of the dose risk calculations. Each table presents the release category identifier, the release frequency (per reactor-year), the mean dose (in rem), and the resulting risk (in rem per reactor-year). In addition, each table presents the total dose risk and the percent that each release category contributes to the total risk.

It is shown that release category CFE presents the largest risk to the site safety in each of the four presented cases.

49.7 Risk Quantification Results

The complementary cumulative distribution function (CCDF) probabilities presented in Figures 49-1 through 49-56 are based on the assumption that the respective release category has occurred. The actual dose probability is equal to the probability of the release multiplied by the CCDF probability. Figure 49-57 summarizes this calculation for the 24 hour, whole-body, site boundary dose for all release categories, excluding the sensitivity study. Figure 49-58 summarizes this calculation for the 24 hour, acute red bone marrow, site boundary dose for all release categories, excluding the sensitivity study. In addition, a total probability-dose curve, which sums all the release categories, is provided. This figure demonstrates compliance with the large release goal (24 hour, whole-body, site boundary dose greater than 25 REM has a frequency of less than 1×10^{-6}).

49.8 References

49-1 "Advanced Light Water Reactor Utility Requirements Document," Volume III, Appendix A to Chapter 1, PRA Key Assumptions and Groundrules," EPRI, Rev. 5 & 6, December 1993.

49-2 Chanin, D., Young, M. L., "Code Manual for MACCS2, User's Guide," NUREG/CR-6613, SAND97-0594, Vol. 1, Sandia National Laboratories, U.S. Nuclear Regulatory Commission.

49-3 "PRA Procedures Guide," NUREG/CR-2300, U.S. Nuclear Regulatory Commission, Vol. 2, Chapter 9, Washington, D.C.

Table 49-1

AP1000 SOURCE TERMS FROM LEVEL 2 ANALYSIS (MAAP)

Case No.	Plume No.	Start Time (Seconds)	End Time (Seconds)	Duration (Seconds)	Release Fraction (MAAP Group) 1 Inert	2 CsI	3 TeO2	4 SrO	5 MoO2	6 CsOH	7 BaO	8 La2O3	9 CeO2	10 Sb	11 Te2	12 UO2	Plume Energy (Joules/sec) (Watts)	Plume Position
CFI	1	2924	32590	29666	5.40E-01	3.19E-03	4.83E-03	2.11E-02	9.11E-03	3.18E-03	1.62E-02	3.53E-03	6.61E-03	6.92E-03	0.00E+00	0.00E+00	0.00E+00	Leading
	2	32590	86420	53830	2.58E-01	1.35E-04	1.45E-04	6.50E-04	1.68E-04	1.35E-04	3.40E-04	4.53E-03	4.19E-03	2.77E-04	0.00E+00	0.00E+00	0.00E+00	Midpoint
	3	86420	172800	86380	8.40E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E-03	5.44E-03	7.40E-05	0.00E+00	0.00E+00	0.00E+00	Midpoint
	4	172800	259200	86400	3.83E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.22E-03	4.74E-03	2.60E-05	0.00E+00	0.00E+00	0.00E+00	Midpoint
CFE	1	3004	19810	16806	4.16E-01	5.53E-02	3.01E-02	3.14E-03	1.16E-02	5.35E-02	4.63E-03	5.57E-05	2.39E-04	2.03E-02	0.00E+00	0.00E+00	0.00E+00	Leading
	2	19810	89970	70160	4.05E-01	1.26E-03	1.48E-03	3.43E-04	2.58E-03	1.20E-03	6.45E-04	9.66E-06	1.14E-05	2.66E-03	0.00E+00	0.00E+00	0.00E+00	Leading
	3	89970	176300	86330	1.08E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	Midpoint
	4	176300	262700	86400	3.43E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-05	0.00E+00	0.00E+00	0.00E+00	Midpoint
DIRECT	1	4378	84810	80432	2.95E-03	3.61E-05	2.86E-05	3.22E-05	3.94E-05	3.44E-05	3.61E-05	4.04E-06	4.39E-06	3.99E-05	0.00E+00	0.00E+00	0.00E+00	Midpoint
	2	84810	134400	49590	1.48E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.80E-08	2.40E-08	2.40E-07	0.00E+00	0.00E+00	0.00E+00	Leading
	3	134400	177600	43200	1.18E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E-08	0.00E+00	0.00E+00	0.00E+00	Midpoint
	4	177600	264000	86400	2.32E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.00E-08	0.00E+00	0.00E+00	0.00E+00	Midpoint
IC	1	4378	84810	80432	9.83E-04	1.20E-05	9.53E-06	1.07E-05	1.31E-05	1.15E-05	1.20E-05	1.35E-06	1.46E-06	1.33E-05	0.00E+00	0.00E+00	0.00E+00	Midpoint
	2	84810	134400	49590	4.93E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.00E-09	8.00E-09	8.00E-08	0.00E+00	0.00E+00	0.00E+00	Leading
	3	134400	177600	43200	3.94E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-08	0.00E+00	0.00E+00	0.00E+00	Midpoint
	4	177600	264000	86400	7.72E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-08	0.00E+00	0.00E+00	0.00E+00	Midpoint
BP	1	31890	46440	14550	1.00E+00	1.69E-01	2.46E-01	3.57E-03	4.48E-02	1.61E-01	8.93E-03	1.30E-04	7.99E-04	1.04E-01	0.00E+00	0.00E+00	0.00E+00	Midpoint
	2	46440	86490	40050	0.00E+00	4.64E-02	6.70E-03	0.00E+00	0.00E+00	3.21E-02	2.00E-06	0.00E+00	0.00E+00	5.17E-02	0.00E+00	0.00E+00	0.00E+00	Leading
	3	86490	172800	86310	0.00E+00	2.31E-01	3.40E-03	0.00E+00	0.00E+00	4.41E-02	0.00E+00	0.00E+00	0.00E+00	8.80E-02	0.00E+00	0.00E+00	0.00E+00	Leading
	4	172800	259200	86400	0.00E+00	2.80E-03	4.00E-04	0.00E+00	0.00E+00	1.09E-02	1.00E-06	0.00E+00	0.00E+00	2.59E-02	0.00E+00	0.00E+00	0.00E+00	Midpoint
CI	1	101	50020	49919	5.73E-01	4.56E-02	2.12E-02	2.03E-02	4.04E-02	1.78E-02	3.16E-02	2.39E-04	7.42E-04	2.71E-02	0.00E+00	0.00E+00	0.00E+00	Midpoint
	2	50020	136400	86380	1.13E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-07	0.00E+00	1.90E-04	0.00E+00	0.00E+00	0.00E+00	Midpoint
	3	136400	211700	75300	5.66E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.34E-03	0.00E+00	0.00E+00	0.00E+00	Midpoint
	4	211700	259600	47900	2.74E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-04	0.00E+00	0.00E+00	0.00E+00	Midpoint
CFL	1	2922	26360	23438	3.36E-04	1.20E-05	8.51E-06	1.57E-05	1.68E-05	1.15E-05	1.61E-05	9.96E-07	1.85E-06	1.66E-05	0.00E+00	0.00E+00	0.00E+00	Midpoint
	2	26360	108000	81640	1.19E-03	5.00E-08	2.60E-08	1.04E-06	2.90E-07	3.00E-08	6.60E-07	1.07E-05	1.01E-05	2.90E-07	0.00E+00	0.00E+00	0.00E+00	Midpoint
	3	108000	194400	86400	9.79E-01	2.13E-05	4.20E-08	2.39E-03	1.26E-03	1.03E-05	2.25E-03	9.75E-02	9.21E-02	4.09E-04	0.00E+00	0.00E+00	0.00E+00	Midpoint
	4	194400	259200	64800	0.00E+00	0.00E+00	0.00E+00	4.42E-04	1.55E-04	2.90E-07	3.46E-04	4.39E-02	4.15E-02	1.98E-04	0.00E+00	0.00E+00	0.00E+00	Midpoint

Table 49-2

AP1000 SOURCE TERMS FOR DOSE EVALUATION (MACCS2)

Case No.	Plume No.	Start Time (Seconds)	End Time (Seconds)	Duration (Seconds)	Release Fraction (MACCS2 Group) 1 Inert	2 I	3 Cs	4 Te/Sb	5 Sr	6 Ru	7 La	8 Ce	9 Ba	Plume Energy Joules/sec (Watts)	Plume Position
CFI	1	2924	32590	29666	5.40E-01	3.19E-03	3.18E-03	4.18E-04	2.11E-02	9.11E-03	3.53E-03	2.64E-05	1.62E-02	0.00E+00	Leading
	2	32590	86420	53830	2.58E-01	1.35E-04	1.35E-04	1.67E-05	6.50E-04	1.68E-04	4.53E-03	1.68E-05	3.40E-04	0.00E+00	Midpoint
	3	86420	172800	86380	8.40E-02	0.00E+00	0.00E+00	4.47E-06	0.00E+00	0.00E+00	6.00E-03	2.17E-05	0.00E+00	0.00E+00	Midpoint
	4	172800	259200	86400	3.83E-02	0.00E+00	0.00E+00	1.57E-06	0.00E+00	0.00E+00	5.22E-03	1.89E-05	0.00E+00	0.00E+00	Midpoint
CFE	1	3004	19810	16806	4.16E-01	5.53E-02	5.37E-02	1.23E-03	3.14E-03	1.16E-02	5.57E-05	9.54E-07	4.63E-03	0.00E+00	Leading
	2	19810	89970	70160	4.05E-01	1.26E-03	1.21E-03	1.61E-04	3.43E-04	2.58E-03	9.66E-06	4.56E-08	6.45E-04	0.00E+00	Leading
	3	89970	176300	86330	1.08E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	Midpoint
	4	176300	262700	86400	3.43E-02	0.00E+00	0.00E+00	6.04E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	Midpoint
DIRECT	1	4378	84810	80432	2.95E-03	3.61E-05	3.46E-05	2.41E-06	3.22E-05	3.94E-05	4.04E-06	1.75E-08	3.61E-05	0.00E+00	Midpoint
	2	84810	134400	49590	1.48E-03	0.00E+00	0.00E+00	1.45E-08	0.00E+00	0.00E+00	1.80E-08	9.59E-11	0.00E+00	0.00E+00	Leading
	3	134400	177600	43200	1.18E-03	0.00E+00	0.00E+00	3.63E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	Midpoint
	4	177600	264000	86400	2.32E-03	0.00E+00	0.00E+00	1.81E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	Midpoint
IC	1	4378	84810	80432	9.83E-04	1.20E-05	1.15E-05	8.04E-07	1.07E-05	1.31E-05	1.35E-06	5.85E-09	1.20E-05	0.00E+00	Midpoint
	2	84810	134400	49590	4.93E-04	0.00E+00	0.00E+00	4.83E-09	0.00E+00	0.00E+00	6.00E-09	3.20E-11	0.00E+00	0.00E+00	Leading
	3	134400	177600	43200	3.94E-04	0.00E+00	0.00E+00	1.21E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	Midpoint
	4	177600	264000	86400	7.72E-04	0.00E+00	0.00E+00	6.04E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	Midpoint
BP	1	31890	46440	14550	1.00E+00	1.69E-01	1.62E-01	6.27E-03	3.57E-03	4.48E-02	1.30E-04	3.19E-06	8.93E-03	0.00E+00	Midpoint
	2	46440	86490	40050	0.00E+00	4.64E-02	3.38E-02	3.12E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-06	0.00E+00	Leading
	3	86490	172800	86310	0.00E+00	2.31E-01	6.60E-02	5.32E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	Leading
	4	172800	259200	86400	0.00E+00	2.80E-03	9.96E-03	1.57E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-06	0.00E+00	Midpoint
CI	1	100.8	50020	49919.2	5.73E-01	4.56E-02	2.10E-02	1.64E-03	2.03E-02	4.04E-02	2.39E-04	2.97E-06	3.16E-02	0.00E+00	Midpoint
	2	50020	136400	86380	1.13E-01	0.00E+00	0.00E+00	1.15E-05	0.00E+00	0.00E+00	1.00E-07	0.00E+00	0.00E+00	0.00E+00	Midpoint
	3	136400	211700	75300	5.66E-02	0.00E+00	0.00E+00	8.10E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	Midpoint
	4	211700	259600	47900	2.74E-02	0.00E+00	0.00E+00	1.27E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	Midpoint
CFL	1	2922	26360	23438	3.36E-04	1.20E-05	1.15E-05	1.00E-06	1.57E-05	1.68E-05	9.96E-07	7.41E-09	1.61E-05	0.00E+00	Midpoint
	2	26360	108000	81640	1.19E-03	5.00E-08	3.23E-08	1.75E-08	1.04E-06	2.90E-07	1.07E-05	4.05E-08	6.60E-07	0.00E+00	Midpoint
	3	108000	194400	86400	9.79E-01	2.13E-05	1.16E-05	2.47E-05	2.39E-03	1.26E-03	9.75E-02	3.68E-04	2.25E-03	0.00E+00	Midpoint
	4	194400	259200	64800	0.00E+00	0.00E+00	2.56E-07	1.20E-05	4.42E-04	1.55E-04	4.39E-02	1.66E-04	3.46E-04	0.00E+00	Midpoint

Table 49-3

SITE BOUNDARY WHOLE BODY DOSE [EFFECTIVE DOSE EQUIVALENT (EDE)], SIEVERTS

24-hour Case Source Term	Quantiles						Peak Consequence
	Mean	50th	90th	95th	99th	99.5th	
CFI	2.59E+01	1.71E+01	7.33E+01	8.07E+01	NOT-FOUND	NOT-FOUND	8.48E+01
CFE	4.23E+01	2.22E+01	1.03E+02	1.35E+02	NOT-FOUND	NOT-FOUND	1.55E+02
DIRECT	5.48E-02	3.37E-02	1.36E-01	1.77E-01	NOT-FOUND	NOT-FOUND	2.37E-01
IC	1.82E-02	1.08E-02	4.84E-02	6.24E-02	NOT-FOUND	NOT-FOUND	7.89E-02
BP	1.37E+02	9.21E+01	3.17E+02	4.12E+02	NOT-FOUND	NOT-FOUND	4.72E+01
CI	5.10E+01	3.53E+01	1.24E+02	1.55E+02	NOT-FOUND	NOT-FOUND	2.27E+02
CFL	3.84E-02	3.08E-02	8.70E-02	1.01E-01	1.06E-01	1.08E-01	1.17E-01
72-hour Case Source Term	**Quantiles**						**Peak Consequence**
	Mean	**50th**	**90th**	**95th**	**99th**	**99.5th**	
CFI	3.72E+01	3.16E+01	7.65E+01	9.13E+01	NOT-FOUND	NOT-FOUND	1.01E+02
CFE	4.60E+01	2.31E+01	1.16E+02	1.47E+02	NOT-FOUND	NOT-FOUND	1.67E+02
DIRECT	5.84E-02	3.54E-02	1.63E-01	2.03E-01	2.15E-01	2.21E-01	2.50E-01
IC	1.94E-02	1.11E-02	5.07E-02	6.31E-02	7.29E-02	7.45E-02	8.30E-02
BP	1.84E+02	1.39E+02	3.68E+02	4.80E+02	NOT-FOUND	NOT-FOUND	5.31E+02
CI	5.40E+01	3.75E+01	1.39E+02	1.89E+02	NOT-FOUND	NOT-FOUND	2.38E+02
CFL	1.33E+02	8.42E+01	3.32E+02	4.02E+02	NOT-FOUND	NOT-FOUND	4.42E+02

Table 49-4

SITE BOUNDARY THYROID DOSE, SIEVERTS

24-hour Case Source Term	Quantiles						Peak Consequence
	Mean	50th	90th	95th	99th	99.5th	
CFI	2.22E+01	1.24E+01	7.03E+01	7.50E+01	NOT-FOUND	NOT-FOUND	7.75E+01
CFE	3.59E+02	2.02E+02	1.01E+03	1.18E+03	NOT-FOUND	NOT-FOUND	1.28E+03
DIRECT	1.34E-01	8.58E-02	3.55E-01	4.48E-01	NOT-FOUND	NOT-FOUND	5.23E-01
IC	4.47E-02	3.08E-02	1.20E-01	1.54E-01	NOT-FOUND	NOT-FOUND	1.74E-01
BP	1.56E+03	1.18E+03	3.14E+03	3.89E+03	NOT-FOUND	NOT-FOUND	4.35E+03
CI	1.82E+02	1.23E+02	4.58E+02	5.74E+02	NOT-FOUND	NOT-FOUND	7.30E+02
CFL	7.28E-02	5.22E-02	1.47E-01	1.81E-01	2.09E-01	2.14E-01	2.38E-01
72-hour Case Source Term	**Quantiles**						**Peak Consequence**
	Mean	**50th**	**90th**	**95th**	**99th**	**99.5th**	
CFI	2.47E+01	1.43E+01	7.07E+01	7.92E+01	NOT-FOUND	NOT-FOUND	8.39E+01
CFE	3.81E+02	2.11E+02	1.02E+03	1.23E+03	NOT-FOUND	NOT-FOUND	1.36E+03
DIRECT	1.50E-01	1.03E-01	4.10E-01	5.39E-01	NOT-FOUND	NOT-FOUND	5.79E-01
IC	4.97E-02	3.38E-02	1.25E-01	1.67E-01	NOT-FOUND	NOT-FOUND	1.92E-01
BP	2.36E+03	2.22E+03	4.43E+03	5.09E+03	NOT-FOUND	NOT-FOUND	2.89E+02
CI	1.98E+02	1.40E+02	4.70E+02	5.79E+02	NOT-FOUND	NOT-FOUND	7.90E+02
CFL	7.72E+00	4.67E+00	1.97E+01	2.28E+01	NOT-FOUND	NOT-FOUND	2.43E+01

Table 49-5

POPULATION WHOLE BODY DOSE [EFFECTIVE DOSE EQUIVALENT (EDE)], 0-80.5 KM PERSON-SIEVERTS

24-hour Case Source Term	Quantiles						Peak Consequence
	Mean	50th	90th	95th	99th	99.5th	
CFI	7.03E+03	5.33E+03	1.31E+04	1.82E+04	3.11E+04	3.59E+04	5.07E+04
CFE	8.51E+03	6.25E+03	1.62E+04	2.31E+04	4.13E+04	5.06E+04	6.40E+04
DIRECT	2.16E+01	1.20E+01	4.78E+01	8.13E+01	1.14E+02	1.23E+02	1.68E+02
IC	7.19E+00	4.21E+00	1.71E+01	2.95E+01	3.56E+01	3.84E+01	5.60E+01
BP	3.23E+04	2.10E+04	6.40E+04	1.03E+05	1.54E+05	1.82E+05	2.64E+05
CI	2.01E+04	1.13E+04	4.71E+04	6.60E+04	1.23E+05	1.48E+05	1.61E+05
CFL	7.37E+01	1.00E+01	1.62E+02	5.91E+02	9.76E+02	1.11E+03	2.56E+03
72-hour Case Source Term	**Quantiles**						**Peak Consequence**
	Mean	**50th**	**90th**	**95th**	**99th**	**99.5th**	
CFI	1.13E+04	9.02E+03	2.12E+04	2.63E+04	4.09E+04	4.89E+04	6.18E+04
CFE	9.36E+03	6.89E+03	1.89E+04	2.54E+04	4.25E+04	5.12E+04	6.77E+04
DIRECT	2.36E+01	1.35E+01	5.28E+01	8.32E+01	1.15E+02	1.25E+02	1.75E+02
IC	7.87E+00	4.75E+00	1.85E+01	3.00E+01	3.79E+01	4.20E+01	5.83E+01
BP	4.17E+04	2.94E+04	7.99E+04	1.16E+05	2.20E+05	2.61E+05	2.87E+05
CI	2.14E+04	1.25E+04	4.90E+04	7.40E+04	1.27E+05	1.53E+05	1.67E+05
CFL	4.79E+04	3.11E+04	9.57E+04	1.57E+05	2.62E+05	3.01E+05	4.14E+05

Table 49-6

SITE BOUNDARY RED MARROW DOSE (TOTAL ACUTE), SIEVERTS

24-hour Case Source Term	Quantiles						Peak Consequence
	Mean	50th	90th	95th	99th	99.5th	
CFI	3.41E+00	2.14E+00	1.01E+01	1.11E+01	NOT-FOUND	NOT-FOUND	1.17E+01
CFE	7.81E+00	4.83E+00	2.01E+01	2.07E+01	2.22E+01	2.29E+01	2.71E+01
DIRECT	2.47E-03	1.49E-03	6.40E-03	8.69E-03	1.01E-02	1.01E-02	1.03E-02
IC	8.23E-04	5.34E-04	2.09E-03	2.67E-03	3.10E-03	3.15E-03	3.42E-03
BP	1.10E+01	8.47E+00	2.69E+01	3.27E+01	NOT-FOUND	NOT-FOUND	3.49E+01
CI	2.47E+00	1.67E+00	6.13E+00	7.72E+00	1.00E+01	NOT-FOUND	1.00E+01
CFL	2.20E-03	1.70E-03	4.91E-03	5.16E-03	5.58E-03	5.77E-03	6.70E-03
72-hour Case Source Term	**Quantiles**						**Peak Consequence**
	Mean	**50th**	**90th**	**95th**	**99th**	**99.5th**	
CFI	4.48E+00	3.05E+00	1.01E+01	1.09E+01	1.33E+01	1.44E+01	1.86E+01
CFE	1.02E+01	5.68E+00	3.01E+01	3.11E+01	3.36E+01	3.48E+01	4.17E+01
DIRECT	4.48E-03	3.08E-03	1.02E-02	1.09E-02	1.26E-02	1.34E-02	1.80E-02
IC	1.49E-03	1.03E-03	3.58E-03	4.49E-03	5.22E-03	5.34E-03	5.98E-03
BP	2.69E+01	2.44E+01	5.35E+01	5.99E+01	NOT-FOUND	NOT-FOUND	6.35E+01
CI	4.23E+00	3.13E+00	1.01E+01	1.08E+01	1.26E+01	1.34E+01	1.70E+01
CFL	5.11E+00	2.88E+00	1.19E+01	1.46E+01	NOT-FOUND	NOT-FOUND	1.61E+01

Table 49-7

DOSE SUMMARY

	Population Dose (Sieverts)				Site Boundary Whole Body Dose (Sieverts)				Site Boundary Thyroid Dose (Sieverts)				Site Boundary Red Marrow Dose (Sieverts)			
	24-Hour		72-Hour		24-Hour		72-Hour		24-Hour		72-Hour		24-Hour		72-Hour	
	Mean	Peak	Mean	Peak	Mean	Peak	Mean	Peak	Mean	Peak	Mean	Peak	Mean	Peak	Mean	Peak
CFI	7.03E+03	5.07E+04	1.13E+04	6.18E+04	2.59E+01	8.48E+01	3.72E+01	1.01E+02	2.22E+01	7.75E+01	2.47E+01	8.39E+01	3.41E+00	1.17E+01	4.48E+00	1.86E+01
CFE	8.51E+03	6.40E+04	9.36E+03	6.77E+04	4.23E+01	1.55E+02	4.60E+01	1.67E+02	3.59E+02	1.28E+03	3.81E+02	1.36E+03	7.81E+00	2.70E+01	1.02E+01	4.17E+01
DIRECT	2.16E+01	1.68E+02	2.36E+01	1.75E+02	5.48E-02	2.37E-01	5.84E-02	2.50E-01	1.34E-01	5.23E-01	1.50E-01	5.79E-01	2.47E-03	1.03E-02	4.48E-03	1.80E-02
IC	7.19E+00	5.60E+01	7.87E+00	5.83E+01	1.82E-02	7.89E-02	1.94E-02	8.30E-02	4.47E-02	1.74E-01	4.97E-02	1.92E-01	8.23E-04	3.42E-03	1.49E-03	5.98E-03
BP	3.23E+04	2.64E+05	4.17E+04	2.87E+05	1.37E+02	4.72E+02	1.84E+02	5.31E+02	1.56E+03	4.35E+03	2.36E+03	5.19E+03	1.10E+01	3.49E+01	2.69E+01	6.35E+01
CI	2.01E+04	1.61E+05	2.14E+04	1.67E+05	5.10E+01	2.27E+02	5.40E+01	2.38E+02	1.82E+02	7.30E+02	1.98E+02	7.90E+02	2.47E+00	1.00E+01	4.23E+00	1.70E+01
CFL	7.37E+01	2.56E+03	4.79E+04	4.14E+05	3.84E-02	1.17E-01	1.33E+02	4.42E+02	7.28E-02	2.38E-01	7.72E+00	2.43E+01	2.20E-03	6.70E-03	5.11E+00	1.61E+01

Table 49-8

SITE BOUNDARY WHOLE BODY EDE DOSE RISK – 24 HOURS

Release Category	Release Frequency (/Reactor Year)	Mean Dose (Sieverts)	Dose (REM)	Risk (REM/Reactor Year)	Percentage Contribution to Total Risk
CFI	1.89E-10	2.59E+01	2.59E+03	4.90E-07	0.3
CFE	7.47E-09	4.23E+01	4.23E+03	3.16E-05	17.3
IC	2.21E-07	1.82E-02	1.82E+00	4.02E-07	0.2
BP	1.05E-08	1.37E+02	1.37E+04	1.44E-04	78.6
CI	1.33E-09	5.10E+01	5.10E+03	6.78E-06	3.7
CFL	3.45E-13	3.84E-02	3.84E+00	1.32E-12	0.0
			Total Risk =	1.83E-04	100.0

Table 49-9

SITE BOUNDARY WHOLE BODY EDE DOSE RISK – 72 HOURS

Release Category	Release Frequency (/Reactor Year)	Mean Dose (Sieverts)	Dose (REM)	Risk (REM/Reactor Year)	Percentage Contribution to Total Risk
CFI	1.89E-10	3.72E+01	3.72E+03	7.03E-07	0.3
CFE	7.47E-09	4.60E+01	4.60E+03	3.44E-05	14.6
IC	2.21E-07	1.94E-02	1.94E+00	4.29E-07	0.2
BP	1.05E-08	1.84E+02	1.84E+04	1.93E-04	81.9
CI	1.33E-09	5.40E+01	5.40E+03	7.18E-06	3.0
CFL	3.45E-13	1.33E+02	1.33E+04	4.59E-09	0.0
			Total Risk =	2.36E-04	100.0

Table 49-10

POPULATION WHOLE BODY EDE DOSE RISK – 24 HOURS

Release Category	Release Frequency (/Reactor Year)	Mean Dose (Person-Sieverts)	Dose (Person-REM)	Risk (Person-REM/ Reactor Year)	Percentage Contribution to Total Risk
CFI	1.89E-10	7.03E+03	7.03E+05	1.33E-04	0.3
CFE	7.47E-09	8.51E+03	8.51E+05	6.36E-03	14.7
IC	2.21E-07	7.19E+00	7.19E+02	1.59E-04	0.4
BP	1.05E-08	3.23E+04	3.23E+06	3.39E-02	78.4
CI	1.33E-09	2.01E+04	2.01E+06	2.67E-03	6.2
CFL	3.45E-13	7.37E+01	7.37E+03	2.54E-09	0.0
			Total Risk =	4.32E-02	100.0

Table 49-11

POPULATION WHOLE BODY EDE DOSE RISK – 72 HOURS

Release Category	Release Frequency (/Reactor Year)	Mean Dose (Person-Sieverts)	Dose (Person-REM)	Risk (Person-REM/ Reactor Year)	Percentage Contribution to Total Risk
CFI	1.89E-10	1.13E+04	1.13E+06	2.14E-04	0.4
CFE	7.47E-09	9.36E+03	9.36E+05	6.99E-03	12.9
IC	2.21E-07	7.87E+00	7.87E+02	1.74E-04	0.3
BP	1.05E-08	4.17E+04	4.17E+06	4.38E-02	81.1
CI	1.33E-09	2.14E+04	2.14E+06	2.85E-03	5.3
CFL	3.45E-13	4.79E+04	4.79E+06	1.65E-06	0.0
			Total Risk =	5.40E-02	100.0

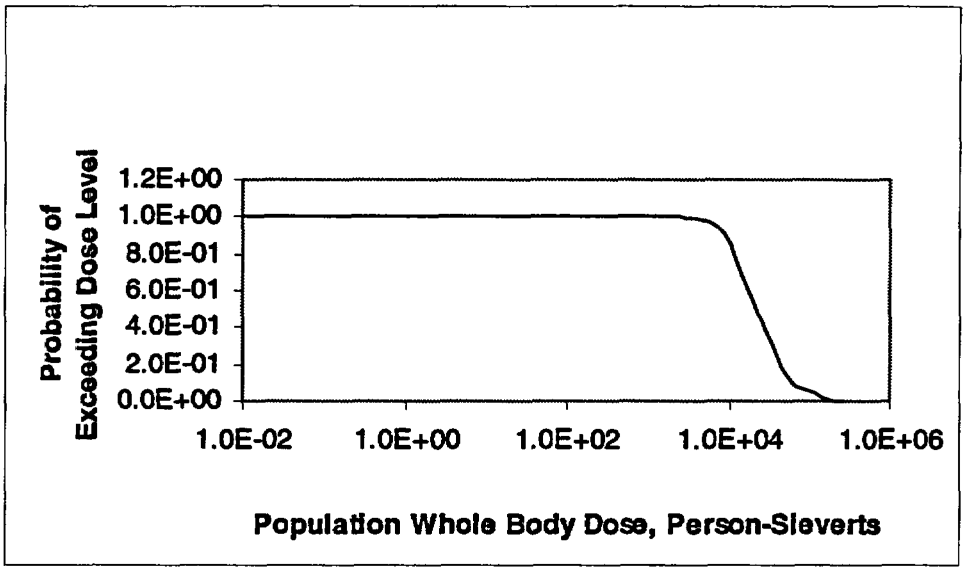

Figure 49-1

Population Whole Body Dose – BP Source Term, 24 Hours

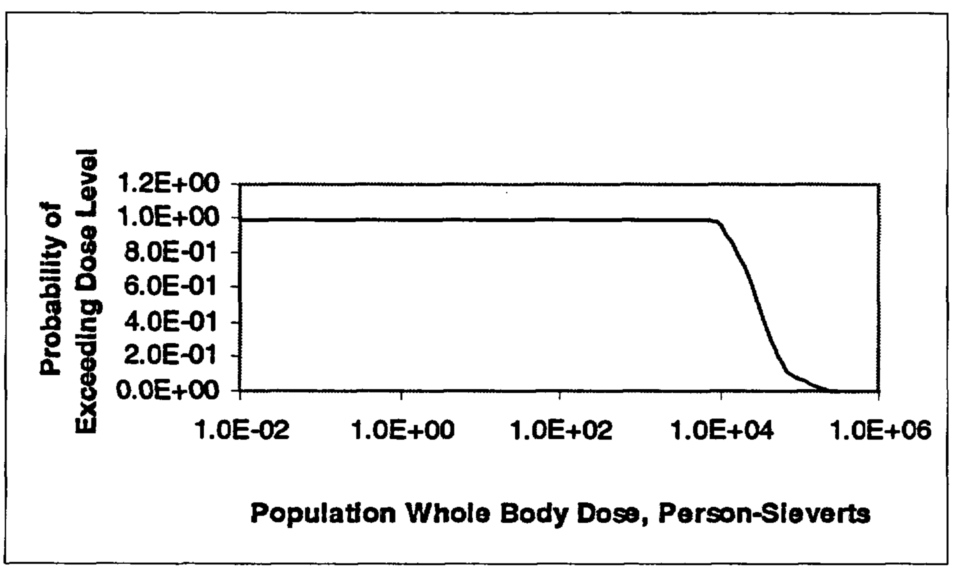

Figure 49-2

Population Whole Body Dose – BP Source Term 72 Hours

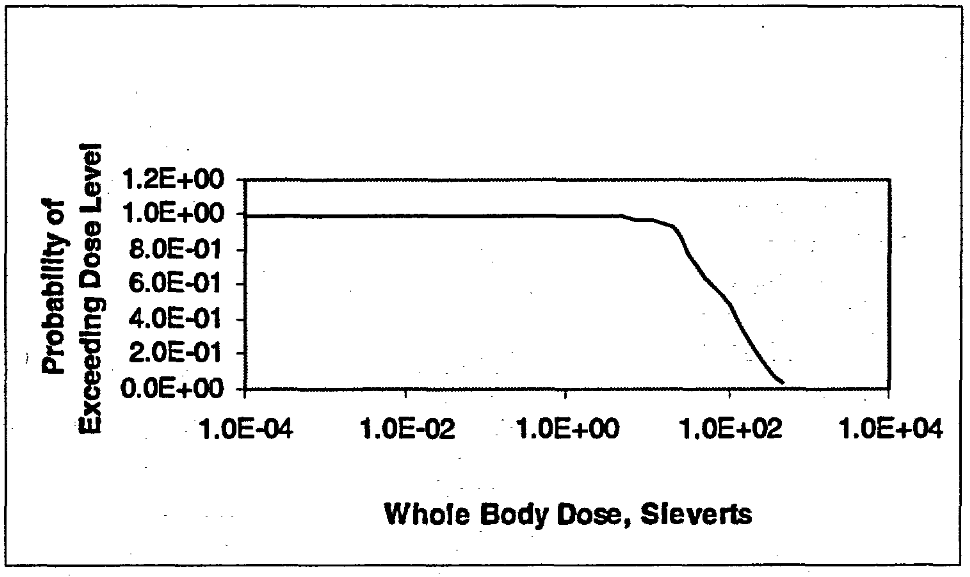

Figure 49-3

Site Boundary Whole Body Dose – BP Source Term, 24 Hours

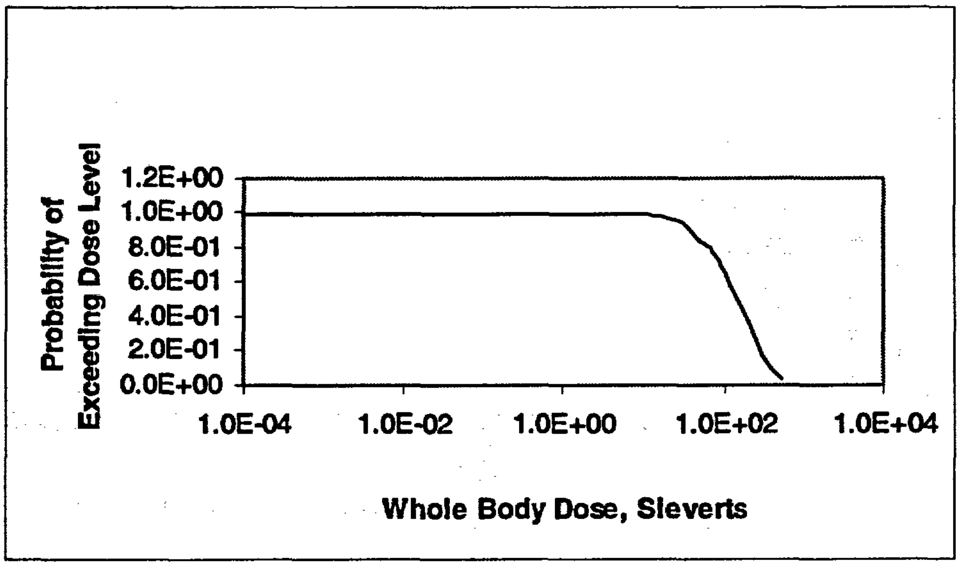

Figure 49-4

Site Boundary Whole Body Dose – BP Source Term, 72 Hours

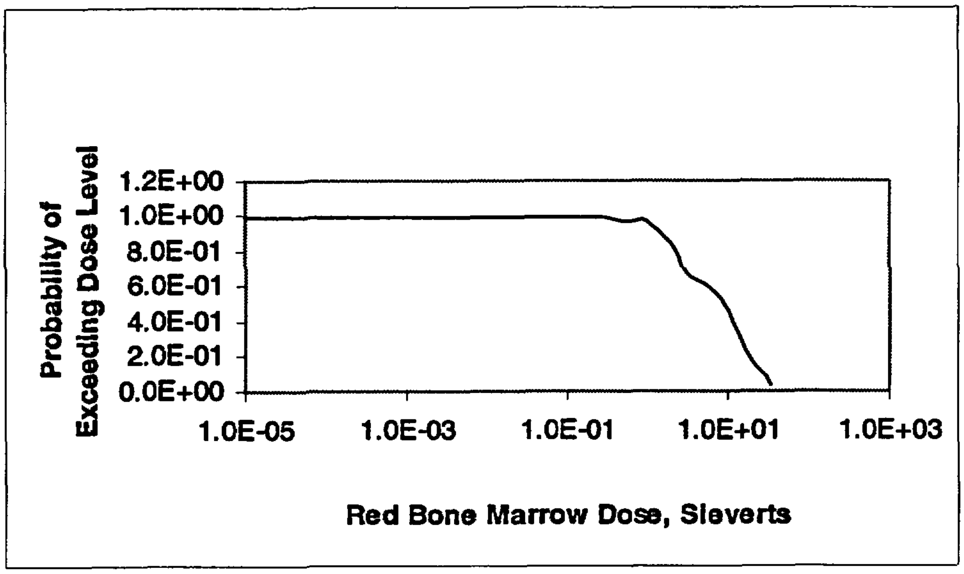

Figure 49-5

Site Boundary Red Bone Marrow Dose – BP Source Term, 24 Hours

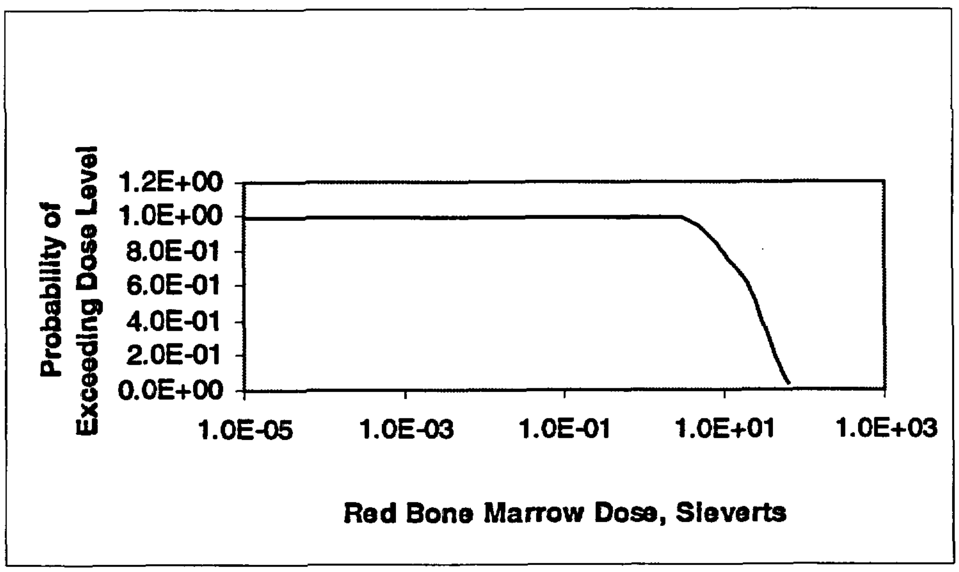

Figure 49-6

Site Boundary Red Bone Marrow Dose – BP Source Term, 72 Hours

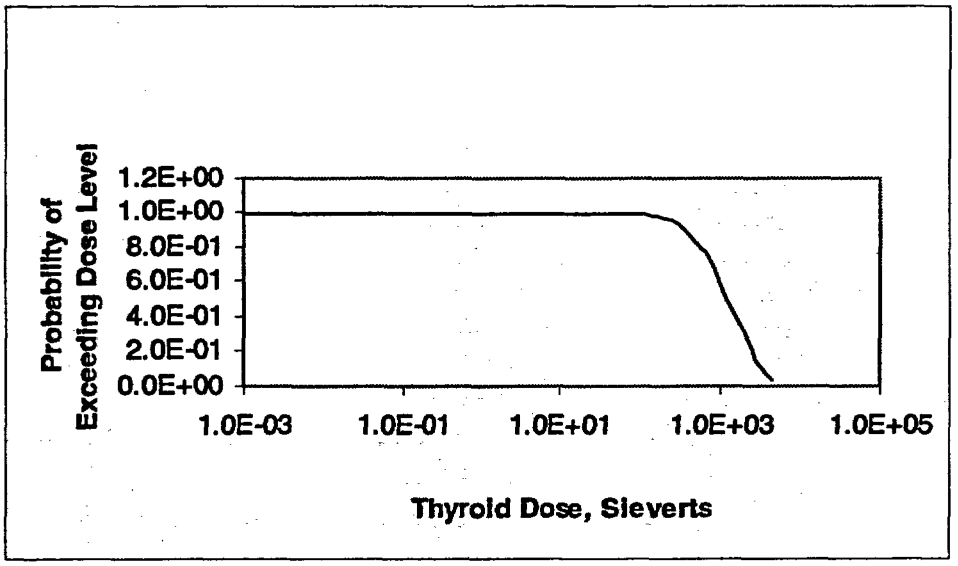

Figure 49-7

Site Boundary Thyroid Dose – BP Source Term, 24 Hours

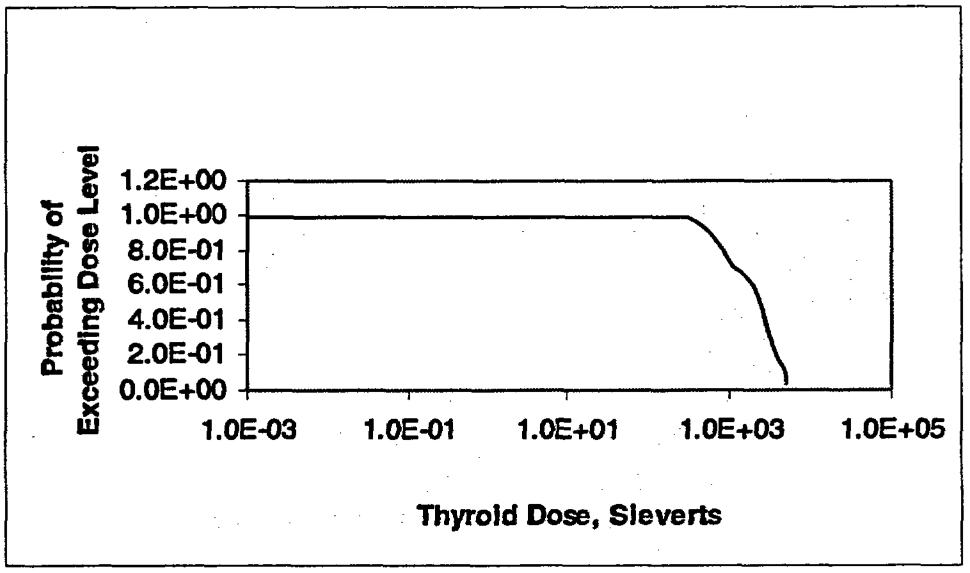

Figure 49-8

Site Boundary Thyroid Dose – BP Source Term, 72 Hours

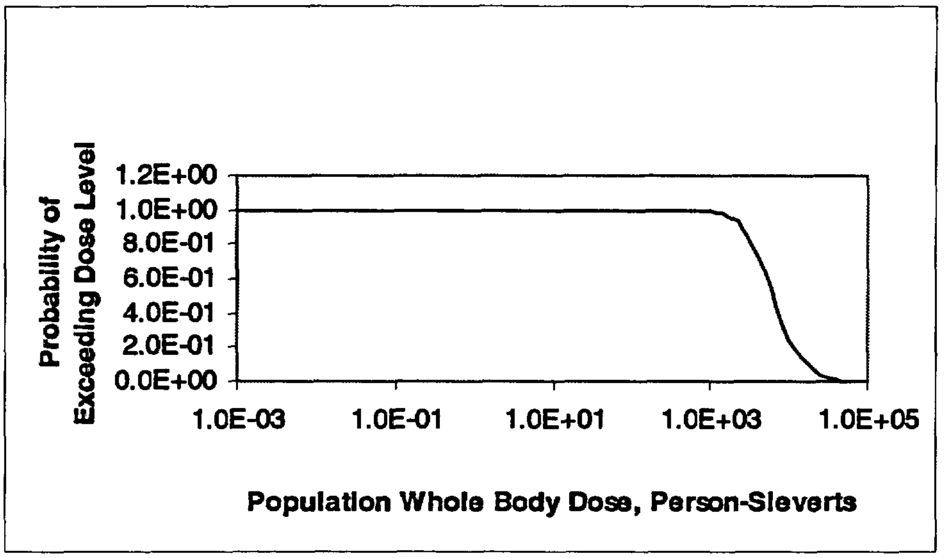

Figure 49-9

Population Whole Body Dose – CFE Source Term, 24 Hours

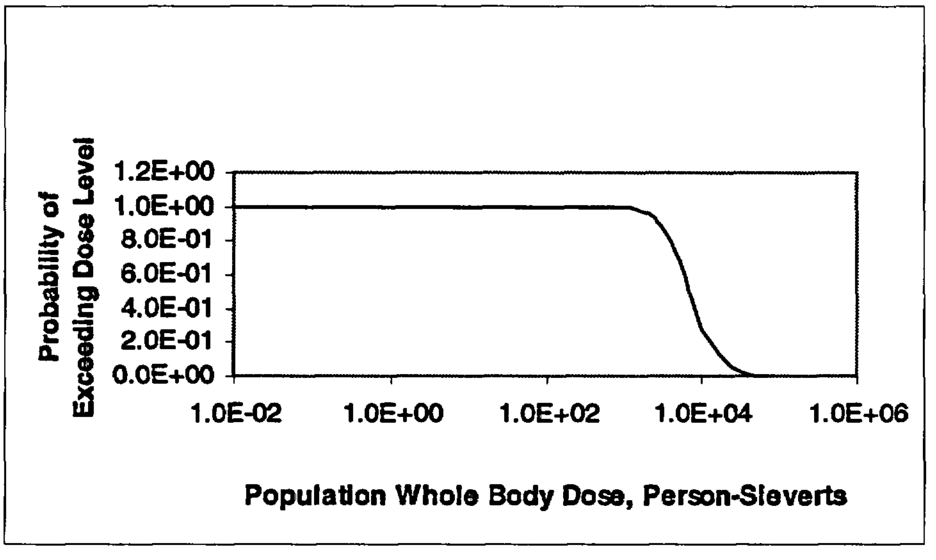

Figure 49-10

Population Whole Body Dose – CFE Source Term, 72 Hours

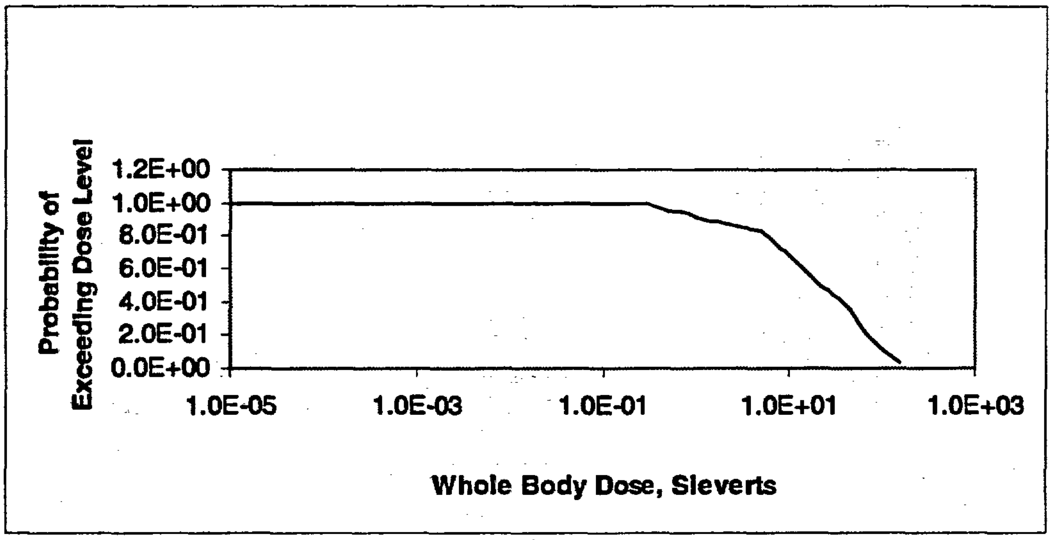

Figure 49-11

Site Boundary Whole Body Dose – CFE Source Term, 24 Hours

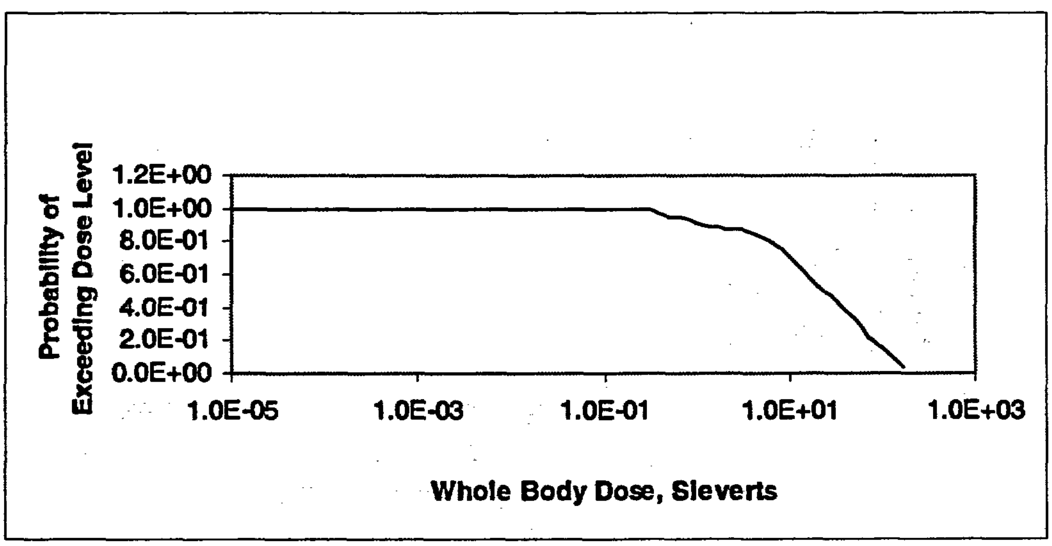

Figure 49-12

Site Boundary Whole Body Dose – CFE Source Term, 72 Hours

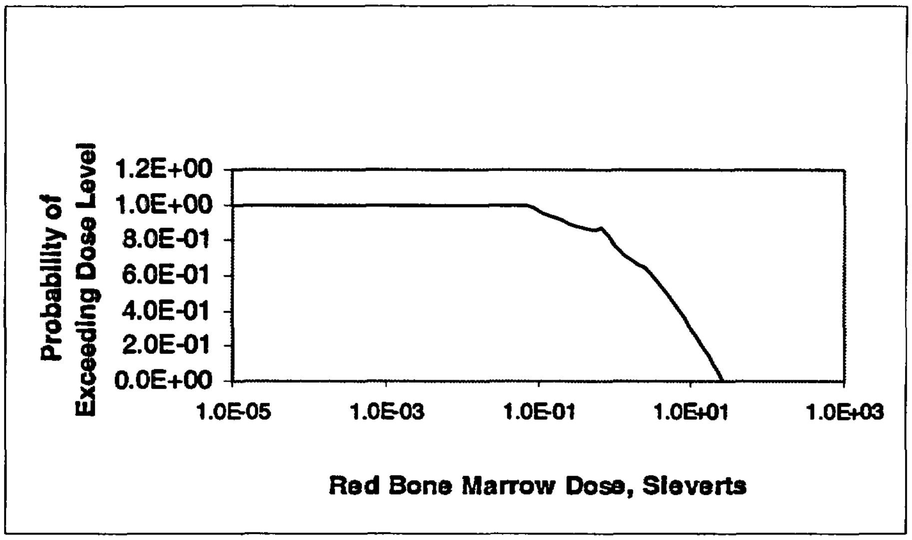

Figure 49-13

Site Boundary Red Bone Marrow Dose – CFE Source Term, 24 Hours

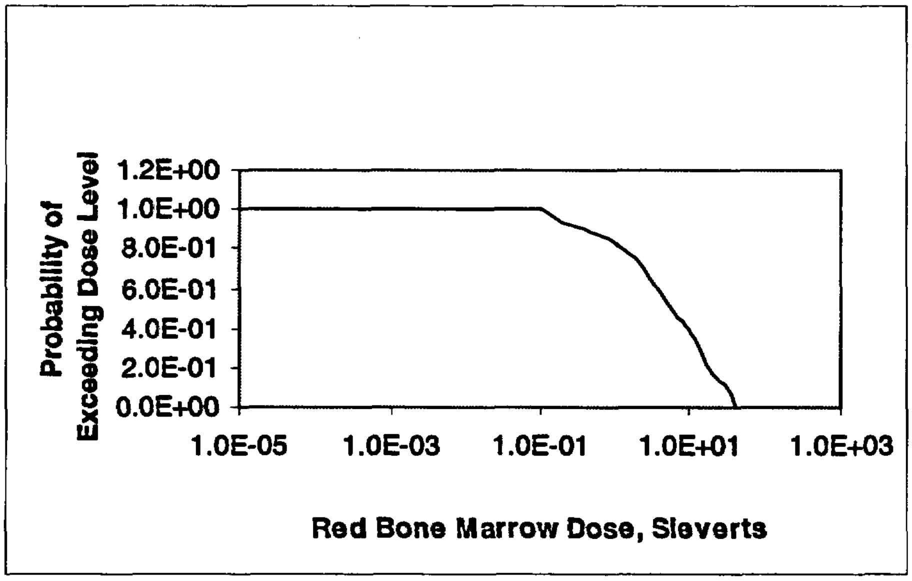

Figure 49-14

Site Boundary Red Bone Marrow Dose – CFE Source Term, 72 Hours

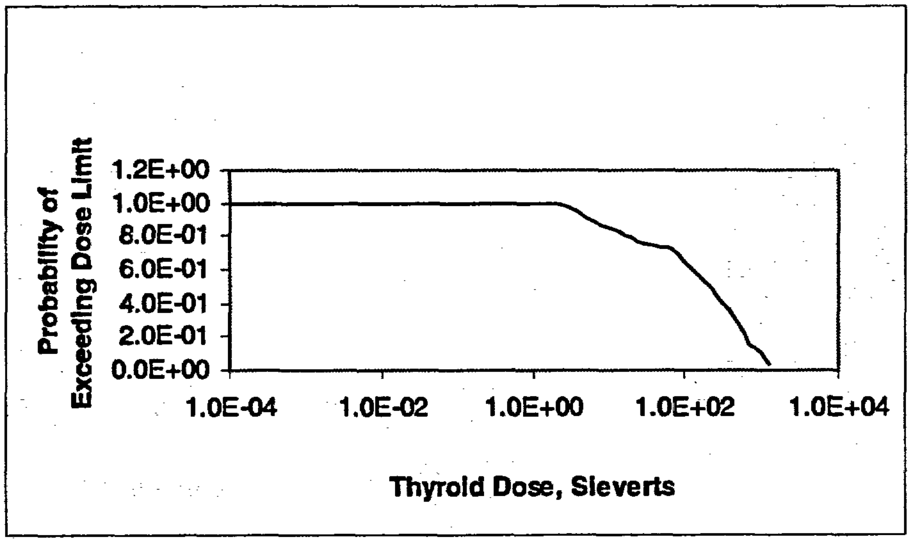

Figure 49-15

Site Boundary Thyroid Dose – CFE Source Term, 24 Hours

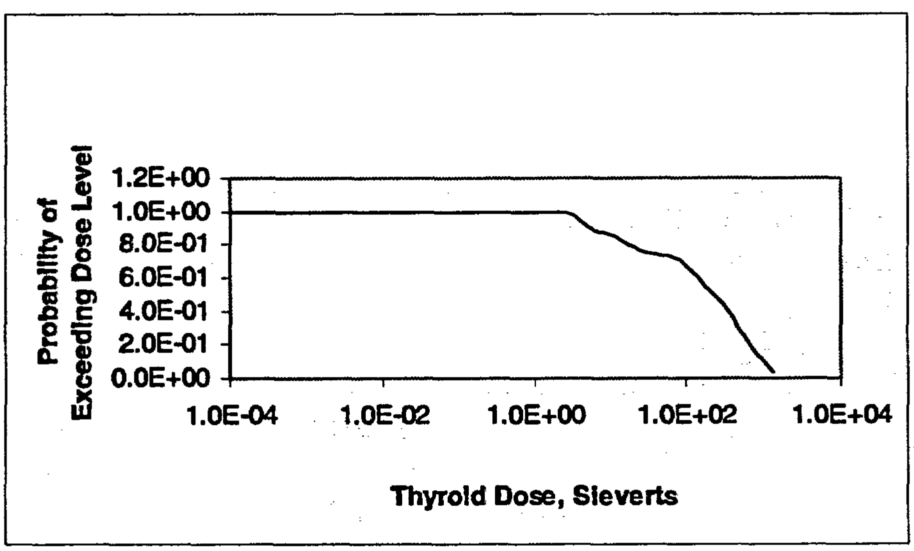

Figure 49-16

Site Boundary Thyroid Dose – CFE Source Term, 72 Hours

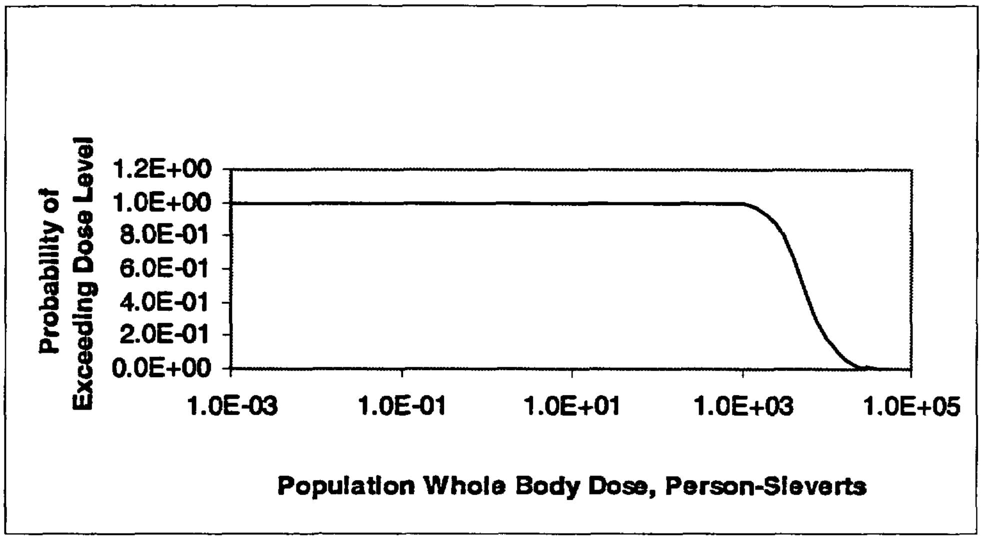

Figure 49-17

Population Whole Body Dose – CFI Source Term, 24 Hours

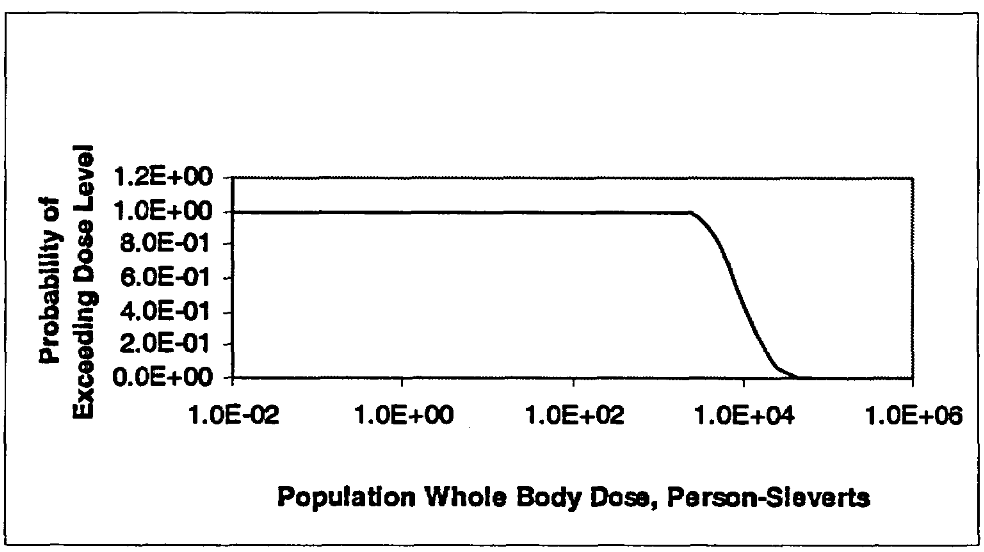

Figure 49-18

Population Whole Body Dose – CFI Source Term, 72 Hours

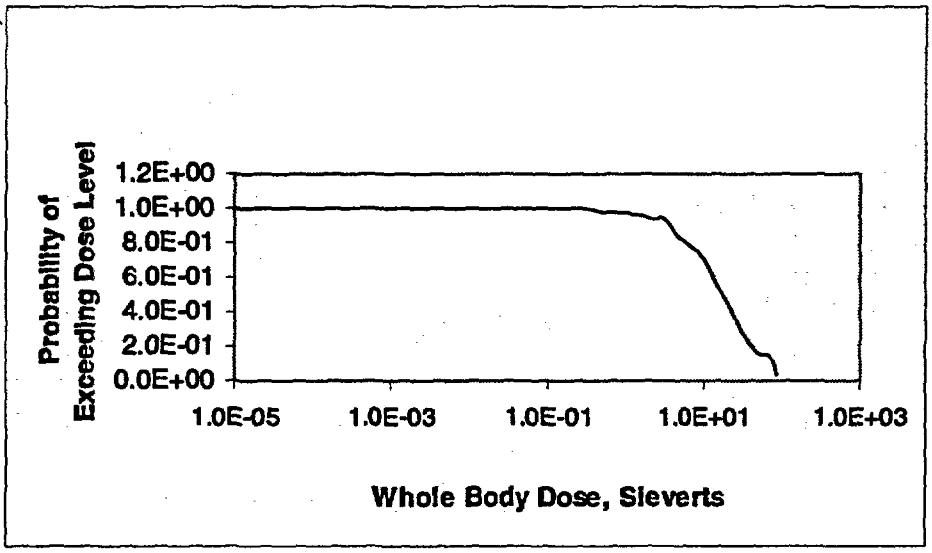

Figure 49-19

Site Boundary Whole Body Dose – CFI Source Term, 24 Hours

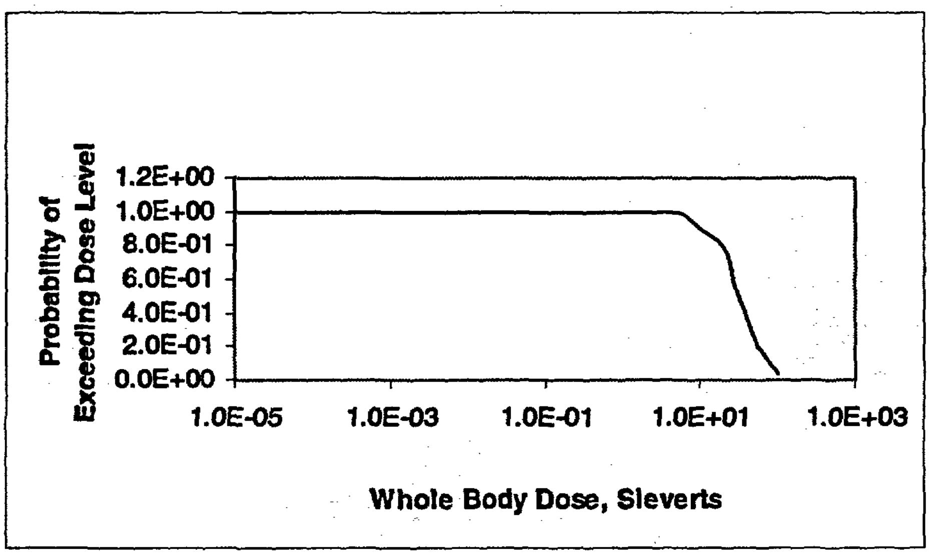

Figure 49-20

Site Boundary Whole Body Dose – CFI Source Term, 72 Hours

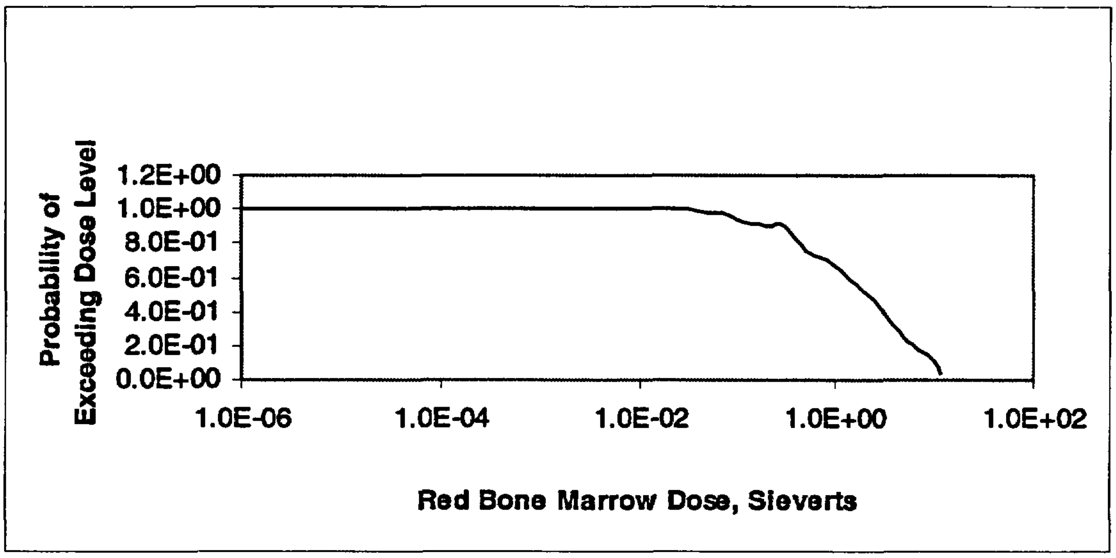

Figure 49-21

Site Boundary Red Bone Marrow Dose – CFI Source Term, 24 Hours

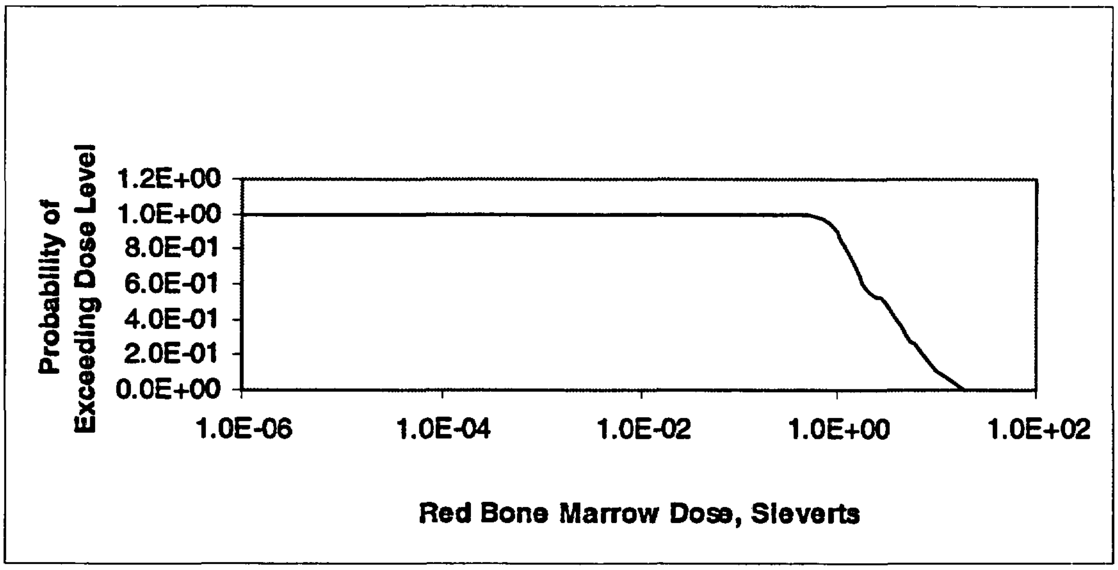

Figure 49-22

Site Boundary Red Bone Marrow Dose – CFI Source Term, 72 Hours

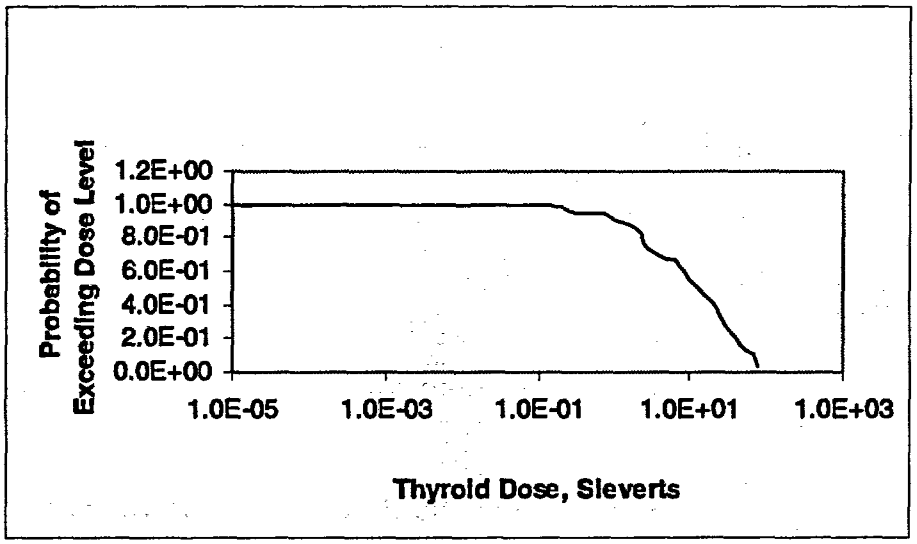

Figure 49-23

Site Boundary Thyroid Dose – CFI Source Term, 24 Hours

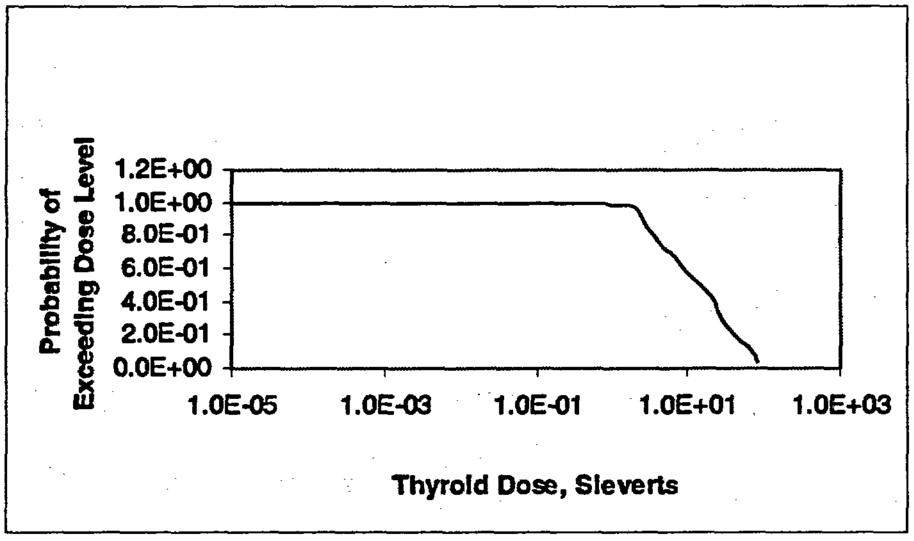

Figure 49-24

Site Boundary Thyroid Dose – CFI Source Term, 72 Hours

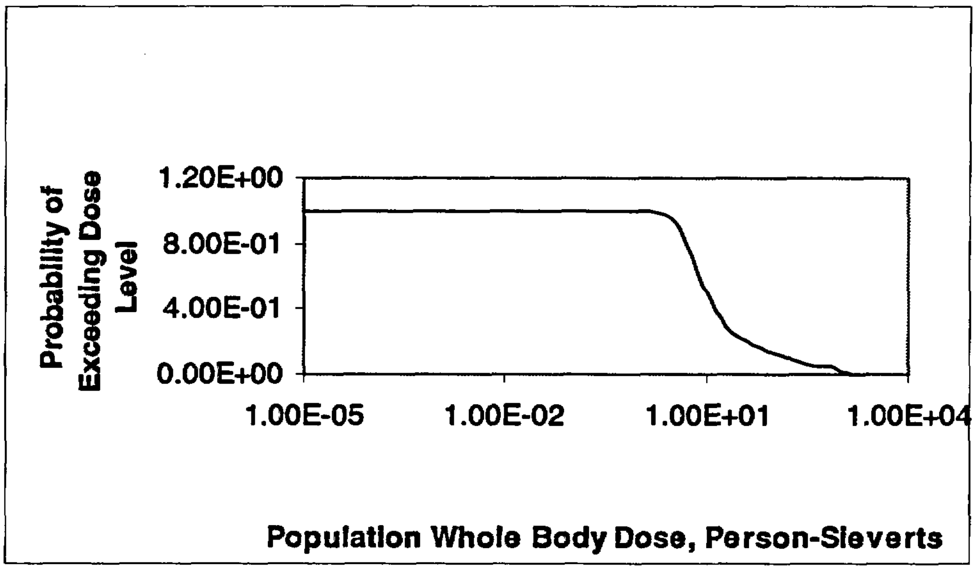

Figure 49-25

Population Whole Body Dose – CFL Source Term, 24 Hours

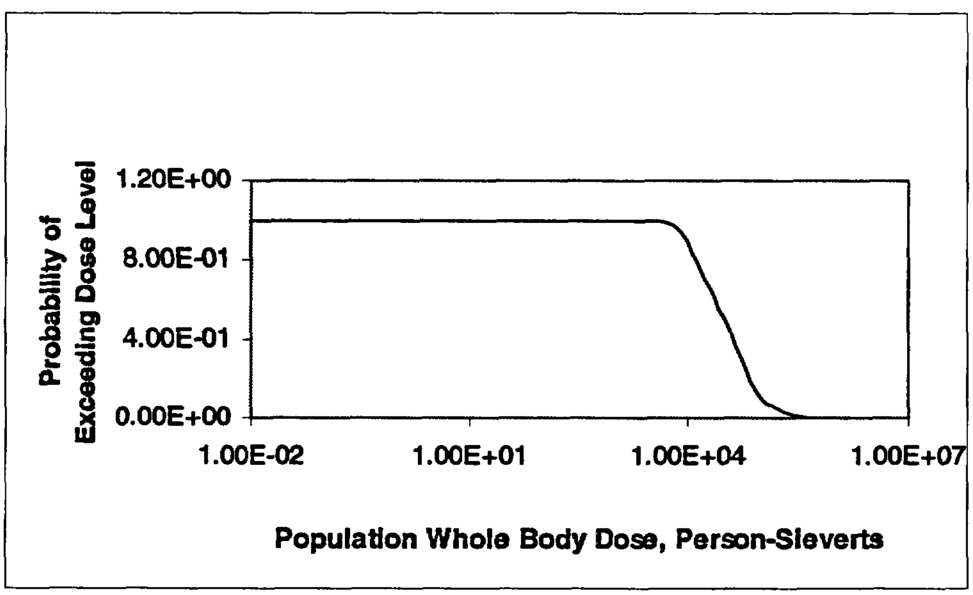

Figure 49-26

Population Whole Body Dose – CFL Source Term, 72 Hours

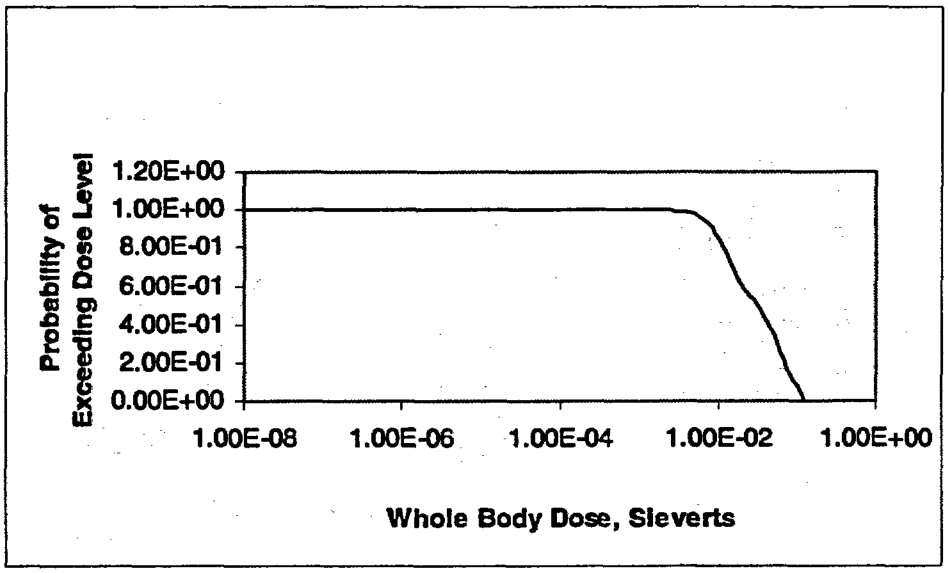

Figure 49-27

Site Boundary Whole Body Dose – CFL Source Term, 24 Hours

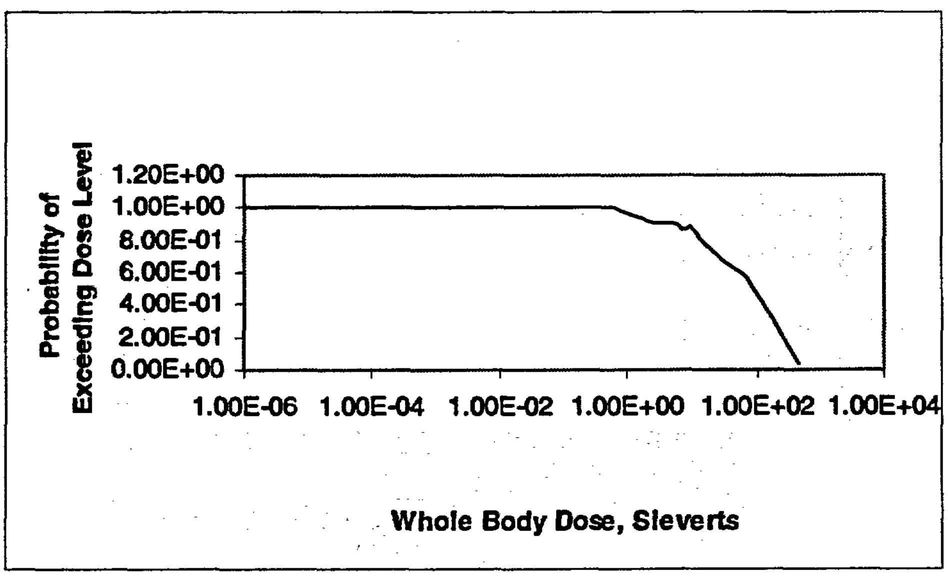

Figure 49-28

Site Boundary Whole Body Dose – CFL Source Term, 72 Hours

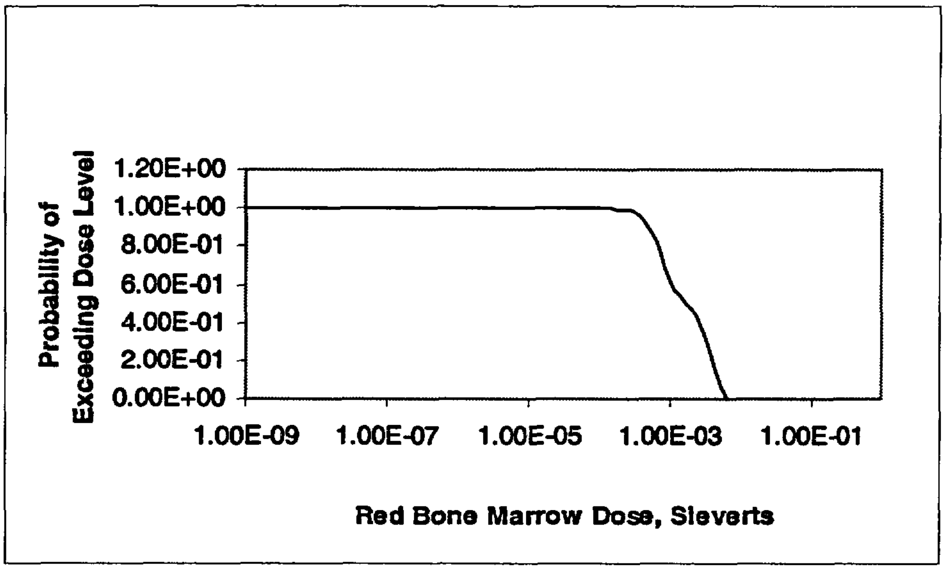

Figure 49-29

Site Boundary Red Bone Marrow Dose – CFL Source Term, 24 Hours

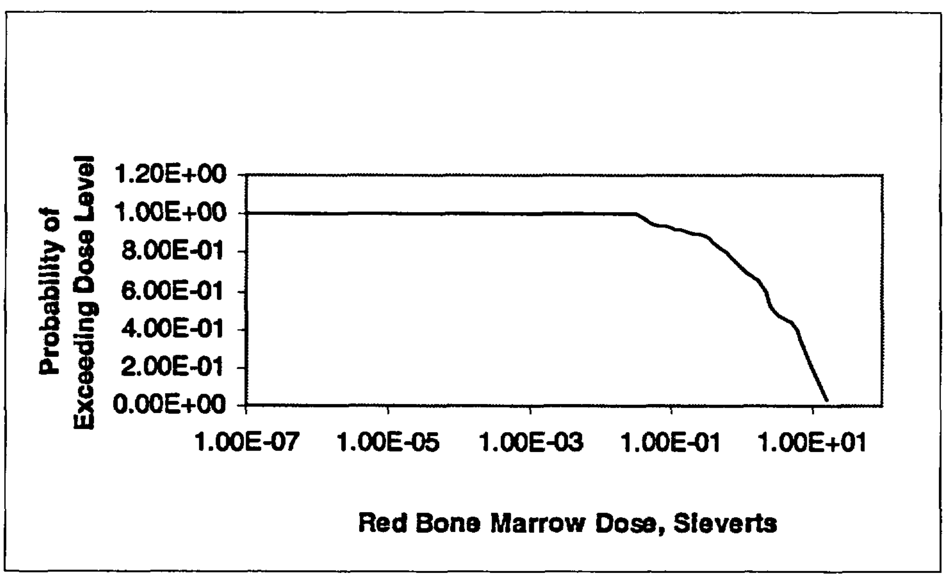

Figure 49-30

Site Boundary Red Bone Marrow Dose – CFL Source Term, 72 Hours

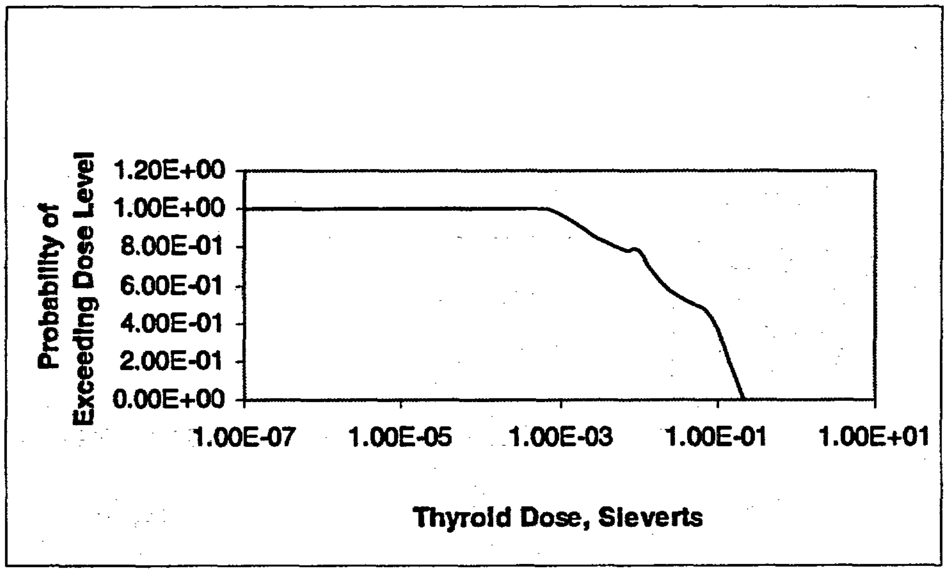

Figure 49-31

Site Boundary Thyroid Dose – CFL Source Term, 24 Hours

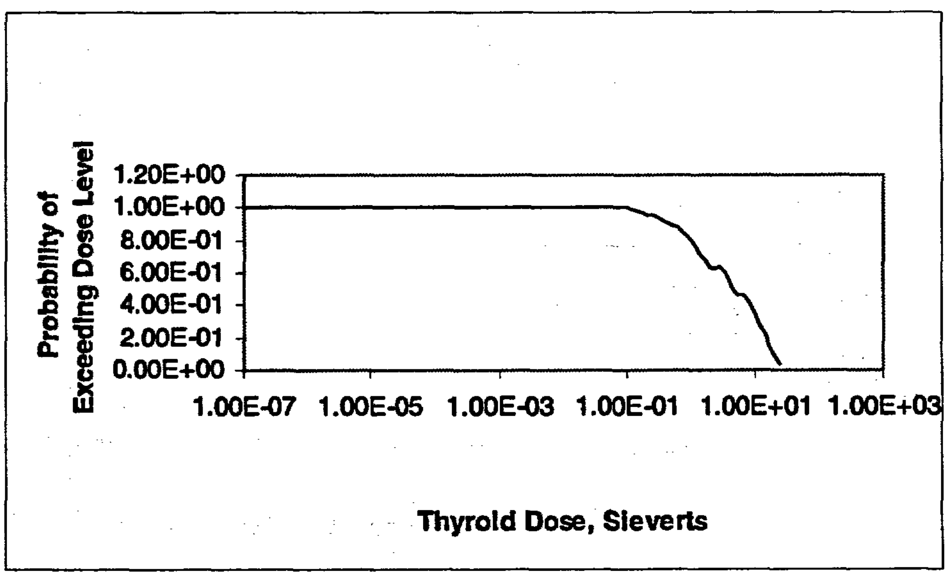

Figure 49-32

Site Boundary Thyroid Dose – CFL Source Term, 72 Hours

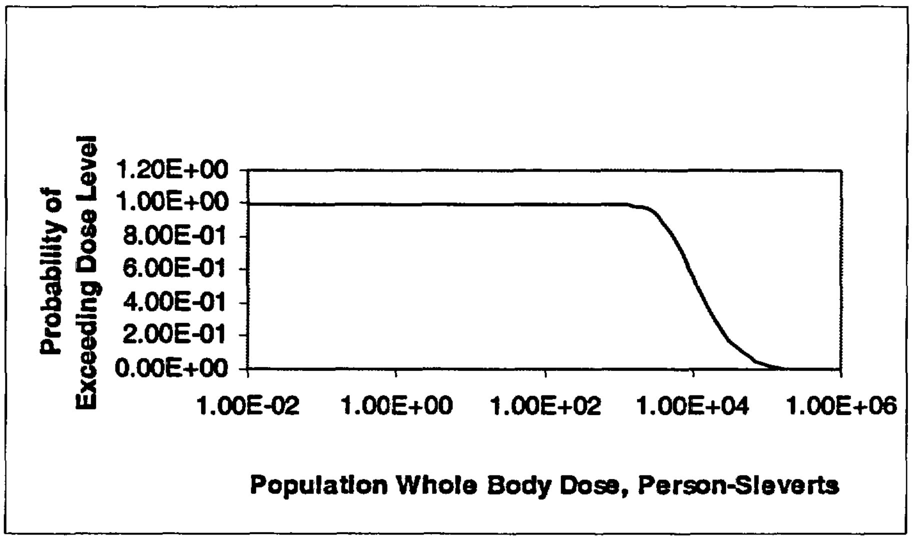

Figure 49-33

Population Whole Body Dose – CI Source Term, 24 Hours

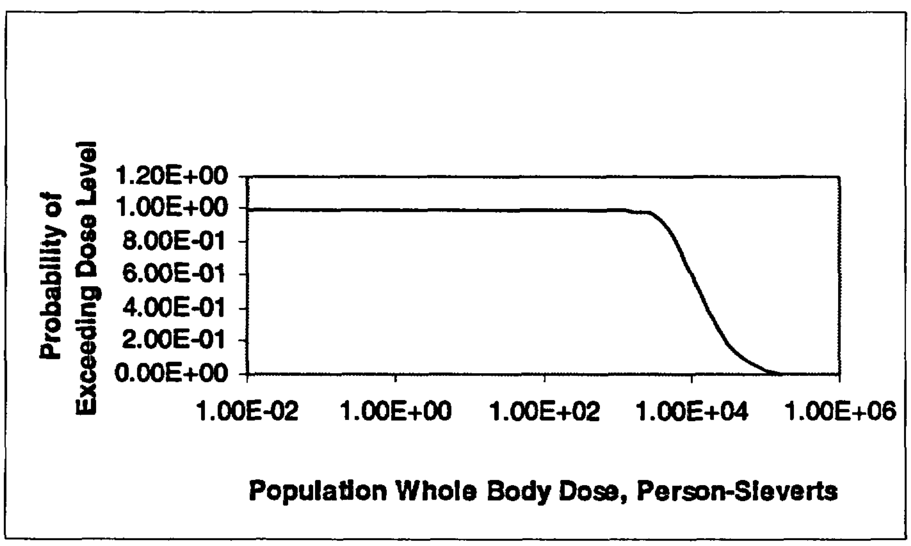

Figure 49-34

Population Whole Body Dose – CI Source Term, 72 Hours

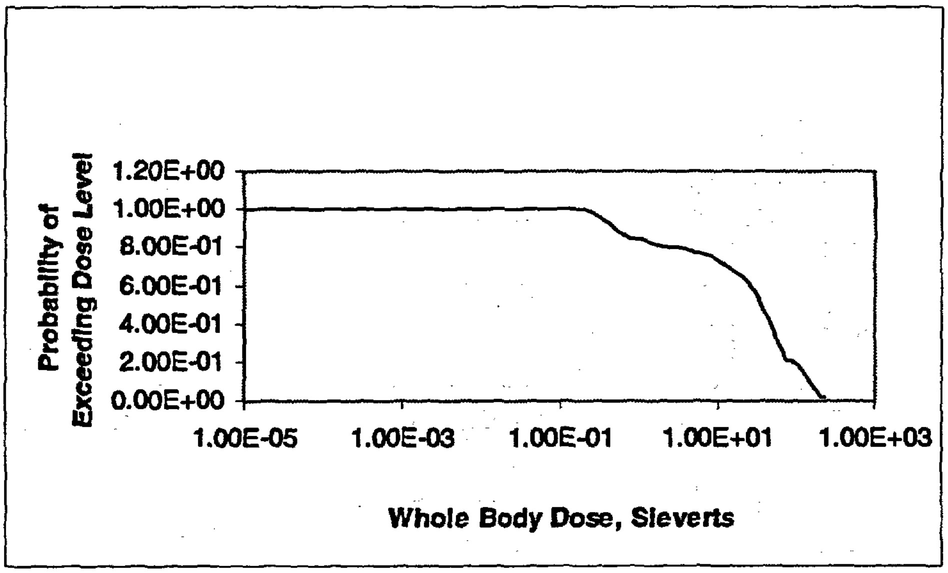

Figure 49-35

Site Boundary Whole Body Dose – CI Source Term, 24 Hours

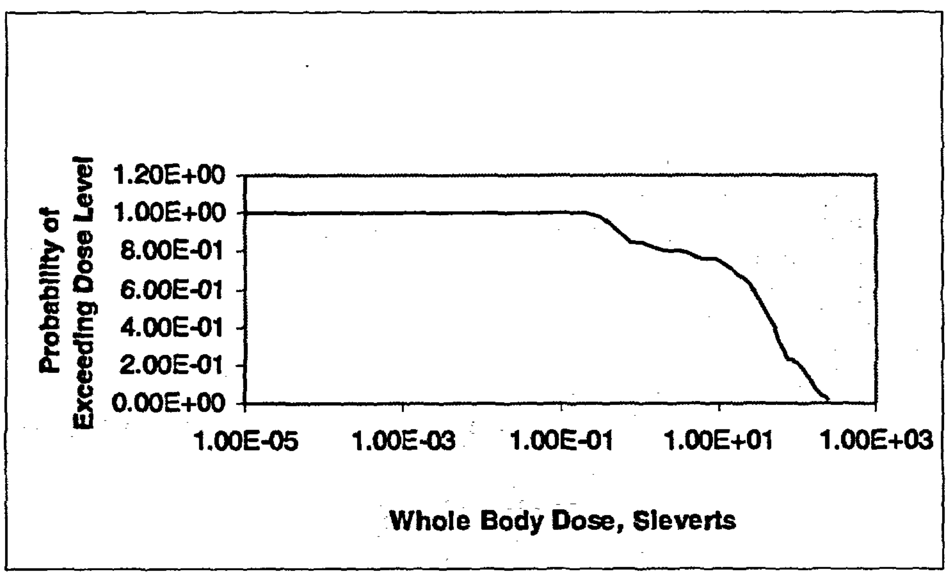

Figure 49-36

Site Boundary Whole Body Dose – CI Source Term, 72 Hours

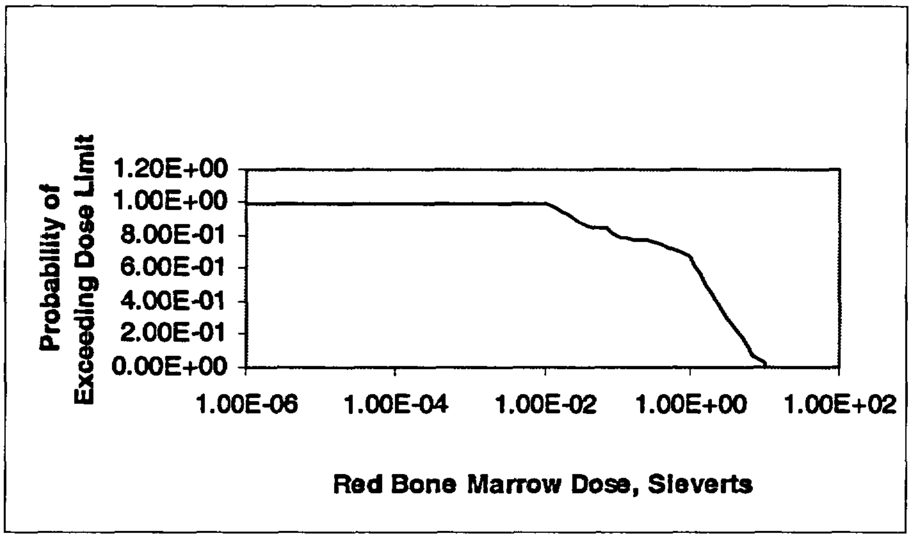

Figure 49-37

Site Boundary Red Bone Marrow Dose – CI Source Term, 24 Hours

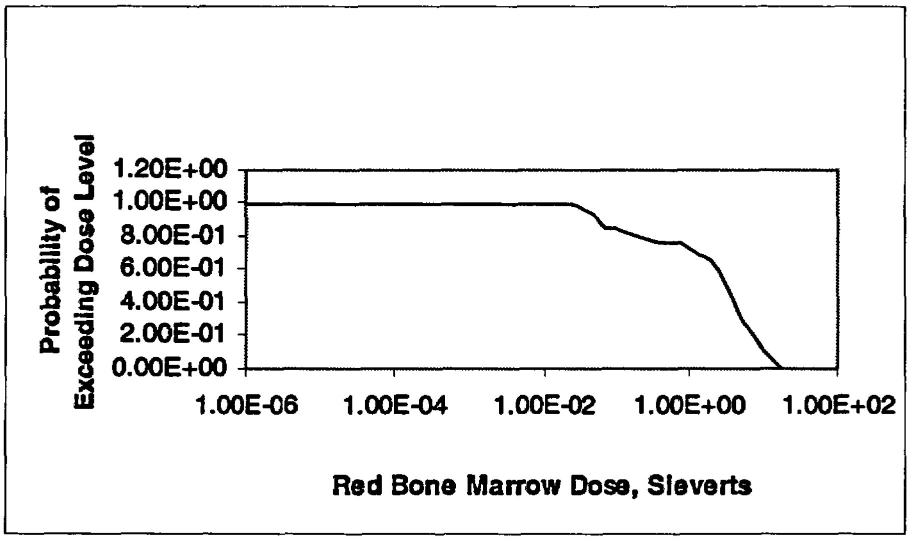

Figure 49-38

Site Boundary Red Bone Marrow Dose – CI Source Term, 72 Hours

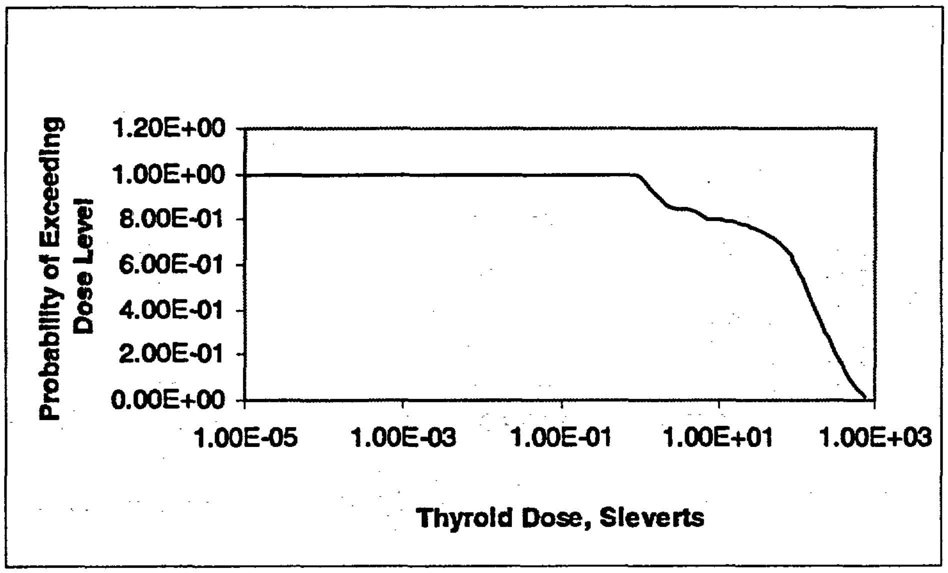

Figure 49-39

Site Boundary Thyroid Dose – CI Source Term, 24 Hours

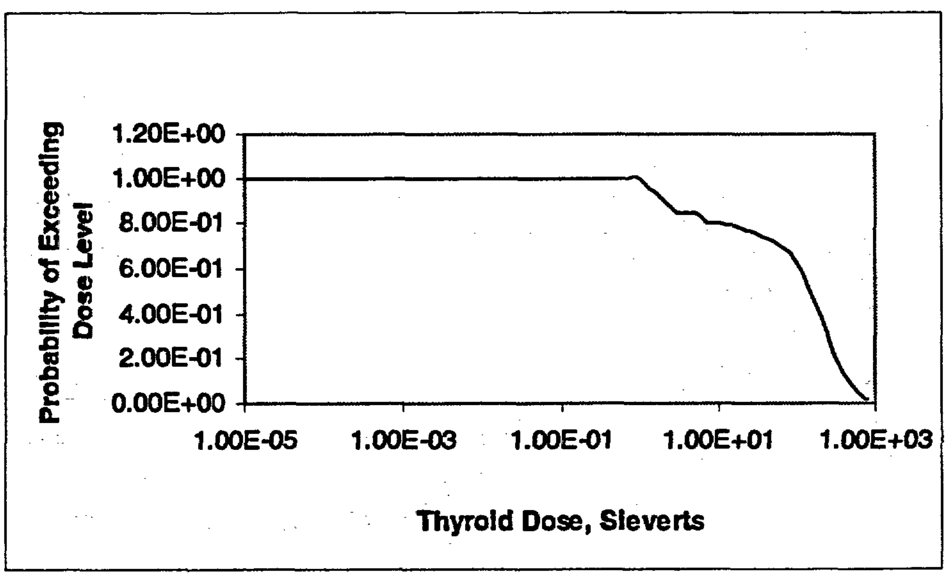

Figure 49-40

Site Boundary Thyroid Dose – CI Source Term, 72 Hours

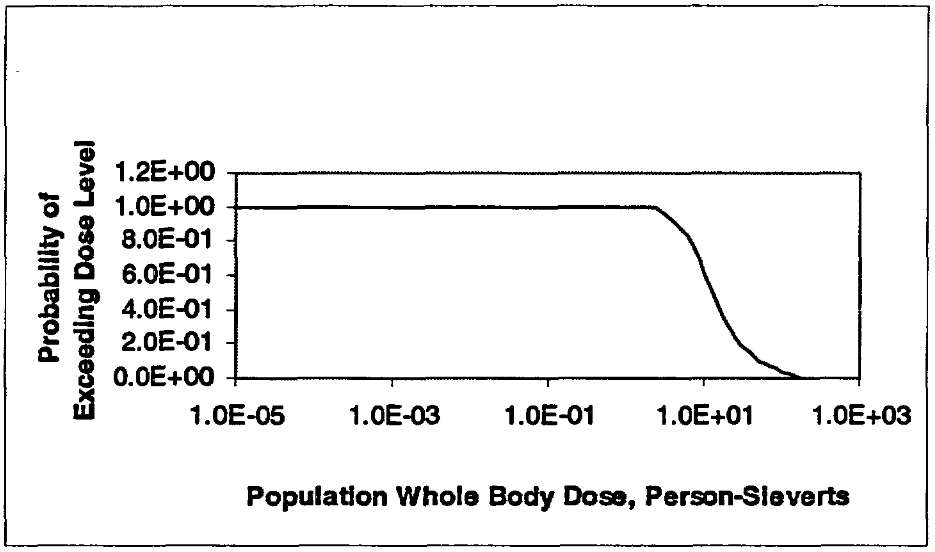

Figure 49-41

Population Whole Body Dose – DIRECT Source Term, 24 Hours

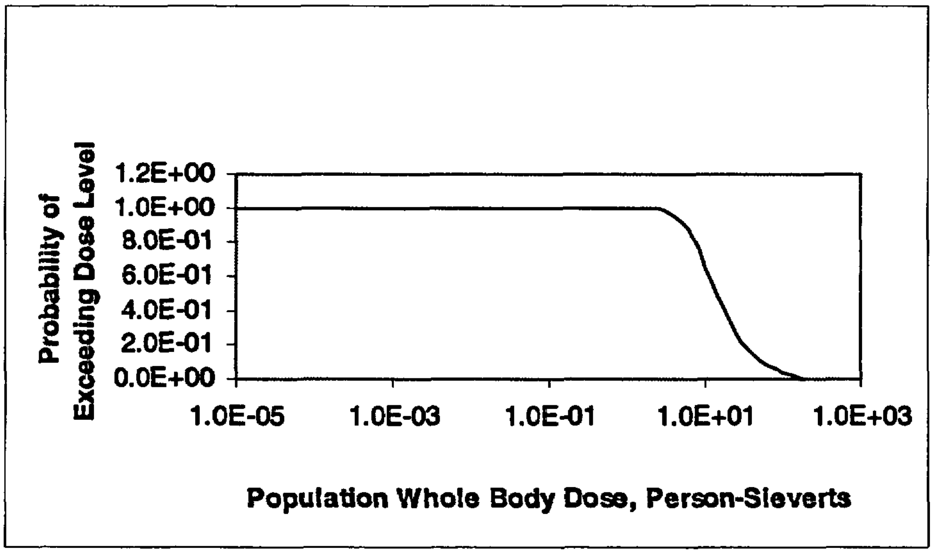

Figure 49-42

Population Whole Body Dose – DIRECT Source Term, 72 Hours

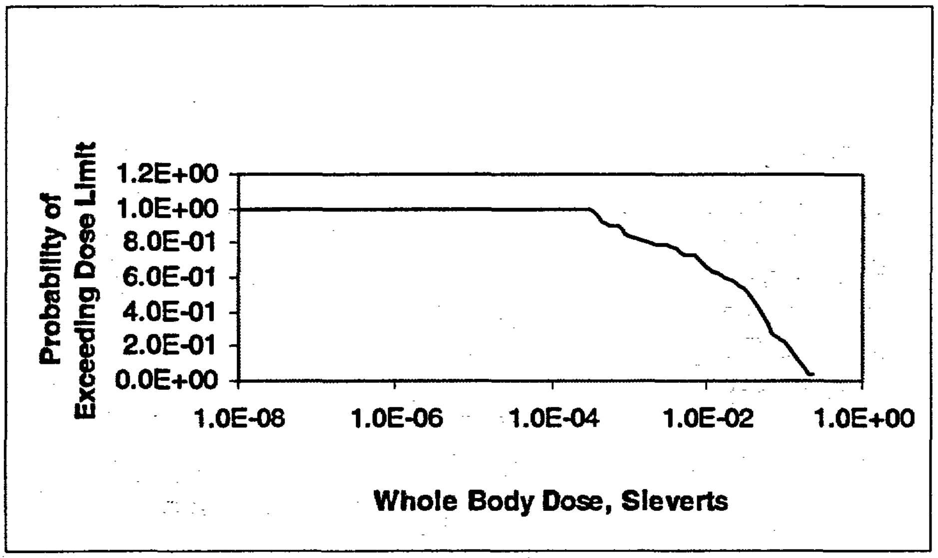

Figure 49-43

Site Boundary Whole Body Dose – DIRECT Source Term, 24 Hours

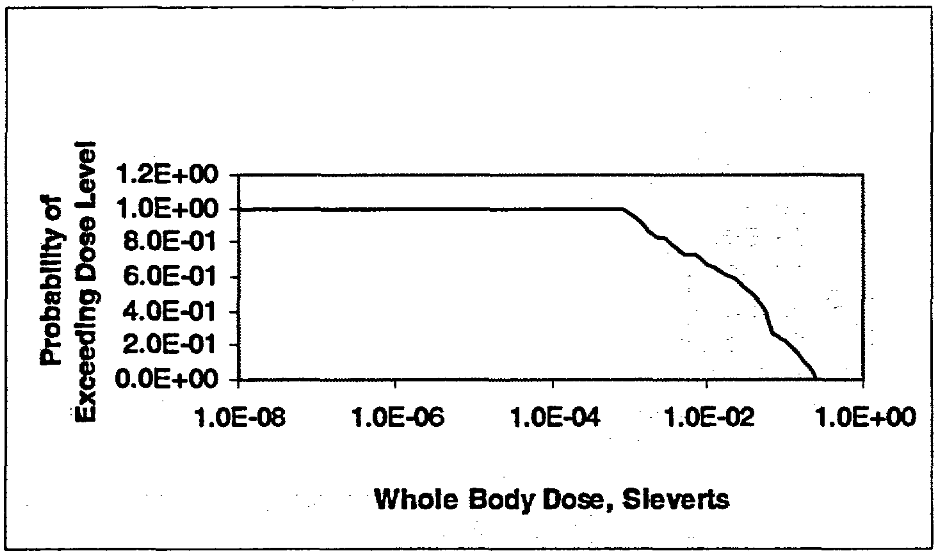

Figure 49-44

Site Boundary Whole Body Dose – DIRECT Source Term, 72 Hours

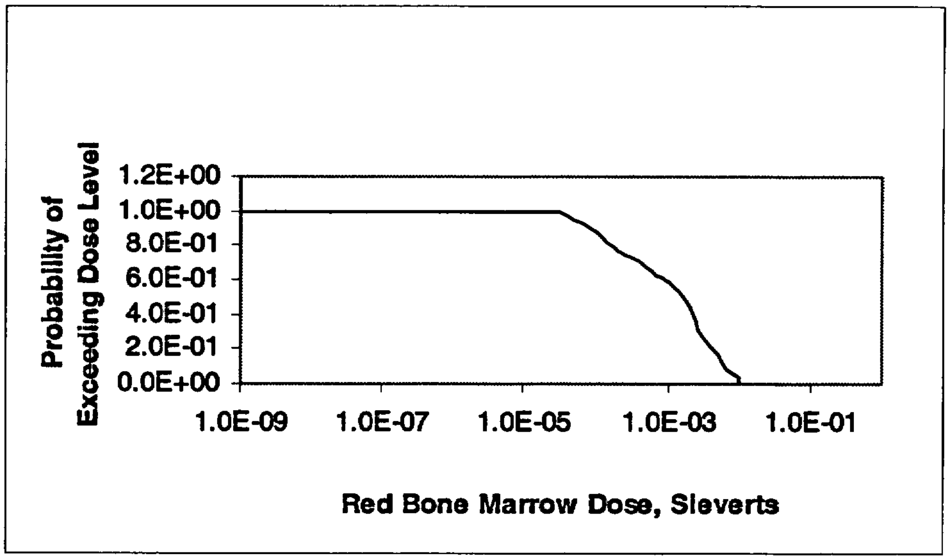

Figure 49-45

Site Boundary Red Bone Marrow Dose – DIRECT Source Term, 24 Hours

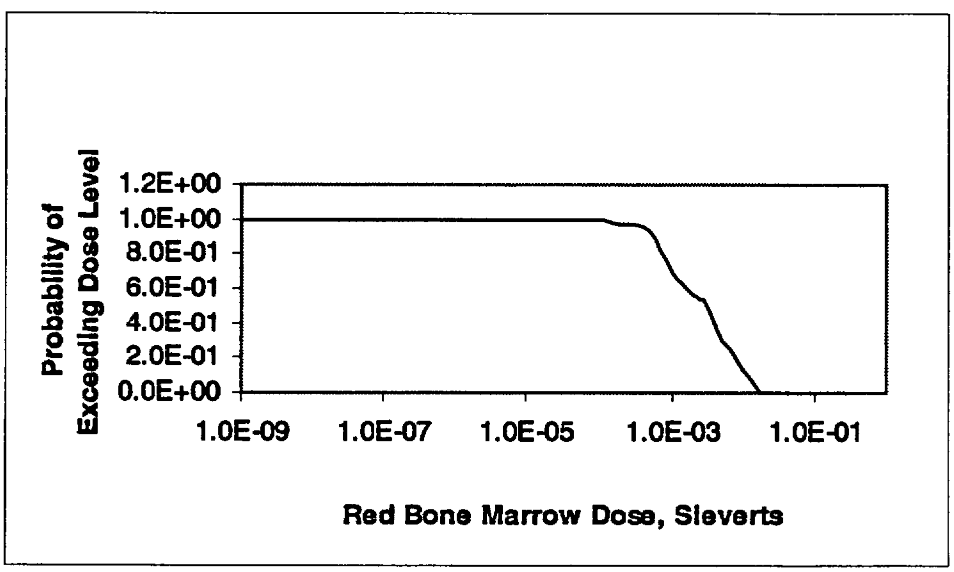

Figure 49-46

Site Boundary Red Bone Marrow Dose – DIRECT Source Term, 72 Hours

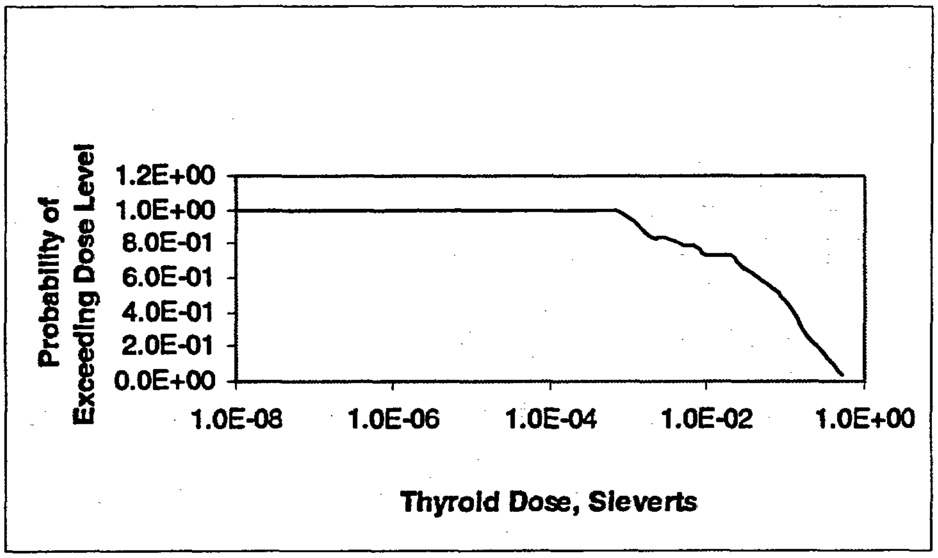

Figure 49-47

Site Boundary Thyroid Dose – DIRECT Source Term, 24 Hours

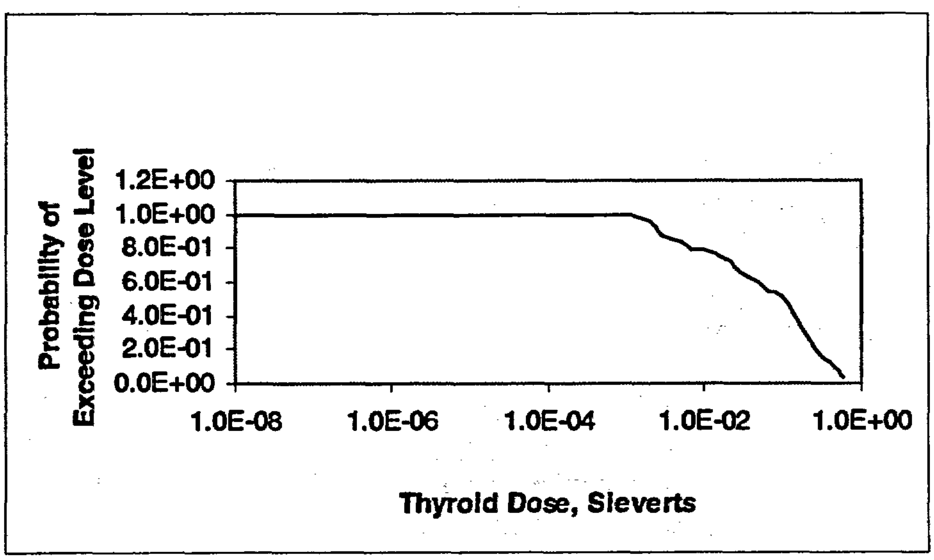

Figure 49-48

Site Boundary Thyroid Dose – DIRECT Source Term, 72 Hours

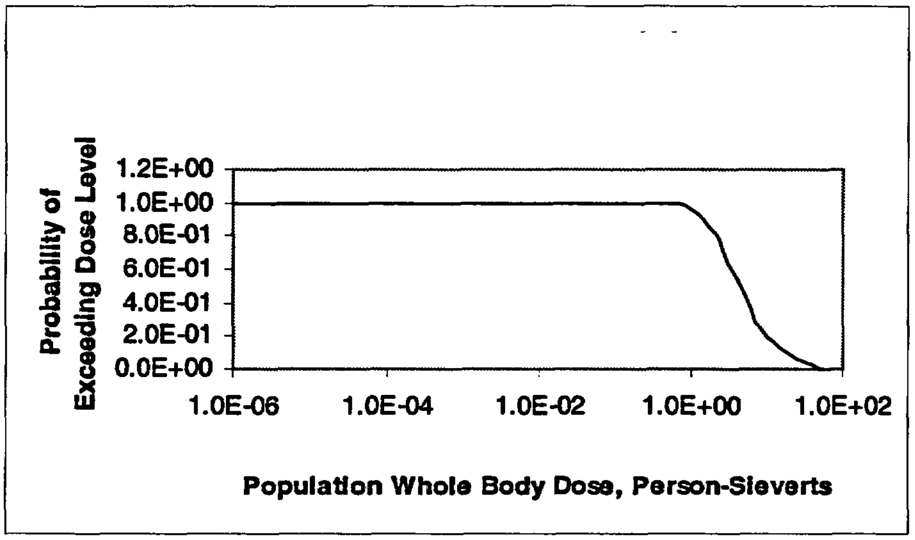

Figure 49-49

Population Whole Body Dose – IC Source Term, 24 Hours

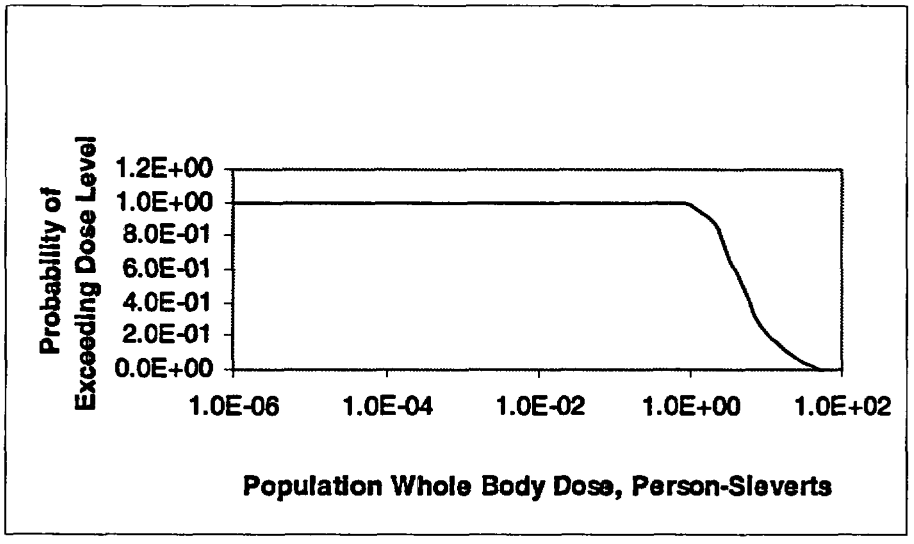

Figure 49-50

Population Whole Body Dose – IC Source Term, 72 Hours

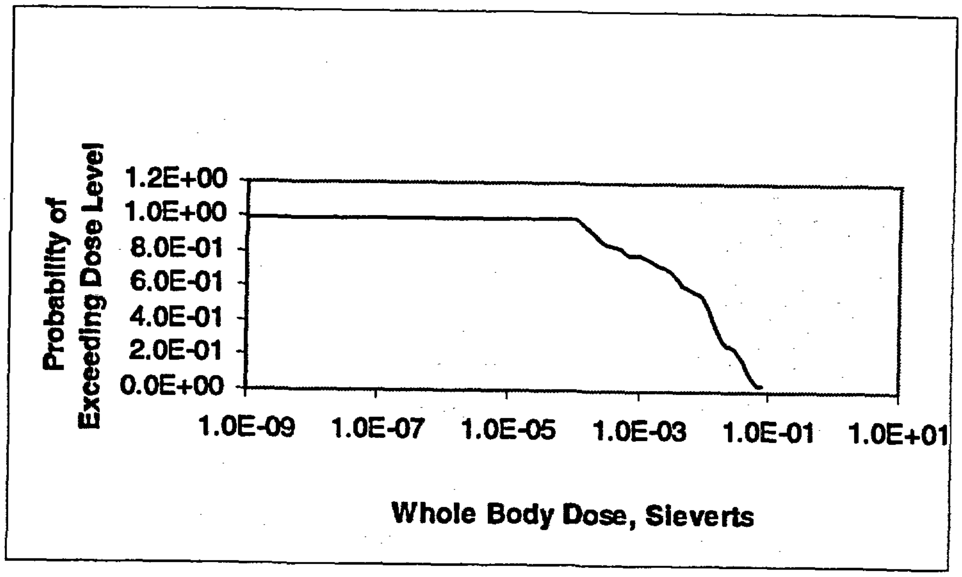

Figure 49-51

Site Boundary Whole Body Dose – IC Source Term, 24 Hours

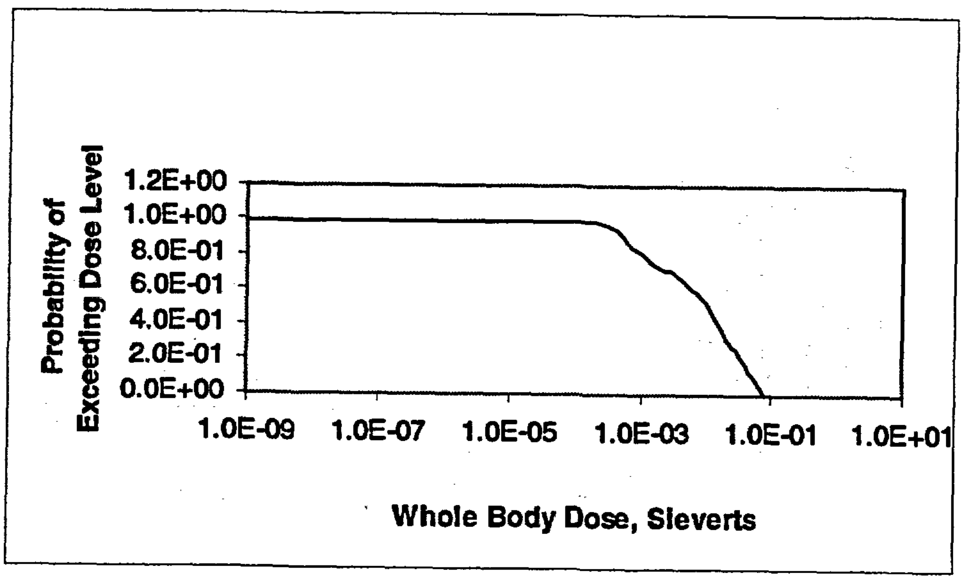

Figure 49-52

Site Boundary Whole Body Dose – IC Source Term, 72 Hours

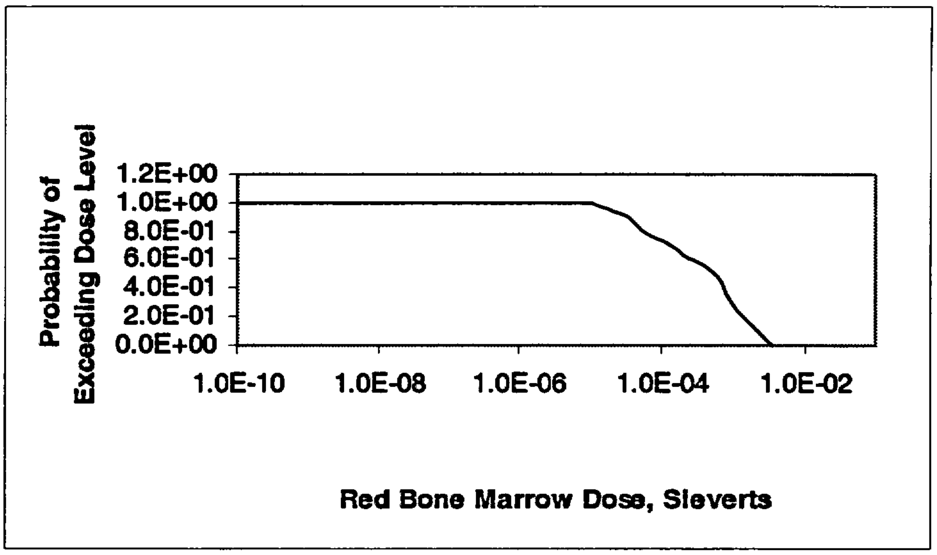

Figure 49-53

Site Boundary Red Bone Marrow Dose – IC Source Term, 24 Hours

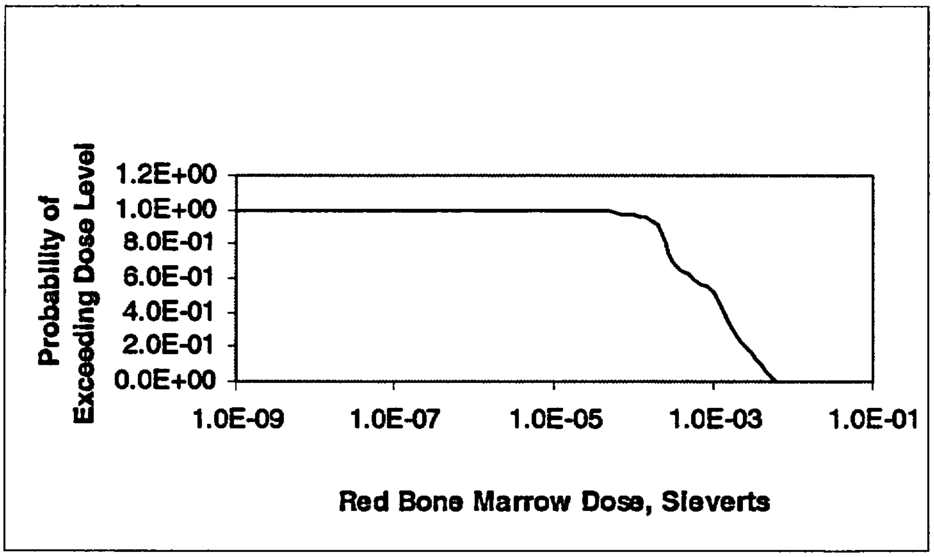

Figure 49-54

Site Boundary Red Bone Marrow Dose – IC Source Term, 72 Hours

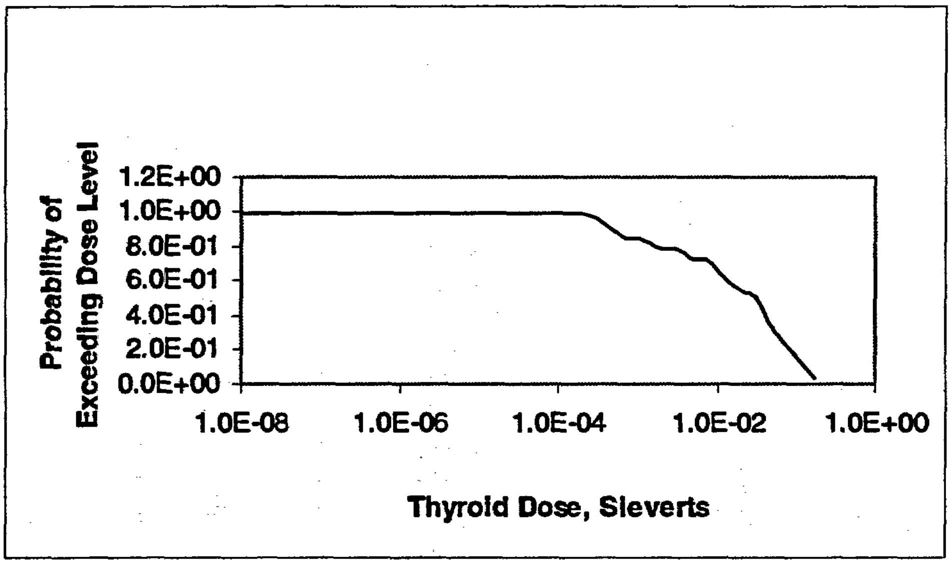

Figure 49-55

Site Boundary Thyroid Dose – IC Source Term, 24 Hours

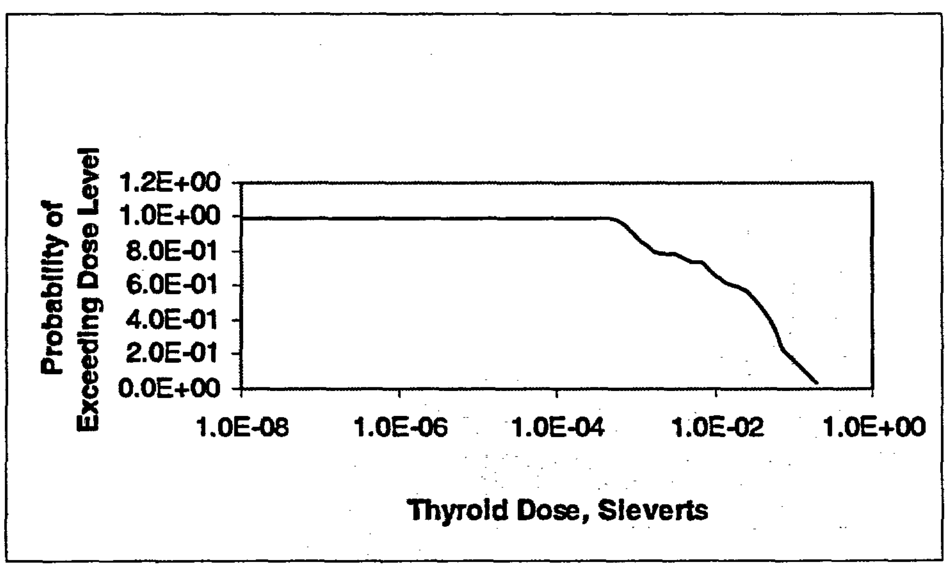

Figure 49-56

Site Boundary Thyroid Dose – IC Source Term, 72 Hours

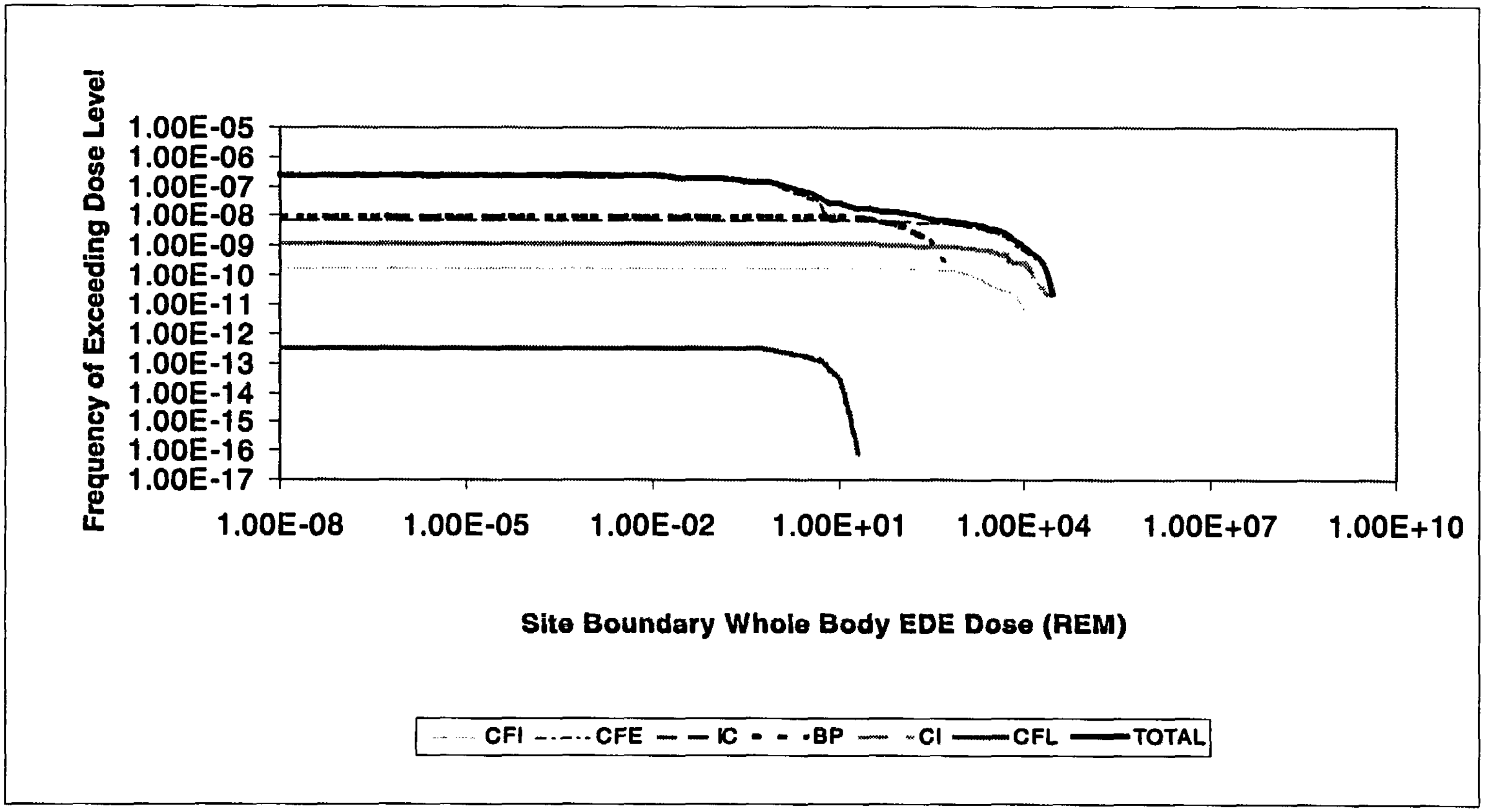

Figure 49-57

Overall Dose Risk – Site Boundary Whole Body EDE Dose, 24 Hours

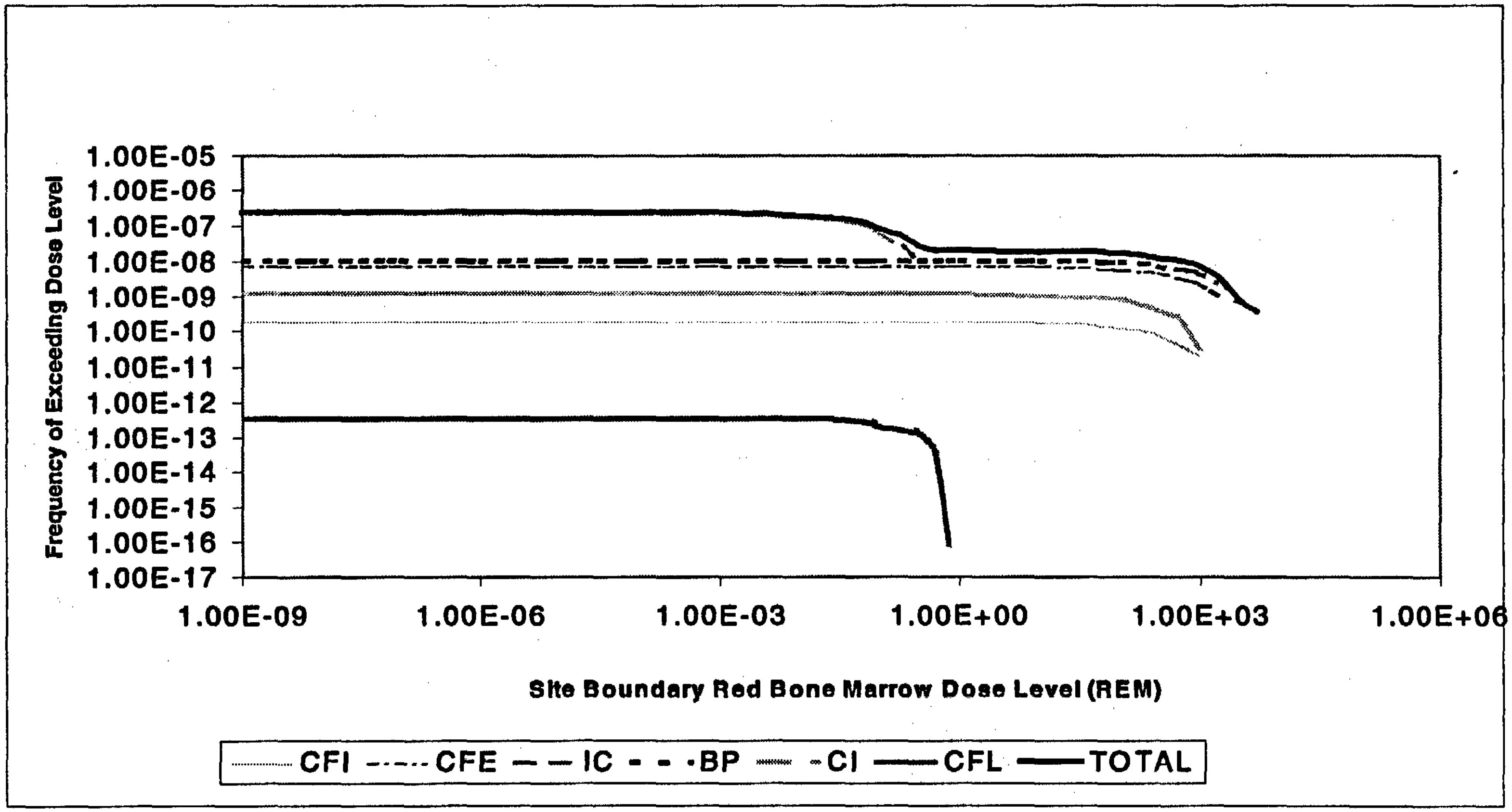

Figure 49-58

Overall Dose Risk – Site Boundary Red Bone Marrow Dose (Acute), 24 Hours

CHAPTER 50

IMPORTANCE AND SENSITIVITY ANALYSES

Various importance and sensitivity analyses have been performed for the AP1000 PRA and are reported in different sections of the report. This chapter contains the importance and sensitivity analyses for plant core damage frequency (CDF) for internal events at power. Sensitivity analyses for other subjects are reported in their respective chapters; for example:

- Chapter 43 LRF sensitivity analyses
- Chapter 49 Dose sensitivity analyses
- Chapter 54 Shutdown sensitivity analyses
- Chapter 56 Internal flooding sensitivity analyses
- Chapter 57 Internal fire sensitivity analyses

50.1 Introduction

Importance and sensitivity analyses have been performed for the AP1000 at-power PRA. These analyses are chosen among numerous potential candidates to address the following issues:

- Importances of individual basic events in their effect on plant CDF
- Importances of safety and non-safety systems in maintaining current plant CDF
- Importances of containment safeguards systems in maintaining current severe release frequency
- Effect of human reliabilities as a group on plant CDF
- Special issues

The importance and sensitivity studies are organized in the following sections:

- Section 50.2 Importance analyses for core damage
- Section 50.3 System importances for core damage
- Section 50.4 Human error sensitivity analyses
- Section 50.5 Other sensitivity analyses for core damage

The importance and sensitivity analyses results are summarized in Section 50.6.

50.2 Importance Analyses for Core Damage

The core damage results for internal initiating events at power have 599 basic events (including initiating events, component failures, human error, and common cause failures) in over 19,000 core damage cutsets. The importance analysis of these basic events is provided in

this section. The results are given in terms of risk decrease (set basic event probability to 0.0) and risk increase (set basic event probability to 1.0) measures.

In this section, the various importances associated with at-power initiating events core damage analysis are discussed in terms of:

- Initiating events
- Accident sequences
- End states
- Common cause
- Human errors
- Component failures

The relative importance of all basic events appearing in the cutsets for the baseline core damage quantification are presented in Tables 50-22 through 50-25. These tables show risk decrease (i.e., the factor by which the core damage frequency would decrease if the failure probability for a particular basic event were set to zero; also referred to as risk reduction worth) and risk increase (i.e., the factor by which the core damage frequency increases if the failure probability for a given basic event were set to one; also referred to as risk achievement worth), respectively. Risk decrease is a useful measure of the benefit that might be obtained as a result of improved component maintenance or testing, better procedures or operator training, and so forth. Risk increase is a useful measure of which components or actions would most adversely affect the core damage frequency if actual operating practices resulted in higher failure probabilities than assumed.

50.2.1 Initiating Event Importances

The AP1000 plant core damage frequency for internal initiating events at power is calculated to be 2.4E-07 events per year. Twenty-six separate initiating event categories are defined to accurately represent the AP1000 design. Of these categories of events, eleven are LOCAs, twelve are transients, and three are ATWS precursors (that is, initiating events that result in an ATWS sequence as a result of failure to trip the reactor). Where appropriate, plant-specific initiating event categories such as safety injection line breaks, core makeup tank (CMT) line breaks, and passive residual heat removal (passive RHR) tube ruptures have also been defined and evaluated. The resulting core damage frequency is very small; a value of 2.4E-07 means that only one core damage event is expected in approximately four million plant-years of operation.

The contribution of initiating events to the total plant core damage frequency is summarized in Table 50-1. This information is equivalent to risk decrease importance of the initiating events. The conditional probability of core damage, given that an initiating event occurs, is given in Table 50-2. These conditional probabilities are related to risk increase importance measure; they can be viewed as indicators of plant's robustness against the initiating events, given that the event has occurred.

From Table 50-1, eight initiating events, all being LOCAs, comprise approximately 93 percent of the total plant core damage frequency. These events are:

- Safety injection line break
- Large LOCA
- Spurious ADS actuation
- Small LOCA
- Medium LOCA
- Reactor vessel rupture
- Steam generation tube rupture (SGTR)
- Core makeup tank line break

Within this group of events, each of the first three events contributes more than 10 percent to the total core damage frequency. Those three events account for approximately 71 percent of the total core damage frequency. Small LOCA and medium LOCA contribute 7.5 and 6.7 percent, respectively, to the CDF. Reactor vessel rupture, steam generator tube rupture, and CMT line break contribute less than 5 percent each to the total CDF.

The remaining 18 initiating events contribute a total of approximately 6.95 percent to the plant core damage frequency from internal events.

50.2.2 Accident Sequence Importances

Out of many hundreds of accident sequences modeled, 186 of them provide contribution to the plant CDF. Ninety-nine of these sequences contribute 99.9 percent to the total CDF. Twenty-three dominant core damage sequences make up 92.6 percent of the total CDF. These dominant sequences are given in Table 50-3.

The first four dominant accident sequences make up 64 percent of the CDF. These sequences are:

1. Safety injection line break event occurs, which is postulated to lead to spill of one train of CMT, in-containment refueling water storage tank (IRWST), and recirculation flows. The reactor is tripped. The second CMT tank successfully injects, and ADS is successfully actuated. Thus, the reactor coolant system (RCS) pressure is low. However, the remaining IRWST line fails to inject to core damage with low RCS pressure, leading to 3BE end state is postulated. The sequence frequency is 6.88E-08/year, contributing 28.5 percent to the plant CDF.

2. Large LOCA event occurs, and the reactor is tripped. One out of two accumulators fails to actuate. Core damage with low RCS pressure, leading to 3BR end state is postulated. The sequence frequency is 4.3E-08/year, contributing 17.7 percent to the plant CDF.

3. Spurious actuation of the ADS occurs, and the reactor is tripped. The RCS rapidly depressurizes. Accumulator injection is successful. Full ADS fails (including failure of CMT). Core damage with medium RCS pressure, leading to 3D end state is postulated. The sequence frequency is 2.13E-08/year, contributing 9 percent to the plant CDF.

4. Safety injection line break event occurs, and the reactor is tripped. CMT injection is successful (with all RCS pumps successfully tripped). Automatic ADS actuation fails (full RCS depressurization fails). Core damage with medium RCS pressure, leading to 3D end state is postulated. The sequence frequency is 1.98E-08/year, contributing 8.2 percent to the plant CDF.

The fifth dominant sequence with 4.2 percent contribution to plant CDF is the reactor vessel rupture event. By the definition of this event, core damage is postulated to occur. The end state is 3C.

The remaining dominant sequences have contributions below that of reactor vessel rupture event, which is deemed to be improbable for this plant design.

50.2.3 End State Importances

The contribution of end states to plant CDF is summarized in Table 50-4. A low-pressure RCS core damage end state, 3BE, and a medium pressure RCS core damage end state, 3D, contribute 57.3 percent to the total CDF. Together with 3BR and 3BL, full or partially depressurized core damage states make up 86.5 percent of the core damage. In these end states, the probability of retaining containment integrity is very likely. Thus, severe release potential for these end states is low.

Containment bypass due to SGTR and interfacing systems LOCA (ISLOCA) events is given by end state 6, which contributes 3.95 percent to the total CDF. Loss of containment integrity is also postulated for vessel failure end state, 3C, which has a 4.1 percent contribution to total CDF.

The remaining 5.4 percent of the end states are those with high RCS pressure, where either ADS depressurization fails, or ATWS event occurs and is not mitigated. These end states have the potential to challenge containment integrity, if RCS depressurization after core damage is not achieved.

50.2.4 Common Cause Failure Importances

The risk-important common cause basic events are given in Tables 50-5 and 50-6 for risk decrease and risk increase measures, respectively. An examination of basic event importance results in Table 50-6 shows that common cause failures (CCFs) of all software cards and IRWST recirculation sump strainers are the most significant in maintaining the current level of low plant damage frequency, or potentially reducing it further.

From Table 50-6, common-cause failure of the following sets of components is found to have a large (or significant) impact on the estimated CDF from internal events (i.e., sets of components with highest risk increase worth):

- Software common cause failure of all protection and safety monitoring system (PMS) and plant control system (PLS) logic cards. Such a failure leaves diverse actuation system (DAS) as the remaining actuation and control function. Should such a common

software failure occur and go undetected, the CDF from internal events would increase nearly 8000 times (from 2.4E-07 events per year to 1.9E-03 events per year).

- Common cause plugging of IRWST strainers or containment sump screen plugging. Opening of these valves is needed after most LOCA events, and after ADS operation in transients, when the feed and bleed operation is performed. Should such a failure occur, and go undetected, the CDF from internal events would increase more than 6000 times (from 2.4E-07 to 1.47E-03 per year).

- Common cause failure of IRWST injection and recirculation high-pressure squib valves. Opening of these valves is needed after most LOCA and transient events. Should such a failure occur, and go undetected, the CDF from internal events would increase more than 1600 times (from 2.4E-07 to 3.99E-04 per year).

- The next set of common cause (items numbered 8,9,10,11) are associated with ADS explosive valves, and IRWST injection check valves. Opening of these valves is needed after most LOCA events, and after ADS operation in transients, when the feed and bleed operation is performed. Should such a failure occur, and go undetected, the CDF from internal events would increase more than 1600 times (from 2.4E-07 to approximately 3.9E-04 per year).

- A set of common cause failures (failures numbered as 13 - 37 in Table 50-8) has approximately the same level of risk importance. These can be grouped as:

  - IRWST injection explosive valves and check valves
  - Passive core cooling system (PXS) air-operated valves
  - PMS engineered safety feature (ESF) software and hardware common cause failures
  - IRWST strainers
  - CMT air-operated valves, check valves, and tank failure
  - Accumulator check valves and tank failures
  - ADS motor-operated valves
  - Class 1E dc and uninterruptible power supply system (IDS) batteries fail

Each of such failures causes the core damage frequency to go above 1E-05 per year, when postulated to occur.

With respect to risk decrease importance (Table 50-5), common cause failure of automatic depressurization system squib valves show with a 9.6 percent risk decrease potential if they were made to be perfectly reliable. Other common cause failures have a much smaller impact if they were made perfectly reliable.

50.2.5 Human Error Importances

In this section, a summary discussion of "operator actions" as they appear in the dominant core damage cutsets is provided first. The risk-important tasks are identified (Tables 50-7 and 50-8) and are discussed. Finally, the importance of "local" (actions outside the control room) actions is discussed.

The following represents an initial evaluation of human error basic event importances based on the base core damage frequency results.

Tables 50-7 and 50-8 show the relative importances for human error basic events only. Table 50-7 indicates human error basic event importance using the risk reduction worth method. Table 50-8 shows human error basic event importance using the risk achievement worth method, for those events for which guaranteed failure would result in an increase in core damage frequency.

The risk increase table shows that the most significant control room crew failure is the failure to diagnose the SGTR event. This failure eliminates the possible use of non-safety related systems to mitigate the event, thus forcing only the safety systems to mitigate it. If this action is postulated to fail, the plant core damage frequency increases 7.6E-07 per year to 1.29E-06 per year. This is a 534 percent (or a 6.34 fold) increase. This also shows that failure of no single operator action would make the plant core damage frequency go above 1.29E-06 per year.

According to Table 50-8, there are 3 additional operator failures that would increase the plant core damage frequency by 200 percent or more. All of these failures are control room actions; no local operator actions are risk important. These operator actions are:

- Operator fails to manually actuate ADS upon failure of automatic actuation due to either CMT failure or ADS actuation failure. Failure of this action would increase plant core damage frequency by 325 percent to a total of 7.82E-07/year.
- Operator fails to actuate containment sump recirculation given that the IRWST level sensors fail and automatic actuation does not occur. Failure of this action would increase plant core damage frequency by 289 percent, to a total of 6.96E-07/year.
- Operator fails to perform a controlled manual shutdown to control and mitigate an RCS leak event. In that case, the event may generate a reactor trip if chemical and volume control system (CVS) water is depleted. Failure of this action would increase plant core damage frequency by 230 percent to a total of 5.35E-07/year.

The risk decrease table shows that there are only four operator actions with importances greater than 1 percent. There are no operator actions that have a risk decrease contribution of more than 5 percent. This indicates that there would be no significant benefit from additional refinement of the actions modeled.

50.2.6 Component Importances

In this section, the following component importances are discussed.

It is useful to separate these into several classes of basic events (i.e., initiating events, hardware events, and human error events), in order to review the most important within each class. Tables 50-9 and 50-10 show the relative importances for hardware-related basic events only. Table 50-9 indicates hardware or component importance using the risk decrease method, for the those components having a 0.30 percent or greater importance. Table 50-10

shows component importance using the risk increase method, for those components for which guaranteed failure would result in at least a factor of 2 increase in core damage frequency.

The ten most significant single failures, based on the risk achievement worth evaluation, are as follows:

- IRWST Discharge Line "A" Strainer Plugged – This failure applies only to safety injection line break events and causes the plant core damage frequency to increase by a factor of 881 (to 2.12E-04/year), if the probability of this failure is set to 1.0. The importance of this failure is due to the safety injection line break initiator, in which injection using the redundant IRWST injection line fails as part of the initiating event.

- Plug/leak of passive RHR heat exchanger or failure of passive RHR due to IRWST tank failure (items 33 and 34). Each of these failures would fail the passive RHR system and would increase the plant core damage frequency by a factor of 70 making the plant CDF from internal events increase from 2.4E-07/yr to 1.7E-05/yr, if the probability of this failure is set to 1.0. This is a failure of the heat sink for passive RHR. Its importance comes from transient sequences, in which success of passive RHR leads to sequence success, but failure of passive RHR leads to sequences in which core damage can occur.

- Accumulator flow tuning orifice plugs or ruptures (events 41, 45, 46). Also accumulator tank rupture (events 44 and 47) or failure of one of two accumulator check valves in series on the same line (events 42 and 43). These failures are associated with the safety injection line break event, and conservatively postulate failure of accumulator injection. Each of these failures would increase the plant core damage frequency to about 5.5E-06/year, if the probability of this failure is set to 1.0.

The risk decrease table shows that only one component failure contributes more than 10 percent to the total CDF. This is the IRWST discharge line plugging event, with a risk decrease importance of 21.1 percent. The next two failures of importance are accumulator line "A" check valves failing to open with a risk decrease importance of 4 percent. The next failures of importance are accumulator line "B" check valves failing to open with a risk decrease importance of 3.8 percent. The next two components with a less than 2 percent contribution each are related to accumulator flow turning orifices plugging.

The remaining components each have a risk decrease importance of 1.5 percent or less.

50.3 System Importances for Core Damage

In this section, system importance for plant core damage frequency for internal initiating events at power is performed (cases 9 through 28), by setting each system failure probability equal to 1.0 and recalculating the core damage frequency.

Table 50-11 contains the list of systems for which the system importances are calculated. Each case is assigned a case name.

The results of the sensitivity analyses are summarized in Table 50-12.

Note that the system importances are calculated by "failing" certain basic events in the plant core damage cutset file; the basic events failed (or modified) to simulate a system are listed in Table 50-13. Sometimes, a basic event is shared by multiple systems and its failure affects more than the system intended to be failed. An example of such a situation is the common cause failure of pumps to run for component cooling water system (CCS) (CCX-PM-ER); if this basic event is set to failure, then the turbine building closed water system and central chilled water system are also failed since it uses the same failure mode. If this basic event is not set to failure, the CCS system importance is slightly underestimated. Both cases were run. It was observed that failing the common caused event for CCS importance misrepresents CCS importance so acutely that it was decided to keep it in at the cost of a slight non-conservatism in CCS importance. This is the result that was reported as Case 23. One can already see that the system importances of CCS, service water system (SWS), and normal residual heat removal system (RNS) are about the same, as expected.

From Table 50-12, it is observed that:

- The most important system is PMS; if no credit is taken for PMS, the plant core damage frequency becomes 1.59E-02/year.
- The next important system is Class 1E DC power; if no credit is taken for this system, plant core damage frequency becomes 5.65E-03/year.
- The next set of important systems are IRWST recirculation, ADS, and IRWST injection, with CMT following.
- The above mentioned systems make up the most important systems in maintaining low plant core damage frequency, according to the system importance calculations of this section.
- No non-safety system has a risk increase contribution greater than 1E-05, which shows that a complete failure of such a non-safety system does not increase the plant core damage frequency above 1E-05. Thus, no single non-safety system has significant importance in avoiding plant core damage.

Table 50-13 groups the system importances by the plant core damage frequency order of magnitude reached when the system is assumed unavailable.

50.4 Human Error Sensitivity Analyses

Sensitivity analysis of operator action failure probabilities is performed to study the impact of human errors on plant core damage frequency for internal initiating events at power (cases 29 through 31). The following three cases are studied:

- Case 29 set human error probabilities (HEPs) to failure in core damage output file (CMTOT.OUT)
- Case 30 set HEPs to 0.0 in CMTOT.OUT

- Case 31 set HEPs to 0.1 in CMTOT.OUT

The objective of these sensitivity analyses is to investigate:

- What would be the plant core damage frequency if no credit is taken for operator actions (case 29)?
- What would be the benefit in making the operator actions more reliable than those in the base case (case 30)?
- What would be the impact increasing all operator actions failure probability (case 31)?

These cases are further discussed in the following subsections.

The core damage results are summarized in terms of cutsets in the CMTOT.OUT file, which contains 19,374 cutsets for the 26 initiating event categories. The file has 599 basic events (initiating event frequencies, component failures, operator action failures, etc.). The base core damage frequency for internal initiating events at power is 2.41E-07/year. Out of these 599 basic events, 30 are operator actions (24 events are independent and 6 events are conditionals). These actions, as extracted from the CMTOT.OUT file, are given in Table 50-14.

Moreover, there is an additional basic event named ALL-IND-FAIL (1.0E-06) representing the failure of all indications (PMS or PLS or DAS originated), which, if it fails, would render multiple operator actions ineffective. This basic event is "or gated" with all operator actions that show in the instrumentation and control (I&C) sub-trees. Thus, the plant core damage cutsets that contain this basic event actually may represent other dropped cutsets that contain multiple operator actions (this event can be viewed as a common cause failure leading to failure of multiple operator actions in a given cutset or a sequence.

50.4.1 Set HEPs to 1.0 (Failure) in Core Damage Output File

In this sensitivity analysis (case 29), 31 basic events (29 HEPs and the indication failure) are set to failure (these events are set to "drop" in the SENS code, that is, the failure rate is set to 1.0 and the event is removed from the cutsets).

The result of the sensitivity analysis shows that the core damage frequency increases by a factor of 57 to 1.37E-05/year, if no credit is taken for operator actions. This is a significant increase, although the resulting core damage frequency is still low. This means that, in general, operator actions are important in maintaining a very low plant core damage frequency for internal events at power.

Table 50-15 shows the contribution of initiating event categories to core damage for this sensitivity case. Also shown in the same table are the base case results and the ratio of the base case frequency to the sensitivity case frequency for each initiating event category. An

examination of the cutsets is given in Table 50-16. Table 50-16 shows that there are two dominant contributors to this sensitivity case:

1. Following a event such as LOCA, SGTR, main steam line stuck-open valve (SLB-V), if the reactor coolant pumps (RCPs) do not trip (as represented by the failure of RCP circuit breakers fail to open basic event), safe shutdown cannot be attained without an operator action; namely, CMTs do not inject and ADS is not automatically actuated.

2. Following any ATWS precursor (including the ones where main feedwater (MFW) is available), common cause failure of PMS hardware; success of diverse actuation system (DAS) but failure of motor generator set supply breakers (MGSETs) to open, would lead to condition where safe shutdown cannot be attained without an operator action; i.e., operator terminating ATWS conditions through DAS supported equipment.

50.4.2 Set HEPs to 0.0 (Success) in Core Damage Output File

This case is similar to Case 30, except all of the 30 operator action HEPs, and the ALL-IND-FAIL event are set equal to 0.0 (perfect operator) in the CMTOT.OUT file.

The resulting core damage frequency is 2.18E-07/year. The ratio of the sensitivity case frequency to the base frequency is 0.9, which shows a decrease of 8 percent. This indicates that the operator actions are not risk important at the level of plant risk obtained by the base case. An examination of the dominant cutsets is given in Table 50-17.

50.4.3 Set HEPs to 0.1 in Core Damage Output File

The purpose of this sensitivity study (case 31) is to see the effects on the core damage frequency by raising the human error probabilities to 0.1. This case is performed similarly to the previous two sensitivity cases.

The resulting core damage frequency is 1.574E-06/yr. The ratio of the sensitivity case frequency to the base frequency is 6.5. This is a considerable increase in CDF due to a slight increase in HEP. The resulting CDF is still very low. This indicates that, in general, operator actions are important in maintaining a very low plant core damage frequency for internal initiating events at power.

An examination of the dominant cutsets is given in Table 50-18.

50.5 Other Sensitivity Analyses for Core Damage

In this section, additional sensitivity analyses for at-power internal initiating events are presented.

50.5.1 Impact of Passive System Check Valves on Core Damage Frequency

The purpose of this sensitivity study (case 32) is to evaluate the impact of passive system check valves on core damage frequency. This is done by decreasing the reliability of these

check valves by a factor of 10. The methodology and results of this sensitivity case are discussed below.

The total plant core damage frequency quantification output file (see Chapter 33) contains 19,374 cutsets for the 26 initiating event categories. The file has 599 basic events (initiating event frequencies, component failures, operator action failures, etc.). The base core damage frequency for internal initiating events at power is 2.41E-07/year. Out of these 599 basic events, 16 are random failures of the passive system check valves and common cause failures among them. These check valves and their common cause, as extracted from the file, are given in Table 50-19.

Using the SENS code, with the CMTOT.OUT file as input, the failure probabilities of passive system check valves (including their common cause failures) are increased by a factor of 10. The updated file is then requantified.

The result of the sensitivity analysis shows that the core damage frequency increases by a factor of 3.7 to 8.83E-07/yr. This is a minor increase and the resulting core damage frequency is still low.

50.5.2 Sensitivity to Squib Valve Failure Probability

Squib valves are used in ADS, IRWST injection, and containment recirculation functions. A sensitivity (case 33) to the failure of these valves is done by increasing the common cause failure probability of basic events associated by these valves by a factor of 10:

Basic Event	Base Case Failure Prob. (/demand)	New Failure Prob. (/demand)
ADX-EV-SA	3.00E-05	3.00E-04
ADX-EV-SA2	5.90E-05	5.90E-04
IWX-EV-SA	2.60E-05	2.60E-04
IWX-EV1-SA	5.80E-06	5.80E-05
IWX-EV2-SA	5.80E-06	5.80E-05
IWX-EV4-SA	5.80E-05	5.80E-04

After replacing the new probabilities in the core damage cutsets output file, the new plant CDF is calculated to be 6.59E-07/year. This is an increase by a factor of 2.7 over the base case CDF. Thus, the plant CDF has some sensitivity to the squib valve failure probability.

50.5.3 Sensitivity to Circuit Breaker Failure Probability

Two types of special breakers are distinguished for this sensitivity case:

1. Reactor trip breakers
2. Reactor coolant pump breakers

1. **Reactor Trip Breakers (Case 34)**

This failure is represented by the common cause failure basic event RCX-RB-FA with a failure probability of 8.1E-06. If the failure probability is increased by a factor of 10, the plant CDF becomes 2.411E-07/year; this is a negligible increase.

2. **Reactor Coolant Pump Breakers (Case 35)**

This failure is represented by the common cause failure basic event RPX-CB-GO with a failure probability of 4.2E-04. If the failure probability is increased by a factor of 10, the plant CDF becomes 2.87E-07/year; this is a 15 percent increase. This increase is small.

50.5.4 Sensitivity to Standby Systems

This section documents the sensitivity analysis named as case 36, performed on the core damage frequency results of the AP1000 PRA internal events at-power. The objective of this analysis is to estimate the core damage frequency (CDF) for internal events at-power when no credit is taken for five standby systems which may not be available following an initiating event. These five systems (which are taken credit for in the base AP1000 PRA) are:

1. Chemical and Volume Control System (CVS)
2. Startup Feedwater System (SFW)
3. Normal Residual Heat Removal System (RNS)
4. Diverse Actuation System (DAS)
5. Diesel Generators (DG)

The PRA CDF cutsets for this analysis are taken from the AP1000 base PRA. The starting point is the CDF cutsets file CMTOT.OUT. The following basic event probabilities are modified in this cutsets file to fail the five systems listed above:

ALL-IND-FAIL
ATW-MAN04
ATW-MAN04C
ATW-MAN06
CLP-UNAVAILABLE
CVBPM01BTM
CVMOD01
CVMOD02
CVMOD03
CVMOD04
CVMOD05
CVMOD07
CVN-MAN00
CVN-MAN02
CVNMV090GC
CVNMV091GC
CVX-PM-ER
DAS

FWACV012GO
FWBCV012GO
FWMOD013A
FWMOD013B
FWMOD03A
FWMOD03B
FWX-MV2-GO
FWX-PM2-ER
FWX-PM2-FS
MDAS
REC-MANDAS
REC-MANDASC
RHN-MAN01
RN11MOD3
RN22MOD4
RN23MOD5
RN55MOD1
RNAMOD06
RNAMOD09
RNBMOD07
RNBMOD10
RNNCV013GO
RNNCV056GO
RNX-CV-GO
RNX-KV-GO
RNX-KV1-GO
RNX-PM-ER
RNX-PM-FS
SGX-AV-FA
SWN-MAN03
ZO1DG001TM
ZO1MOD01
ZO1MOD03
ZO1MOD04
ZO2DG002TM
ZO2MOD01
ZO2MOD04
ZOX-BL-ES
ZOX-DG-DR
ZOX-DG-DS
ZOX-PD-ER
ZOX-PD-ES
FSMOD255A
RNAEP01ASA
RNAEP01BSA
RNAEP022SA
RNBEP011SA
RNDEP023SA

SGX-CV-GO
SGX-MV-RP

The failure probabilities of these basic events are set to 1.0 and the drop option of SEN.EXE code is used to process the CDF cutset uncertainty.

Results

The calculations are performed on a personal computer using the SEN code for sensitivity analysis. The input file is taken from the AP1000 PRA CDF analysis. This file is CMTOT.OUT. The results of the sensitivity analysis are given in Tables 50-20 and 50-21.

Table 50-20 shows the contribution of the initiating events when no credit is taken for the above standby systems.

The output file contains 7269 cutsets. The top 50 of these cutsets are shown in Table 50-23.

This sensitivity analysis estimates that the CDF increases from 2.41E-07/year to 7.41E-06/year when no credit is taken for the standby systems CVS, SFS, RNS, DAS, and DGs.

These results are limited by the way the sensitivity analysis is performed. Namely, if a CDF cutset does not appear in the CMTOT.OUT file due to cutoff probability, then it is not resurrected in the present analysis.

50.5.5 Sensitivity to Standby Systems; Manual DAS Credited

This section documents the sensitivity analysis named as case 37, which is similar to case 36, except manual DAS is credited (automatic DAS is assumed failed). This sensitivity analysis is performed on the core damage frequency results of the AP1000 PRA internal events at-power. The objective of this analysis is to estimate the benefit of manual DAS actuation, when other standby nonsafety systems are assumed unavailable. These five standby nonsafety systems (which are taken credit for in the base AP1000 PRA) are:

1. Chemical and Volume Control System (CVS)
2. Startup Feedwater System (SFW)
3. Normal Residual Heat Removal System (RNS)
4. Automatic Diverse Actuation System (DAS) – excludes manual DAS
5. Diesel Generators (DG)

The process is similar to that of case 36, except the following basic events appearing in the plant CDF cutsets are not set to failure: REC-MANDAS, REC-MANDASC, MDAS, ATW-MAN04, ATW-MAN04C, and ATW-MAN06. This allows credit for manual DAS actuation to be retained.

The resulting plant CDF is 2.12E-06/yr. This result shows that crediting manual DAS reduces the case 36 CDF by a factor of 3.5. This is a worthwhile decrease, which justifies the administrative controls placed on manual DAS.

50.6 Results

Importance and sensitivity analyses are performed on the core damage model for internal initiating events at power. The results for individual cases have been discussed in their respective sections, whenever needed.

The major conclusions of the sensitivity analyses are:

- If no credit is taken for operator actions, the plant core damage frequency is 1.37E-05/year (case 29). This compares well with the risk of existing plants where credit is taken for operator actions.
- For system importances the most important systems for core damage prevention are PMS, Class 1E DC, ADS, and IRWST. None of the non-safety systems have high system importance.
- The common cause failure basic events are important individually, as well as a group for plant core damage frequency. This is expected for a plant with highly redundant safety systems.
- There are no operator actions that provide a significant risk decrease if made to be more reliable.
- When no credit is taken for standby systems CVS, SFS, RNS, DAS, and DGs, the plant core damage frequency increased by a factor of 31. While this is a significant increase, the plant core damage frequency is still low (7.41E-06/year). If manual DAS credit is retained in this case, the plant CDF becomes 2.12E-06/yr, which shows the benefit gained by the administrative controls placed on manual DAS.

Table 50-1

CORE DAMAGE FOR AT-POWER EVENTS CONTRIBUTION OF INITIATING EVENTS TO PLANT CORE DAMAGE FREQUENCY

	Initiating Event Category	Percent Contribution	Number of Cutsets	CDF Contribution	IEV Frequency
1	IEV-SI-LB	39.43	1160	9.50E-08	2.12E-04
2	IEV-LLOCA	18.66	286	4.50E-08	5.00E-06
3	IEV-SPADS	12.28	1078	2.96E-08	5.40E-05
4	IEV-SLOCA	7.5	1638	1.81E-08	5.00E-04
5	IEV-MLOCA	6.69	1681	1.61E-08	4.36E-04
6	IEV-RV-RP	4.15	1	1.00E-08	1.00E-08
7	IEV-SGTR	2.82	3076	6.79E-09	3.88E-03
8	IEV-CMTLB	1.53	987	3.68E-09	9.31E-05
9	IEV-ATWS	1.5	136	3.61E-09	*4.81E-01
10	IEV-TRANS	1.28	1500	3.08E-09	1.40E+00
11	IEV-RCSLK	0.71	1526	1.71E-09	6.20E-03
12	IEV-POWEX	0.69	701	1.66E-09	4.50E-03
13	IEV-LCOND	0.52	858	1.24E-09	1.12E-01
14	IEV-LOSP	0.4	530	9.58E-10	1.20E-01
15	IEV-LMFW	0.36	1334	8.70E-10	3.35E-01
16	IEV-ATW-T	0.3	13	7.12E-10	*1.17E+00
17	IEV-LCAS	0.28	417	6.72E-10	3.48E-02
18	IEV-SLB-V	0.25	305	6.06E-10	1.21E-03
19	IEV-PRSTR	0.21	317	5.02E-10	1.34E-04
20	IEV-LMFW1	0.19	763	4.53E-10	1.92E-01
21	IEV-LCCW	0.13	690	3.23E-10	1.44E-01
22	IEV-SLB-U	0.05	160	1.31E-10	3.72E-04
23	IEV-ATW-S	0.05	55	1.11E-10	*1.48E-02
24	IEV-ISLOC	0.02	1	5.00E-11	5.00E-11
25	IEV-LRCS	0.01	143	3.52E-11	1.80E-02
26	IEV-SLB-D	0	18	9.15E-12	5.96E-04
	TOTALS	100	19374	2.41E-07	*2.37

Note:

* The ATWS precursor frequencies are not included in the total initiating event frequency, since they are already accounted for in the other categories.

Table 50-2

CORE DAMAGE FOR AT-POWER EVENTS CONDITIONAL CORE DAMAGE PROBABILITY OF INITIATING EVENTS

	Initiating Event Category	CDF Contribution	Initiating Event Frequency	Conditional CDF
1	IEV-SI-LB	9.50E-08	2.12E-04	4.48E-04
2	IEV-LLOCA	4.50E-08	5.00E-06	8.99E-03
3	IEV-SPADS	2.96E-08	5.40E-05	5.48E-04
4	IEV-SLOCA	1.81E-08	5.00E-04	3.62E-05
5	IEV-MLOCA	1.61E-08	4.36E-04	3.70E-05
6	IEV-RV-RP	1.00E-08	1.00E-08	1.00E+00
7	IEV-SGTR	6.79E-09	3.88E-03	1.75E-06
8	IEV-CMTLB	3.68E-09	9.31E-05	3.95E-05
9	IEV-ATWS	3.61E-09	4.81E-01	7.49E-09
10	IEV-TRANS	3.08E-09	1.40E+00	2.20E-09
11	IEV-RCSLK	1.71E-09	6.20E-03	2.75E-07
12	IEV-POWEX	1.66E-09	4.50E-03	3.69E-07
13	IEV-LCOND	1.24E-09	1.12E-01	1.11E-08
14	IEV-LOSP	9.58E-10	1.20E-01	7.98E-09
15	IEV-LMFW	8.70E-10	3.35E-01	2.60E-09
16	IEV-ATW-T	7.12E-10	1.17E+00	6.09E-10
17	IEV-LCAS	6.72E-10	3.48E-02	1.93E-08
18	IEV-SLB-V	6.06E-10	1.21E-03	5.01E-07
19	IEV-PRSTR	5.02E-10	1.34E-04	3.74E-06
20	IEV-LMFW1	4.53E-10	1.92E-01	2.36E-09
21	IEV-LCCW	3.23E-10	1.44E-01	2.24E-09
22	IEV-SLB-U	1.31E-10	3.72E-04	3.51E-07
23	IEV-ATW-S	1.11E-10	1.48E-02	7.48E-09
24	IEV-ISLOC	5.00E-11	5.00E-11	1.00E+00
25	IEV-LRCS	3.52E-11	1.80E-02	1.96E-09
26	IEV-SLB-D	9.15E-12	5.96E-04	1.54E-08
	TOTALS	2.41E-07		

Table 50-3 (Sheet 1 of 5)

AP1000 PRA CORE DAMAGE FOR AT-POWER EVENTS ACCIDENT SEQUENCE IMPORTANCES

	Sequence Probability	Percent Contrib	Sequence Description	Sequence Identifier
1	6.88E-08	28.52	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	IEV-SI-LB
			RCPS TRIP AND CMT INJECTION IS SUCCESSFUL – 1 OF 2 CMT TRAINS	DEL-XCM1A
			SUCCESS OF FULL ADS DEPRESSURIZATION	DEL-ADM
			FAILURE OF ONE OF ONE IRWST INJECTION LINE	SYS-IW1A
2	4.26E-08	17.66	LARGE LOCA INITIATING EVENT OCCURS	IEV-LLOCA
			ANY ONE OF TWO ACCUMULATOR TRAINS FAIL	SYS-ACBOTH
3	2.13E-08	8.82	SPURIOUS ADS INITIATING EVENT OCCURS	IEV-SPADS
			SUCCESS OF 1/2 OR 2/2 ACCUMULATORS	DEL-AC2AB
			FAILURE OF ADS OR CMT	SYS-XADMA
4	1.98E-08	8.23	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	IEV-SI-LB
			RCPS TRIP AND CM T INJECTION IS SUCCESSFUL – 1 OF 2 CMT TRAINS	DEL-XCM1A
			FAILURE OF FULL ADS DEPRESSURIZATION	SYS-ADM
5	1.00E-08	4.15	REACTOR VESSEL RUPTURE INITIATING EVENT OCCURS	IEV-RV-RP
6	8.44E-09	3.5	SMALL LOCA INITIATING EVENT OCCURS	IEV-SLOCA
			SUCCESS OF CMT & RCP TRIP	DEL-XCM2SL
			SUCCESS OF PASSIVE RHR SYSTEM	DEL-PRL
			SUCCESS OF FULL ADS DEPRESSURIZATION	DEL-ADS
			FAILURE OF NORMAL RHR IN INJECTION MODE	SYS-RNR
			SUCCESS OF TWO OF TWO IRWST INJECTION LINES	DEL-IW2AB
			SUCCESS OF CIS & PRE-EXISTING CONTAINMENT OPENING	DEL-XCICPO
			FAILURE OF RECIRCULATION	SYS-RECIRC

Table 50-3 (Sheet 2 of 5)

AP1000 PRA CORE DAMAGE FOR AT-POWER EVENTS ACCIDENT SEQUENCE IMPORTANCES

	Sequence Probability	Percent Contrib	Sequence Description	Sequence Identifier
7	7.35E-09	3.05	MEDIUM LOCA INITIATING EVENT OCCURS	IEV-MLOCA
			SUCCESS OF CMT & RCP TRIP	DEL-XCM2NL
			SUCCESS OF FULL ADS DEPRESSURIZATION	DEL-ADM
			FAILURE OF NORMAL RHR IN INJECTION MODE	SYS-RNR
			SUCCESS OF TWO OF TWO IRWST INJECTION LINES	DEL-IW2AB
			SUCCESS OF CIS & PRE-EXISTING CONTAINMENT OPENING	DEL-XCICPO
			FAILURE OF RECIRCULATION	SYS-RECIRC
8	5.11E-09	2.12	SMALL LOCA INITIATING EVENT OCCURS	IEV-SLOCA
			SUCCESS OF CMT & RCP TRIP	DEL-XCM2SL
			SUCCESS OF PASSIVE RHR SYSTEM	DEL-PRL
			FAILURE OF FULL ADS DEPRESSURIZATION	SYS-ADS
			SUCCESS OF PARTIAL ADS DEPRESSURIZATION	DEL-ADV
			FAILURE OF NORMAL RHR IN INJECTION MODE	SYS-RNR
9	4.46E-09	1.85	MEDIUM LOCA INITIATING EVENT OCCURS	IEV-MLOCA
			SUCCESS OF CMT & RCP TRIP	DEL-XCM2NL
			FAILURE OF FULL ADS DEPRESSURIZATION	SYS-ADM
			SUCCESS OF PARTIAL ADS DEPRESSURIZATION	DEL-ADU
			FAILURE OF NORMAL RHR IN INJECTION MODE	SYS-RNR
10	3.72E-09	1.54	SPURIOUS ADS INITIATING EVENT OCCURS	IEV-SPADS
			FAILURE OF 2/2 ACCUMULATORS	SYS-AC2AB
11	3.67E-09	1.52	SPURIOUS ADS INITIATING EVENT OCCURS	IEV-SPADS
			SUCCESS OF 1/2 OR 2/2 ACCUMULATORS	DEL-AC2AB
			SUCCESS OF ADS & CMT	DEL-XADMA
			FAILURE OF IRW OR CMT	SYS-XIW2AB

Table 50-3 (Sheet 3 of 5)

AP1000 PRA CORE DAMAGE FOR AT-POWER EVENTS ACCIDENT SEQUENCE IMPORTANCES

	Sequence Probability	Percent Contrib	Sequence Description	Sequence Identifier
12	3.57E-09	1.48	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	IEV-SI-LB
			RCPS TRIP AND CMT INJECTION IS SUCCESSFUL – 1 OF 2 CMT TRAINS	DEL-XCM1A
			SUCCESS OF FULL ADS DEPRESSURIZATION	DEL-ADM
			IRWST INJECTION IS SUCCESSFUL – 1 OF 1 TRAINS	DEL-IW1A
			SUCCESS OF CIS & PRE-EXISTING CONTAINMENT OPENING	DEL-XCICPO
			FAILURE OF RECIRCULATION	SYS-RECIRC
13	3.55E-09	1.47	SGTR EVENT SEQUENCE CONTINUES	SYS-SGTRC
			FAILURE OF CMT OR RCP TRIP	SYS-XCM2SL
			SUCCESS OF PASSIVE RHR SYSTEM	DEL-PRL
			FAILURE OF FULL ADS DEPRESSURIZATION	SYS-ADT
			FAILURE OF PARTIAL ADS DEPRESSURIZATION	SYS-ADZ
14	3.31E-09	1.37	ATWS PRECURSOR WITH NO MFW EVENT SEQUENCE CONTINUES	SYS-ATWSC
			SUCCESS OF SFW OR PRHR SYSTEM	DEL-XSRT
			SUCCESS OF MANUAL REACTOR TRIP	DEL-RTSTP
			FAILURE OF MANUAL BORATION BY CVS	SYS-CSBOR1
			FAILURE OF CMT OR RCP TRIP	SYS-XCM2AB
15	3.30E-09	1.37	SMALL LOCA INITIATING EVENT OCCURS	IEV-SLOCA
			SUCCESS OF CMT & RCP TRIP	DEL-XCM2SL
			SUCCESS OF PASSIVE RHR SYSTEM	DEL-PRL
			SUCCESS OF FULL ADS DEPRESSURIZATION	DEL-ADS
			FAILURE OF NORMAL RHR IN INJECTION MODE	SYS-RNR
			FAILURE OF TWO OF TWO IRWST INJECTION LINES	SYS-IW2AB

Table 50-3 (Sheet 4 of 5)

AP1000 PRA CORE DAMAGE FOR AT-POWER EVENTS ACCIDENT SEQUENCE IMPORTANCES

	Sequence Probability	Percent Contrib	Sequence Description	Sequence Identifier
16	2.88E-09	1.19	MEDIUM LOCA INITIATING EVENT OCCURS	IEV-MLOCA
			SUCCESS OF CMT & RCP TRIP	DEL-XCM2NL
			SUCCESS OF FULL ADS DEPRESSURIZATION	DEL-ADM
			FAILURE OF NORMAL RHR IN INJECTION MODE	SYS-RNR
			FAILURE OF TWO OF TWO IRWST INJECTION LINES	SYS-IW2AB
17	2.19E-09	0.91	SGTR EVENT SEQUENCE CONTINUES	SYS-SGTRC
			SUCCESS OF CMT & RCP TRIP	DEL-XCM2SL
			SUCCESS OF PASSIVE RHR SYSTEM	DEL-PRL
			FAILURE OF FULL ADS DEPRESSURIZATION	SYS-ADS
			FAILURE OF PARTIAL ADS DEPRESSURIZATION	SYS-ADV
18	1.97E-09	0.82	LARGE LOCA INITIATING EVENT OCCURS	IEV-LLOCA
			ACCUMULATOR INJECTION IS SUCCESSFUL – 2 OF 2 TRAINS	DEL-ACBOTH
			FAILURE OF ADS OR CMT	SYS-XADMA
19	1.57E-09	0.65	CMT LINE BREAK INITIATING EVENT OCCURS	IEV-CMTLB
			RCPS TRIP AND CMT INJECTION IS SUCCESSFUL – 1 OF 2 CMT TRAINS	DEL-XCM1A
			SUCCESS OF FULL ADS DEPRESSURIZATION	DEL-ADM
			FAILURE OF NORMAL RHR IN INJECTION MODE	SYS-RNR
			SUCCESS OF TWO OF TWO IRWST INJECTION LINES	DEL-IW2AB
			SUCCESS OF CIS & PRE-EXISTING CONTAINMENT OPENING	DEL-XCICPO
			FAILURE OF RECIRCULATION	SYS-RECIRC

Table 50-3 (Sheet 5 of 5)

AP1000 PRA CORE DAMAGE FOR AT-POWER EVENTS ACCIDENT SEQUENCE IMPORTANCES

	Sequence Probability	Percent Contrib	Sequence Description	Sequence Identifier
20	1.41E-09	0.59	TRANSIENT WITH MFW INITIATING EVENT OCCURS	IEV-TRANS
			FAILURE OF MFW & SFW & PRHR SYSTEMS	SYS-XSTW
			SUCCESS OF CMT & RCP TRIP	DEL-XCM2AB
			FAILURE OF FULL ADS DEPRESSURIZATION	SYS-ADA
			FAILURE OF PARTIAL ADS DEPRESSURIZATION	SYS-AD1A
21	1.29E-09	0.54	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	IEV-SI-LB
			CMT INJECTION (1 OF 1 TRAINS) OR RCP TRIP FAILS	SYS-XCM1A
			SUCCESS OF FULL ADS DEPRESSURIZATION	DEL-ADQ
			FAILURE OF 1/1 ACCUMULATOR	SYS-AC1A
22	1.13E-09	0.47	CONSEQUENTIAL SGTR EVENT OCCURS	SYS-IECSGT
			SUCCESS OF CMT & RCP TRIP	DEL-XCM2SL
			SUCCESS OF PASSIVE RHR SYSTEM	DEL-PRL
			SUCCESS OF FULL ADS DEPRESSURIZATION	DEL-ADS
			FAILURE OF NORMAL RHR IN INJECTION MODE	SYS-RNR
			SUCCESS OF TWO OF TWO IRWST INJECTION LINES	DEL-IW2AB
			SUCCESS OF CIS & PRE-EXISTING CONTAINMENT OPENING	DEL-XCICPO
			FAILURE OF RECIRCULATION	SYS-RECIRC
23	9.98E-10	0.41	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	IEV-SI-LB
			CMT INJECTION (1 OF 1 TRAINS) OR RCP TRIP FAILS	SYS-XCM1A
			FAILURE OF FULL ADS DEPRESSURIZATION	SYS-ADQ
24	9.71E-10	0.4	CONSEQUENTIAL SGTR EVENT OCCURS	SYS-IECSGT
			SUCCESS OF CMT & RCP TRIP	DEL-XCM2SL
			SUCCESS OF PASSIVE RHR SYSTEM	DEL-PRL
			FAILURE OF FULL ADS DEPRESSURIZATION	SYS-ADS
			SUCCESS OF PARTIAL ADS DEPRESSURIZATION	DEL-ADV
			FAILURE OF NORMAL RHR IN INJECTION MODE	SYS-RNR

Table 50-4

CORE DAMAGE FOR AT-POWER EVENTS END STATE IMPORTANCES

End State	Frequency	Percent Contribution
3BE	8.06E-08	33.4%
3D	5.76E-08	23.9%
3BR	4.64E-08	19.2%
3BL	2.40E-08	9.9%
3C	1.00E-08	4.1%
6	9.52E-09	4.0%
1A	5.06E-09	2.1%
3A	4.43E-09	1.8%
1P	3.55E-09	1.5%
3E	8.27E-12	0.0%
5E	4.13E-12	0.0%
Total	2.41E-07	100.0%

Table 50-5 (Sheet 1 of 2)

COMMON CAUSE IMPORTANCES – RISK DECREASE[a]

Rel. Rank	Basic Event ID	Basic Event Description	Basic Event Probability	Risk Reduction Worth	Risk Decrease Percent
5	ADX-EV-SA2	CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	1.11E+00	9.55
7	REX-FL-GP	CCF PLUGGING OF BOTH RECIRC LINES DUE TO SUMP SCREENS	1.20E-05	1.08E+00	7.35
9	ADX-EV-SA	CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.00E-05	1.05E+00	4.92
10	IWX-CV-AO	CCF OF 4 GRAVITY INJECTION CVs	3.00E-05	1.05E+00	4.89
11	IWX-EV-SA	CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	2.60E-05	1.05E+00	4.31
18	IWX-XMTR	CCF OF IRWST LEVEL TRANSMITTERS	4.78E-04	1.03E+00	2.97
20	CCX-INPUT-LOGIC	CCF OF ESF INPUT LOGIC (HARDWARE)	1.03E-04	1.03E+00	2.84
22	RPX-CB-GO	CCF TO OPEN OF 4.16 KVAC CIRCUIT BREAKERS	4.20E-04	1.02E+00	2.13
23	CCX-AV-LA	CCF OF 4 AOVS TO OPEN	6.20E-05	1.02E+00	1.75
24	CCX-XMTR	CCF OF PRESSURE TRANSMITTERS	4.78E-04	1.02E+00	1.74
25	CCX-XMTR195	CCF OF PZR LEVEL SENSORS	4.78E-04	1.02E+00	1.68
32	ADX-MV3-GO	CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVS	3.24E-04	1.01E+00	1.39
33	CMX-CV-GO	CCF OF 4 CHECK VALVES TO OPEN	5.10E-05	1.01E+00	1.38
35	ACX-CV-GO	CCF OF 2 ACCUMULATOR CHECK VALVES	5.10E-05	1.01E+00	1.26
41	CMX-VS-FA	CCF OF CMT LEVEL SWITCHES	3.84E-05	1.01E+00	1.04
44	CCX-SFTW	CCF SOFTWARE - ALL CARDS	1.20E-06	1.01E+00	0.95
45	IWX-FL-GP	CCF OF STRAINERS IN IRWST TANK	1.20E-05	1.01E+00	0.9
46	CCX-PMXMOD1-SW	CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-05	1.01E+00	0.88
54	PXX-AV-LA1	FAILURE OF IRWST GUTTER DUE TO CCF OF AOVs	9.60E-05	1.01E+00	0.74
55	PXX-AV-LA	FAILURE OF PRHR DUE TO CCF OF AOVs	9.60E-05	1.01E+00	0.74

Table 50-5 (Sheet 2 of 2)

COMMON CAUSE IMPORTANCES – RISK DECREASE[a]

Rel. Rank	Basic Event ID	Basic Event Description	Basic Event Probability	Risk Reduction Worth	Risk Decrease Percent
56	CCX-BY-PN	CCF OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	1.01E+00	0.74
62	CCX-EP-SAM	CCF OF EPO BOARDS IN PMS (POWER INTERFACE OUTPUT BOARD)	8.62E-06	1.01E+00	0.69
69	IWX-EV1-SA	CCF OF 2 GRAVITY INJECTION SQUIB VALVES IN 1/1 LINES TO OPEN	5.80E-06	1.01E+00	0.51

CCF basic events above 0.5% risk decrease contribution are given above.

Note:
a. The relative rank numbers denote the ranking of the component failure in the overall core damage quantification importance ranking, including operator actions and initiating events.

Table 50-6 (Sheet 1 of 3)

COMMON CAUSE IMPORTANCES – RISK INCREASE[a]

Rel. Rank	Basic Event ID	Basic Event Description	Basic Event Probability	Risk Achievement Worth	Risk Increase Percent
4	CCX-SFTW	CCF SOFTWARE - ALL CARDS	1.20E-06	7.91E+03	7.91E+05
5	REX-FL-GP	CCF PLUGGING OF BOTH RECIRC LINES DUE TO SUMP SCREENS	1.20E-05	6.12E+03	6.12E+05
8	IWX-EV-SA	CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	2.60E-05	1.66E+03	1.66E+05
9	ADX-EV-SA	CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.00E-05	1.64E+03	1.64E+05
10	IWX-CV-AO	CCF OF 4 GRAVITY INJECTION CVs	3.00E-05	1.63E+03	1.63E+05
11	ADX-EV-SA2	CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	1.62E+03	1.62E+05
13	IWX-EV1-SA	CCF OF 2 GRAVITY INJECTION SQUIB VALVES IN 1/1 LINES TO OPEN	5.80E-06	8.81E+02	8.80E+04
14	IWX-CV1-AO	CCF OF GRAVITY INJECTION CVs IN 1/1 LINES TO OPEN	5.40E-07	8.77E+02	8.76E+04
15	CCX-PMXMOD1-SW	CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-05	8.01E+02	8.00E+04
16	CCX-EP-SAM	CCF OF EPO BOARDS IN PMS (POWER INTERFACE OUTPUT BOARD)	8.62E-06	7.98E+02	7.97E+04
17	IWX-FL-GP	CCF OF STRAINERS IN IRWST TANK	1.20E-05	7.47E+02	7.46E+04
18	CCX-AV-LA	CCF OF 4 AOVS TO OPEN	6.20E-05	2.83E+02	2.82E+04
19	CCX-INPUT-LOGIC	CCF OF ESF INPUT LOGIC (HARDWARE)	1.03E-04	2.76E+02	2.75E+04
20	CMX-VS-FA	CCF OF CMT LEVEL SWITCHES	3.84E-05	2.73E+02	2.72E+04
21	CMX-CV-GO	CCF OF 4 CHECK VALVES TO OPEN	5.10E-05	2.73E+02	2.72E+04
22	CCX-IN-LOGIC-SW	CCF OF ESF INPUT LOGIC SOFTWARE	1.10E-05	2.61E+02	2.60E+04
23	CCX-PMXMOD2-SW	CCF OF PMS ESF ACTUATION LOGIC SOFTWARE	1.10E-05	2.61E+02	2.60E+04
24	CMX-TK-AF	CCF OF TANKS	1.20E-07	2.55E+02	2.54E+04
25	ACX-CV-GO	CCF OF 2 ACCUMULATOR CHECK VALVES	5.10E-05	2.48E+02	2.47E+04

Table 50-6 (Sheet 2 of 3)

COMMON CAUSE IMPORTANCES – RISK INCREASE[(a)]

Rel. Rank	Basic Event ID	Basic Event Description	Basic Event Probability	Risk Achievement Worth	Risk Increase Percent
26	ACX-TK-AF	CCF FAILURE OF ACCUMULATOR TANKS	1.20E-07	2.47E+02	2.46E+04
28	CCX-BY-PN	CCF OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	1.58E+02	1.57E+04
31	PXX-AV-LA	FAILURE OF PRHR DUE TO CCF OF AOVs	9.60E-05	7.82E+01	7.72E+03
32	PXX-AV-LA1	FAILURE OF IRWST GUTTER DUE TO CCF OF AOVs	9.60E-05	7.82E+01	7.72E+03
35	IWX-XMTR	CCF OF IRWST LEVEL TRANSMITTERS	4.78E-04	6.30E+01	6.20E+03
37	ADX-MV3-GO	CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVS	3.24E-04	4.39E+01	4.29E+03
38	CCX-XMTR	CCF OF PRESSURE TRANSMITTERS	4.78E-04	3.73E+01	3.63E+03
39	CCX-XMTR195	CCF OF PZR LEVEL SENSORS	4.78E-04	3.61E+01	3.51E+03
51	RCX-RB-FA	CCF OF REACTOR TRIP BREAKERS	8.10E-06	2.00E+01	1.90E+03
54	CCX-PMXMOD4-SW	CCF OF SOFTWARE – MUX LOGIC GROUPS (CCX-P##MOD4-SW)	1.10E-05	1.54E+01	1.44E+03
61	CMX-AV-LA	CCF (DELTA) FOR 2 AOVS TO OPEN	9.60E-05	1.04E+01	9.43E+02
71	CCX-IV-XR	CCF OF THE INVERTER	2.40E-05	7.92E+00	6.92E+02
72	CCX-EP-SA	CCF OF THE POWER INTERFACE OUTPUT BOARD (CCX-EP-SA)	8.62E-06	6.85E+00	5.85E+02
76	CCX-PMS-HARDWARE	PMS REACTOR TRIP SYSTEM HARDWARE CCF	7.89E-05	5.89E+00	4.89E+02
88	CCX-TT-UF	CCF OF TEMPERATURE TRANSMITTERS (CCX-TT-UF)	1.17E-04	4.89E+00	3.89E+02
92	CCX-TRNSM	CCF NON-SAFETY TRANSMITTERS INTERFACING SYSTEM PRESSURE	4.78E-04	4.37E+00	3.37E+02
97	CCX-VS-FA	CCF OF CMT LEVEL SWITCHES (CMX-VS-FA)	3.84E-05	3.82E+00	2.82E+02
111	CIX-AV-LA	CCF OF ALL CI AOVS TO CLOSE	7.70E-04	2.30E+00	1.30E+02

Table 50-6 (Sheet 3 of 3)

COMMON CAUSE IMPORTANCES – RISK INCREASE[a]

Rel. Rank	Basic Event ID	Basic Event Description	Basic Event Probability	Risk Achievement Worth	Risk Increase Percent
112	CCX-XMTR1	CCF OF PRESSURE TRANSMITTERS FOLLOWING ACCIDENT (CCX-XMTR1)	4.78E-04	2.30E+00	1.30E+02
116	CCX-PMDMOD1	CCF OF OUTPUT LOGIC I/Os (CCX-P##MOD1)	1.41E-04	2.11E+00	1.11E+02
119	CCX-PMD030	CCF OF THE LOGIC GROUP PROCESSING (CCX-###03)	9.69E-05	2.10E+00	1.10E+02
121	ED1MOD113	FIXED COMPONENTS FAILURE	3.17E-04	2.04E+00	1.04E+02
122	ED1MOD11	FIXED COMPONENTS FAILURE	3.17E-04	2.04E+00	1.04E+02
123	CCX-BC-SA	CCF OF THE BATTERY CHARGERS	8.40E-06	2.02E+00	1.02E+02
124	CCX-PM-ER	DUE TO CCF TO RUN OF THE MOTOR PUMPS	1.40E-05	2.01E+00	1.01E+02

CCF basic events that increase the core damage frequency more than a factor of 2 (when they fail) are given above.

Note:
a. The relative rank numbers denote the ranking of the component failure in the overall core damage quantification importance ranking, including operator actions and initiating events.

Table 50-7 (Sheet 1 of 2)

HUMAN ERROR RISK IMPORTANCES – RISK DECREASE[a]

Rel. Rank	Basic Event ID	Basic Event Description	Basic Event Probability	Risk Reduction Worth	Risk Reduction Percent
17	REC-MANDASC	COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACT.)	5.06E-01	1.03E+00	3.18
19	REN-MAN04	OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRWST LEVEL SIGNAL FAILURE	1.00E-02	1.03E+00	2.92
29	ATW-MAN03	OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS	5.20E-02	1.02E+00	1.53
31	ATW-MAN04C	COND. PROB. OF ATW-MAN04 (OPER. FAILS TO TRIP REACTOR)	5.26E-01	1.02E+00	1.46
42	CIB-MAN00	COGNITIVE OPERATOR ERROR	1.84E-03	1.01E+00	0.98
43	ADN-MAN01	OPERATOR FAILS TO FULFILL MANUAL ACTUATION OF ADS	3.02E-03	1.01E+00	0.98
48	ADN-MAN01C	COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	5.00E-01	1.01E+00	0.83
52	REC-MANDAS	FAILURE OF MANUAL DAS ACT.	1.16E-02	1.01E+00	0.76
64	LPM-MAN01C	COND. PROB OF LPM-MAN01	5.00E-01	1.01E+00	0.63
65	LPM-MAN02	OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING MLOCA	3.30E-03	1.01E+00	0.62
71	ADF-MAN01	OPERATOR FAILS TO FULFILL MANUAL ACTUATION OF ADS	5.00E-01	1.00E+00	0.42
80	CVN-MAN00	FAILURE TO ALIGN CVCS IN AUX. SPRAY MODE	3.10E-03	1.00E+00	0.34
83	CIB-MAN01	OPERATOR ERROR TO CLOSE VALVES ON RUPTURED SG	1.34E-03	1.00E+00	0.31
85	ATW-MAN05	OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS	5.20E-03	1.00E+00	0.3
86	ATW-MAN06C	COND. PROB. OF ATW-MAN06 (OPER. FAILS TO TRIP REACTOR VIA DAS)	5.00E-01	1.00E+00	0.29
93	RHN-MAN01	OPERATOR FAILS TO ALIGN AND ACTUATE THE RNS	2.90E-03	1.00E+00	0.22
94	REG-MAN00	MANUALLY REGULATE FLOW TO SG "A"	2.04E-01	1.00E+00	0.22

Table 50-7 (Sheet 2 of 2)

HUMAN ERROR RISK IMPORTANCES – RISK DECREASE[(a)]

Rel. Rank	Basic Event ID	Basic Event Description	Basic Event Probability	Risk Reduction Worth	Risk Reduction Percent
102	LPM-MAN01	OPERATOR ERROR	1.34E-03	1.00E+00	0.17
129	OTH-SDMAN	OPERATOR FAILS TO SHUT DOWN REACTOR DURING ACCIDENT	7.70E-04	1.00E+00	0.07
170	SWN-MAN03	FAILURE OF OPERATOR TO REFILL BASIN	4.00E-02	1.00E+00	0.02
177	VWN-MAN01	OPERATOR FAILS TO RECOGNIZE NEED AND FAILS TO ALIGN STANDBY CHILLER DURING A LOCA	5.16E-03	1.00E+00	0.02
198	ATW-MAN01C	COND. PROB. OF ATW-MAN01 (OPER. FAILS TO STEP-IN CONTROL ROD	5.17E-01	1.00E+00	0.01
261	ATW-MAN04	OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA DAS	5.20E-02	1.00E+00	0.01
323	DUMP-MAN01	FAILURE TO CONTROL DUMP VALVES FOLLOWING AN STGR	1.32E-03	1.00E+00	0
356	CVN-MAN03	OPERATOR FAILURE TO ACTUATE PUMP "B" IF PUMP "A" FAILED	1.07E-03	1.00E+00	0
431	HPM-MAN01	FAILURE TO RECOGNIZE NEED FOR HIGH PRESS. HEAT REMOVAL	5.02E-04	1.00E+00	0
434	PRI-MAN01	OPERATOR ERROR TO ISOLATE PRHR	4.96E-04	1.00E+00	0
475	ATW-MAN01	OPERATOR FAILS TO STEP IN THE CONTROL RODS	3.30E-02	1.00E+00	0
582	CVN-MAN02	FAILURE TO MANUALLY ALIGN CVCS IN BORATION MODE	1.58E-03	1.00E+00	0
599	ATW-MAN06	OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA DAS	5.20E-03	1.00E+00	0

Note:

a. The relative rank numbers denote the ranking of the human error in the overall core damage quantification importance ranking, including component failures and initiating events, as shown in Chapter 33.

Table 50-8 (Sheet 1 of 2)

HUMAN ERROR RISK IMPORTANCES – RISK INCREASE[a]

Rel. Rank	Basic Event ID	Basic Event Description	Basic Event Probability	Risk Achievement Worth	Risk Increase Percent
73	CIB-MAN00	COGNITIVE OPERATOR ERROR	1.84E-03	6.34E+00	5.34E+02
93	ADN-MAN01	OPERATOR FAILS TO FULFILL MANUAL ACTUATION OF ADS	3.02E-03	4.25E+00	3.25E+02
95	REN-MAN04	OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRWST LEVEL SIGNAL FAILURE	1.00E-02	3.89E+00	2.89E+02
103	CIB-MAN01	OPERATOR ERROR TO CLOSE VALVES ON RUPTURED SG	1.34E-03	3.30E+00	2.30E+02
105	LPM-MAN02	OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING MLOCA	3.30E-03	2.89E+00	1.89E+02
113	LPM-MAN01	OPERATOR ERROR	1.34E-03	2.28E+00	1.28E+02
117	CVN-MAN00	FAILURE TO ALIGN CVCS IN AUX. SPRAY MODE	3.10E-03	2.11E+00	1.11E+02
129	OTH-SDMAN	OPERATOR FAILS TO SHUT DOWN REACTOR DURING ACCIDENT	7.70E-04	1.85E+00	8.45E+01
135	RHN-MAN01	OPERATOR FAILS TO ALIGN AND ACTUATE THE RNS	2.90E-03	1.77E+00	7.71E+01
174	REC-MANDAS	FAILURE OF MANUAL DAS ACT.	1.16E-02	1.65E+00	6.46E+01
180	ATW-MAN05	OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS	5.20E-03	1.57E+00	5.65E+01
208	ATW-MAN03	OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS	5.20E-02	1.28E+00	2.78E+01
313	VWN-MAN01	OPERATOR FAILS TO RECOGNIZE NEED AND FAILS TO ALIGN STANDBY CHILLER DURING A LOCA	5.16E-03	1.04E+00	3.70E+00
321	REC-MANDASC	COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACT.)	5.06E-01	1.03E+00	3.11E+00
363	DUMP-MAN01	FAILURE TO CONTROL DUMP VALVES FOLLOWING AN SGTR	1.32E-03	1.02E+00	2.05E+00
383	CVN-MAN03	OPERATOR FAILURE TO ACTUATE PUMP "B" IF PUMP "A" FAILED	1.07E-03	1.02E+00	1.69E+00

Table 50-8 (Sheet 2 of 2)

HUMAN ERROR RISK IMPORTANCES – RISK INCREASE[a]

Rel. Rank	Basic Event ID	Basic Event Description	Basic Event Probability	Risk Achievement Worth	Risk Increase Percent
411	ATW-MAN04C	COND. PROB. OF ATW-MAN04 (OPER. FAILS TO TRIP REACTOR)	5.26E-01	1.01E+00	1.32E+00
428	HPM-MAN01	FAILURE TO RECOGNIZE NEED FOR HIGH PRESS. HEAT REMOVAL	5.02E-04	1.01E+00	9.53E-01
432	PRI-MAN01	OPERATOR ERROR TO ISOLATE PRHR	4.96E-04	1.01E+00	9.34E-01
433	REG-MAN00	MANUALLY REGULATE FLOW TO SG "A"	2.04E-01	1.01E+00	8.46E-01
434	ADN-MAN01C	COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	5.00E-01	1.01E+00	8.29E-01
446	LPM-MAN01C	COND. PROB OF LPM-MAN01	5.00E-01	1.01E+00	6.32E-01
452	SWN-MAN03	FAILURE OF OPERATOR TO REFILL BASIN	4.00E-02	1.01E+00	5.31E-01
463	ADF-MAN01	OPERATOR FAILS TO FULFILL MANUAL ACTUATION OF ADS	5.00E-01	1.00E+00	4.21E-01
488	ATW-MAN06C	COND. PROB. OF ATW-MAN06 (OPER. FAILS TO TRIP REACTOR VIA DAS)	5.00E-01	1.00E+00	2.89E-01
522	ATW-MAN04	OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA DAS	5.20E-02	1.00E+00	1.17E-01
580	ATW-MAN01C	COND. PROB. OF ATW-MAN01 (OPER. FAILS TO STEP-IN CONTROL ROD)	5.17E-01	1.00E+00	1.19E-02
581	ATW-MAN01	OPERATOR FAILS TO STEP IN THE CONTROL RODS	3.30E-02	1.00E+00	7.23E-03
583	CVN-MAN02	FAILURE TO MANUALLY ALIGN CVCS IN BORATION MODE	1.58E-03	1.00E+00	6.51E-03
594	ATW-MAN06	OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA DAS	5.20E-03	1.00E+00	8.97E-04

Note:

a. The relative rank numbers denote the ranking of the human error in the overall core damage quantification importance ranking, including component failures and initiating events, as given in Chapter 33.

Table 50-9 (Sheet 1 of 2)

COMPONENT IMPORTANCES – RISK DECREASE[a]

Rel. Rank	Basic Event ID	Basic Event Description	Basic Event Probability	Risk Reduction Worth	Risk Reduction Percent
2	IWA-PLUG	IWRST DISCHARGE LINE "A" STRAINER PLUGGED	2.40E-04	1.27E+00	21.13
13	ACACV028GO	CHECK VALVE 028A FAILS TO OPEN	1.75E-03	1.04E+00	4.02
14	ACACV029GO	CHECK VALVE 029A FAILS TO OPEN	1.75E-03	1.04E+00	4.02
15	ACBCV029GO	CHECK VALVE 029B FAILS TO OPEN	1.75E-03	1.04E+00	3.8
16	ACBCV028GO	CHECK VALVE 028B FAILS TO OPEN	1.75E-03	1.04E+00	3.8
26	ACAOR001SP	FLOW TUNING ORIFICE PLUGS	7.27E-04	1.02E+00	1.67
27	ACBOR001SP	FLOW TUNING ORIFICE PLUGS	7.27E-04	1.02E+00	1.58
36	RN11MOD3	HARDWARE FAILURE OF ISOLATION MOV 011	1.41E-02	1.01E+00	1.1
37	RN22MOD4	HARDWARE FAILS TO OPEN MOV V022/CB FTC/RELAY FTC	1.41E-02	1.01E+00	1.1
38	RN23MOD5	HARDWARE FAILS TO OPEN MOV V023/CB FTC/RELAY FTC	1.41E-02	1.01E+00	1.1
39	RN55MOD1	MECHANICAL FAILURE OF RNS MOV V055	1.41E-02	1.01E+00	1.1
40	OTH-SGTR	CONSEQUENTIAL SGTR OCCURS	1.00E-02	1.01E+00	1.08
47	EC1BS001TM	UNAVAILABILITY OF BUS ECS ES 1 DUE TO UNSCHEDUL MAINTENANCE	2.70E-03	1.01E+00	0.84
49	OTH-SLSOV1	ANY SECOND. SIDE RELIEF VALVE FAILS TO CLOSE (2 SV + PORV)	2.10E-02	1.01E+00	0.81
50	CLP-UNAVAILABLE	CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS	1.00E-02	1.01E+00	0.78
51	EC1BS012TM	BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	1.01E+00	0.76
53	MDAS	UNAVAILABILITY GOAL FOR MANUAL DIVERSE ACTUATION SYSTEM	1.00E-02	1.01E+00	0.75

Table 50-9 (Sheet 2 of 2)

COMPONENT IMPORTANCES – RISK DECREASE[a]

Rel. Rank	Basic Event ID	Basic Event Description	Basic Event Probability	Risk Reduction Worth	Risk Reduction Percent
57	IWACV124AO	CHECK VALVE 124A FAILS TO OPEN	1.75E-03	1.01E+00	0.73
58	IWACV122AO	CHECK VALVE 122A FAILS TO OPEN	1.75E-03	1.01E+00	0.73
60	CMA-PLUG	FLOW TUNING ORIFICE PLUGS	7.27E-04	1.01E+00	0.7
63	OTH-PRSOV	EITHER PRZR SV FAILS TO RECLOSE	1.00E-02	1.01E+00	0.69
66	IRWMOD06	HARDWARE FAILURE OF VALVE 125A	1.46E-03	1.01E+00	0.61
67	IRWMOD05	HARDWARE FAILURE OF VALVE 123A	1.46E-03	1.01E+00	0.61
70	ED3MOD07	EDS3 EA 1 DISTR. PNL FAILURE OR T&M	3.05E-04	1.01E+00	0.49
72	DAS	UNAVAILABILITY GOAL FOR DAS	1.00E-02	1.00E+00	0.42
74	OTH-R05	FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES	7.00E-01	1.00E+00	0.4
75	CANTP011RI	FAILURE OF AIR COMPRESSOR TRANSMITTER	5.23E-03	1.00E+00	0.38
77	IWBRS123AFA	RELAY FAILS TO OPERATE	8.76E-04	1.00E+00	0.36
78	IWDRS125AFA	RELAY FAILS TO OPERATE	8.76E-04	1.00E+00	0.36
81	IDBBSDS1TM	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	1.00E+00	0.32
82	IDBBSDD1TM	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	1.00E+00	0.32

Note:

a. The relative rank numbers denote the ranking of the component failure in the overall core damage quantification importance ranking, including operator actions and initiating events.

Table 50-10 (Sheet 1 of 4)

COMPONENT IMPORTANCES – RISK INCREASE[a]

Rel. Rank	Basic Event ID	Basic Event Description	Basic Event Probability	Risk Achievement Worth	Risk Increase Percent
12	IWA-PLUG	IWRST DISCHARGE LINE "A" STRAINER PLUGGED	2.40E-04	8.81E+02	8.80E+04
33	PCNHR001ML	PLUG/LEAK OF PRHR HEAT EXCHANGER	2.40E-06	7.06E+01	6.96E+03
34	IWNTK001AF	FAILURE OF THE PRHR DUE TO IRWS TANK FAILURE	2.40E-06	7.06E+01	6.96E+03
41	ACAOR001SP	FLOW TUNING ORIFICE PLUGS	7.27E-04	2.40E+01	2.30E+03
42	ACACV028GO	CHECK VALVE 028A FAILS TO OPEN	1.75E-03	2.39E+01	2.29E+03
43	ACACV029GO	CHECK VALVE 029A FAILS TO OPEN	1.75E-03	2.39E+01	2.29E+03
44	ACATK001AF	ACCUMULATOR TANK A (T001A) RUPTURES	2.40E-06	2.39E+01	2.29E+03
45	ACAOR001EB	FLOW TUNING ORIFICE RUPTURES	7.20E-07	2.38E+01	2.28E+03
46	ACBOR001SP	FLOW TUNING ORIFICE PLUGS	7.27E-04	2.27E+01	2.17E+03
47	ACBTK001AF	ACCUMULATOR TANK B (T001B) RUPTURES	2.40E-06	2.27E+01	2.17E+03
48	ACBOR001EB	FLOW TUNING ORIFICE RUPTURES	7.20E-07	2.27E+01	2.17E+03
49	ACBCV029GO	CHECK VALVE 029B FAILS TO OPEN	1.75E-03	2.27E+01	2.17E+03
50	ACBCV028GO	CHECK VALVE 028B FAILS TO OPEN	1.75E-03	2.27E+01	2.17E+03
52	ED3MOD07	EDS3 EA 1 DISTR. PNL FAILURE OR T&M	3.05E-04	1.69E+01	1.59E+03
55	IDBBSDS1TM	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	1.17E+01	1.07E+03
56	IDBBSDD1TM	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	1.16E+01	1.06E+03
57	CMA-PLUG	FLOW TUNING ORIFICE PLUGS	7.27E-04	1.06E+01	9.62E+02

Table 50-10 (Sheet 2 of 4)

COMPONENT IMPORTANCES – RISK INCREASE[(a)]

Rel. Rank	Basic Event ID	Basic Event Description	Basic Event Probability	Risk Achievement Worth	Risk Increase Percent
58	CMATK002AF	CMT TANK T002A RUPTURES	2.40E-06	1.05E+01	9.53E+02
59	CMA-CV	CHECK VALVES V016A/017A FAIL TO OPEN	2.00E-06	1.05E+01	9.52E+02
60	CMAOR001EB	FLOW TUNING ORIFICE RUPTURES	7.20E-07	1.05E+01	9.47E+02
62	IDBFD013RQ	FUSE DISCONNECT SWITCH (FD13) SPURIOUSLY OPENS	1.20E-05	9.88E+00	8.88E+02
63	IDBBSDS1LF	BUS IDSB-DS-1 FAILS (ALL MODES)	4.80E-06	9.56E+00	8.56E+02
64	IDBBSDD1LF	BUS IDSB-DD-1 FAILS (ALL MODES)	4.80E-06	9.56E+00	8.56E+02
65	IDDBSDS1TM	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	9.54E+00	8.54E+02
66	IDDBSDD1TM	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	9.52E+00	8.52E+02
67	IDDFD019RQ	FUSE DISCONNECT SWITCH (FD19) SPURIOUSLY OPENS	1.20E-05	9.12E+00	8.12E+02
68	IDDBSDS1LF	BUS IDSD-DS-1 FAILS (ALL MODES)	4.80E-06	8.89E+00	7.89E+02
69	IDDBSDD1LF	BUS IDSD-DD-1 FAILS (ALL MODES)	4.80E-06	8.89E+00	7.89E+02
74	IDABSDS1TM	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	5.97E+00	4.97E+02
75	IDABSDD1TM	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	5.95E+00	4.95E+02
77	IDCBSDS1TM	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	5.54E+00	4.54E+02
78	IDCBSDD1TM	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	5.52E+00	4.52E+02
79	IDAFD003RQ	FUSE DISCONNECT SWITCH (FD3) SPURIOUSLY OPENS	1.20E-05	5.48E+00	4.48E+02
80	IDABSDD1LF	BUS IDSA-DD-1 FAILS (ALL MODES)	4.80E-06	5.37E+00	4.37E+02

Table 50-10 (Sheet 3 of 4)

COMPONENT IMPORTANCES – RISK INCREASE[a]

Rel. Rank	Basic Event ID	Basic Event Description	Basic Event Probability	Risk Achievement Worth	Risk Increase Percent
81	IDABSDS1LF	BUS IDSA-DS-1 FAILS (ALL MODES)	4.80E-06	5.37E+00	4.37E+02
82	IWBRS123AFA	RELAY FAILS TO OPERATE	8.76E-04	5.15E+00	4.15E+02
83	IWDRS125AFA	RELAY FAILS TO OPERATE	8.76E-04	5.15E+00	4.15E+02
84	IRWMOD06	HARDWARE FAILURE OF VALVE 125A	1.46E-03	5.15E+00	4.15E+02
85	IRWMOD05	HARDWARE FAILURE OF VALVE 123A	1.46E-03	5.15E+00	4.15E+02
86	IWACV124AO	CHECK VALVE 124A FAILS TO OPEN	1.75E-03	5.14E+00	4.14E+02
87	IWACV122AO	CHECK VALVE 122A FAILS TO OPEN	1.75E-03	5.14E+00	4.14E+02
89	IDCFD007RQ	FUSE DISCONNECT SWITCH (FD7) SPURIOUSLY OPENS	1.20E-05	4.84E+00	3.84E+02
90	IDCBSDS1LF	BUS IDSC-DS-1 FAILS (ALL MODES)	4.80E-06	4.69E+00	3.69E+02
91	IDCBSDD1LF	BUS IDSC-DD-1 FAILS (ALL MODES)	4.80E-06	4.69E+00	3.69E+02
94	EC1BS001TM	UNAVAILABILITY OF BUS ECS ES 1 DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	4.12E+00	3.12E+02
96	EC1BS012TM	BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	3.82E+00	2.82E+02
98	AD4MOD09	HARDWARE FAILURE OF ST. #4 LINE 3	5.80E-04	3.74E+00	2.74E+02
99	AD4MOD08	HARDWARE FAILURE OF ST. #4 LINE 2	5.80E-04	3.74E+00	2.74E+02
100	AD4MOD07	HARDWARE FAILURE OF ST. #4 LINE 1	5.80E-04	3.74E+00	2.74E+02
101	AD4MOD10	HARDWARE FAILURE OF ST. #4 LINE 4	5.80E-04	3.74E+00	2.74E+02

Table 50-10 (Sheet 4 of 4)

COMPONENT IMPORTANCES – RISK INCREASE[a]

Rel. Rank	Basic Event ID	Basic Event Description	Basic Event Probability	Risk Achievement Worth	Risk Increase Percent
102	EC1MOD12	FIXED COMPONENT FAULTS	4.80E-05	3.32E+00	2.32E+02
106	REA-PLUG	SUMP SCREEN "A" PLUGS AND PREVENTS FLOW	2.40E-04	2.73E+00	1.73E+02
107	REB-PLUG	SUMP SCREEN "B" PLUGS AND PREVENTS FLOW	2.40E-04	2.70E+00	1.70E+02
108	EC1BS001LF	MECHANICAL FAULT ON BUS ECS ES 1	4.80E-06	2.56E+00	1.56E+02
114	OTH-PO	PRE-EXISTING CONTAINMENT OPENING > 100 SQ CM	1.20E-04	2.28E+00	1.28E+02
118	ED1BSDS1TM	BUS EDS1 DS 1 UNAVAILABLE DUE TO CORRECTIVE MAINTENANCE	3.00E-04	2.10E+00	1.10E+02
120	OTH-SGTR	CONSEQUENTIAL SGTR OCCURS	1.00E-02	2.07E+00	1.07E+02
121	ED1MOD113	FIXED COMPONENTS FAILURE	3.17E-04	2.04E+00	1.04E+02
122	ED1MOD11	FIXED COMPONENTS FAILURE	3.17E-04	2.04E+00	1.04E+02

Note:

a. The relative rank numbers denote the ranking of the component failure in the overall core damage quantification importance ranking, including operator actions and initiating events.

Table 50-11 (Sheet 1 of 4)

LIST OF SYSTEMS FOR SYSTEM IMPORTANCE ANALYSES

Case Name	System Name	Case Description	Fault Trees	Basic Events
Case 9	ADS	No credit is taken for ADS in core damage sequences	All ADS fault trees	AD2MOD1, AD2MOD2, AD3MOD3, AD3MOD4, AD4MOD7, AD4MOD8, AD4MOD9, AD4MOD10, AND-MAN01, ADX-EV-SA, ADX-MV-GO, ADX-MV3-GO, ADX-EV-SA2, LPM-MAN01, LPM-MAN02
Case 10	CMT	No credit is taken for CMT in core damage sequences	All CMT fault trees	CCX-AV-LA, CMA-CV, CMA-PLUG, CMAAV014LA, CMAAV015LA, CMAOR001EB, CMATK002AF, CMB-PLUG, CMX-AV-LA, CMX-CV-GO, CMX-TK-AF, CMX-VS-FA
Case 11	ACC	No credit is taken for accumulators in core damage sequences	All accumulator fault trees	ACACV028GO, ACACV029GO, ACAOR001EB, ACAOR001SP, ACATK001AF, ACBCV028GO, ACBCV029GO, ACBOR001EB, ACBOR001SP, ACBTK001AF, ACX-CV-GO, ACX-TK-AF
Case 12	IRWST-INJ	No credit is taken for IRWST Injection in core damage sequences	IW2AB, IW1A	IWA-PLUG, IWACV122AO, IWACV124AO, IWB-PLUG, IWBCV122AO, IWBCV124AO, IWX-CV-AO, IWXCV1-AO, IWXFL-GP, IWX-EV1-SA, IRWMOD05, IRWMOD06, IRWMOD07, IRWMOD08
Case 13	IRWST-REC	No credit is taken for IRWST recirculation in core damage sequences	RECIRC, RECIRCP, RECIRCB, RECIRC1, RECIRC1P, RECIRC1B	REA-PLUG, REACV119GO, REB-PLUG, REBCV119GO, REX-FL-GP, IRCEP118ASA, IRDEP118BSA, IWX-EV2-SA, IWX-EV4-SA, IRWMOD09, IRWMOD10, IRWMOD11, IRWMOD12
Case 14	PRHR	No credit is taken for Passive RHR in core damage sequences	PRI, PRP PRT, PRTA, PRL, PRW, PRS	IWNTK001AF, PRAAV108LA, PRAAV108TM, PRBAV108LA, PRBAV108TM, PXX-AV-LA, PXX-AV-LA1, PRAAV130LA, PRAAV130TM, PRBAV130LA, PRBAV130TM, PRI-MAN01, PRAMOD9, PRAMOD10, PRBMOD10

Table 50-11 (Sheet 2 of 4)

LIST OF SYSTEMS FOR SYSTEM IMPORTANCE ANALYSES

Case Name	System Name	Case Description	Fault Trees	Basic Events
Case 15	PMS	No credit is taken for PMS in core damage sequences	All PMS fault trees	ATW-MAN01C, ATW-MAN03, ATW-MAN04C, ATW-MAN05, CCX-EP-SAM, CCX-PMS-HARDWARE, CCX-EAI, CCX-EAO, CCX-EP-SA, CCX-IN-LOGIC-SW, CCX-INPUT-LOGIC, CCX-PMA030, CCX-PMAEH0, CCX-PMAMOD1, CCX-PMAMOD4, CCX-PMB030, CCX-PMBMOD1, CCX-PMBMOD2, CCX-PMC030, CCX-PMCMOD1, CCX-PMD030, CCX-PMDEH0, CCX-PMDMOD1, CCX-PMDMOD2, CCX-PMDMOD4, CCX-PMDMOD4-SW, CCX-TT-UF, CCX-XMTR195, CIB-MAN00, CIB-MAN01, ALL-IND-FAIL
Case 16	PLS	No credit is taken for PLS in core damage sequences	All PLS fault trees	CCX-EP-SA, CCX-PLSMOD6, CCX-PL2MOD5, CCX-PL2MOD5-SW, CCX-PL903, CCX-PL9MOD1, CCX-PL9MOD1-SW, CCX-PL2MOD1, CCX-PL303, CCX-PL3MOD1, CCX-PL3MOD1-SW, CCX-PL3MOD5, CCX-PL3MOD5-SW, CCX-PLB03, CCX-PLBMOD1, CCX-PLMMOD4, CCX-PLMOD3, CCX-PLMOD3-SW, CCX-PLSMOD6-SW, ALL-IND-FAIL
Case 17	DAS	No credit is taken for DAS in core damage sequences	DAS, DAS1	DAS, MDAS, ATW-MAN04, ATW-MAN04C, ATW-MAN06, REC-MANDAS, REC-MANDASC, ALL-IND-FAIL
Case 18	N-RHR	No credit is taken for normal RHR in core damage sequences	RNR, RNN, RNH	RHN-MAN01, RN11MOD3, RN22MOD4, RN23MOD5, RNAMOD06, RNAMOD09, RNBMOD07, RNBMOD10, RNNCV013GO, RNX-CV-GO, RNX-KV-GO, RNX-PM-ER, RNX-PM-FS, RNAEP022SA, RNBEP011SA, RNDEP023SA, RN55MOD1, CLP-UNAVAILABLE, RNX-KV1-GO, RNAEP01ASA, RNAEP01BSA, RNNCV056GO

Table 50-11 (Sheet 3 of 4)

LIST OF SYSTEMS FOR SYSTEM IMPORTANCE ANALYSES

Case Name	System Name	Case Description	Fault Trees	Basic Events
Case 19	SG overfill protection	No credit is taken for SG overfill protection in core damage sequences	SGHL	***SEE NOTE***
Case 20	MFW	No credit is taken for MFW in core damage sequences	FWT, FWF	CONDVACUUM, MSX-AV4-FA, CDNTF01BRI, MSMODV001, MSMODV003, TCBMOD01B
Case 21	SFW	No credit is taken for SFW in core damage sequences	SFW, SFWT, SFW1, SFWP, SFWM, SFWA	FWMOD013A, FWMOD013B, FWMOD03A, FWMOD03B, FWX-MV2-GO, FWX-PM2-FS, SGX-MV-RP, SGX-AV-FA, FWX-PM2-ER, SGX-CV-GO
Case 22	AC	No credit is taken for AC Power in core damage sequences	All AC Power fault trees	EC0MOD01, EC1BS001LF, EC1BS001TM, EC1BS011TM, EC1BS012TM, EC1BS013TM, EC1BS111TM, EC1BS112TM, EC1BS121TM, EC1BS122TM, EC1BS131TM, EC1CB100RQ, EC1CB100VO, EC1MOD01, EC1MOD11, EC1MOD12, EC1MOD121, EC1MOD13, EC2BS002LF, EC2BS002TM, EC2BS021TM, EC2BS022TM, EC2BS023TM, EC2BS211TM, EC2BS212TM, EC2BS221TM, , EC2BS222TM, EC2BS231TM, EC2CB200VO, EC2MOD22, EC2MOD221, EC2MOD23, ECX-CB-GC, ECX-CB-GO
Case 23	DG	No credit is taken for diesel generators in core damage sequences	DGEN	ZO1DG001TM, ZO1MOD01, ZO1MOD03, ZO1MOD04, ZO2DG002TM, ZO2MOD01, ZO2MOD04, ZOX-BL-ES, ZOX-DG-DR, ZOX-DG-DS, ZOX-PD-ER, ZOX-PD-ES

Table 50-11 (Sheet 4 of 4)

LIST OF SYSTEMS FOR SYSTEM IMPORTANCE ANALYSES

Case Name	System Name	Case Description	Fault Trees	Basic Events
Case 24	DC-1E	No credit is taken for 1E DC power in core damage sequences	All 1E DC power fault trees	CCX-BC-SA, CCX-BY-PN, IDABSDD1LF, IDABSDD1TM, IDABSDK1LF, IDABSDK1TM, IDABSDS1LF, IDABSDS1TM, IDAFD003RQ, IDAFD004RQ, IDAMOD04, IDAMOD05, IDAMOD07, IDAMOD08, IDBBSDD1LF, IDBBSDD1TM, IDBBSDK1LF, IDBBSDK1TM, IDBBSDS1LF, IDBBSDS1TM, IDBFD013RQ, IDBMOD24, IDBMOD25, IDBMOD27, IDBMOD36, IDCBSDD1LF, IDCBSDD1TM, IDCBSDS1LF, IDCBSDS1TM, IDCFD007RQ, IDDBSDD1LF, IDDBSDD1TM, IDDBSDS1LF, IDDBSDS1TM, IDDFD019RQ, IDDMOD32, IDDMOD33, IDDMOD35, IDDMOD38
Case 25	DC-Non 1E	No credit is taken for Non-1E DC power in core damage sequences	All Non-1E DC power fault trees	CCX-BY-PN1, ED1BSDS1LF, ED1BSDS1TM, ED1MOD01, ED1MOD02, ED1MOD03, ED1MOD06, ED1MOD07, ED1MOD11, ED1MOD113, ED1MOD13, ED2BSDS1TM, ED2MOD03, ED2MOD11, ED3BSDS1TM, ED3MOD01, ED3MOD03, ED3MOD04, ED3MOD06, ED3MOD07, ED4BSDS1TM, ED4MOD03, ED4MOD11, ED4MOD112
Case 26	SWS	No credit is taken for SWS in core damage sequences	SWT, SWP, SWN	SWAMOD03, SWAMOD09T, SWB-001TM, SWBMOD02, SWX-PM-ER
Case 27	CCS	No credit is taken for CCS in core damage sequences	CCT, CCN, CCP	CCAMOD02, CCAMOD03, CCBMOD01
Case 28	CAS	No credit is taken for CAS in core damage sequences	CAIAIR, CAIR, CAIAIRP	CANTP011RI, CASMOD01, CASMOD02, CASMOD03, CASPPRUPT, CAX-CM-ER, CA9EPCMPASA

Note:
No basic events for Case 20: SG Overfill Protection events were not included in the file "CMTOT.OUT." These event probabilities were too low to be considered.

Table 50-12 (Sheet 1 of 2)

SYSTEM IMPORTANCE CALCULATION RESULTS

Case Name	System Name	Case Description	New Core Damage Frequency (Q_{NEW})	Core Damage Frequency Increasing Factor (R = QNEW/2.41E-7)[*]
Case 9	ADS	No credit is taken for ADS in core damage sequences	1.46E-03	6040
Case 10	CMT	No credit is taken for CMT in core damage sequences	7.08E-05	294
Case 11	ACC	No credit is taken for Accumulators in core damage sequences	6.01E-05	249
Case 12	IRWST-INJ	No credit is taken for IRWST Injection in core damage sequences	3.93E-04	1631
Case 13	IRWST-REC	No credit is taken for IRWST recirculation in core damage sequences	1.47E-03	6119
Case 14	PRHR	No credit is taken for passive RHR in core damage sequences	1.84E-05	76
Case 15	PMS	No credit is taken for PMS in core damage sequences	1.59E-02	65878
Case 16	PLS	No credit is taken for PLS in core damage sequences	9.00E-06	37
Case 17	DAS	No credit is taken for DAS in core damage sequences	3.89E-6	16
Case 18	N-RHR	No credit is taken for normal RHR in core damage sequences	4.11E-07	1.7
Case 19	SG Overfill Protection	No credit is taken for SG overfill protection in core damage sequences	2.41E-07	1.0
Case 20	MFW	No credit is taken for main feedwater in core damage sequences	2.54E-07	1.1

Table 50-12 (Sheet 2 of 2)

SYSTEM IMPORTANCE CALCULATION RESULTS

Case Name	System Name	Case Description	New Core Damage Frequency (Q_{NEW})	Core Damage Frequency Increasing Factor (R = QNEW/2.41E-7)(*)
Case 21	SFW	No credit is taken for startup feedwater in core damage sequences	2.78E-07	1.2
Case 22	AC	No credit is taken for AC power in core damage sequences	2.36E-06	10
Case 23	DG	No credit is taken for diesel generators in core damage sequences	2.56E-07	1.1
Case 24	DC-1E	No credit is taken for 1E DC power in core damage sequences	5.65E-03	23454
Case 25	DC-Non 1E	No credit is taken for Non-1E DC power in core damage sequences	6.56E-06	27
Case 26	SWS	No credit is taken for SWS in core damage sequences	4.00E-07	1.7
Case 27	CCS	No credit is taken for CCS in core damage sequences	3.78E-07	1.6
Case 28	CAS	No credit is taken for CAS in core damage sequences	4.14E-07	1.7

Note:

* Core damage frequency increasing factor (R) was calculated as the new core damage frequency ((Q_{NEW}) shown in this Table divided by the base case (2.41E-07). The core damage frequency of the base case was calculated in Chapter 33.

Table 50-13

SYSTEMS GROUPED BY PRA SYSTEM IMPORTANCE

Important			Medium Importance(*)	Marginally Important	
1E-02	1E-03	1E-04	1E-05	1E-06	1E-07
PMS	ADS	IRW-INJ	CMT	AC Power	SG Overfill Protection
	IRW-RECIRC		ACC		NRHR
	DC-1E		PRHR		MFW
			PLS		SFW
			NON DC-1E		DG
			DAS		SWS
					CCS
					CAS

Note:
* Core melt values greater than 5.0E-06 are conservatively classified in this column, since this column contains transition from marginally important category to important category.

Table 50-14

OPERATOR ACTIONS IN "CMTOT.OUT" FILE

31	ADF-MAN01	5.00E-01	0.00E+00
32	ADN-MAN01	3.02E-03	0.00E+00
33	*ADN-MAN01C	5.00E-01	0.00E+00
39	ATW-MAN01	3.30E-02	0.00E+00
40	*ATW-MAN01C	5.17E-01	0.00E+00
41	ATW-MAN03	5.20E-02	0.00E+00
42	ATW-MAN04	5.20E-02	0.00E+00
43	*ATW-MAN04C	5.26E-01	0.00E+00
44	ATW-MAN05	5.20E-03	0.00E+00
45	ATW-MAN06	5.20E-03	0.00E+00
46	*ATW-MAN06C	5.00E-01	0.00E+00
135	CIB-MAN00	1.84E-03	0.00E+00
136	CIB-MAN01	1.34E-03	0.00E+00
167	CVN-MAN00	3.10E-03	0.00E+00
168	CVN-MAN02	1.58E-03	0.00E+00
169	CVN-MAN03	1.07E-03	0.00E+00
175	DUMP-MAN01	1.32E-03	0.00E+00
254	HPM-MAN01	5.02E-04	0.00E+00
358	LPM-MAN01	1.34E-03	0.00E+00
359	*LPM-MAN01C	5.00E-01	0.00E+00
360	LPM-MAN02	3.30E-03	0.00E+00
383	OTH-SDMAN	7.70E-04	0.00E+00
489	PRI-MAN01	4.96E-04	0.00E+00
505	REC-MANDAS	1.16E-02	0.00E+00
506	*REC-MANDASC	5.06E-01	0.00E+00
507	REG-MAN00	2.04E-01	0.00E+00
508	REN-MAN04	1.00E-02	0.00E+00
510	RHN-MAN01	2.90E-03	0.00E+00
565	SWN-MAN03	4.00E-02	0.00E+00
580	VWN-MAN01	5.16E-03	0.00E+00

Note:
* denotes conditional HEPs

Table 50-15

CONTRIBUTION OF IEVS TO CORE DAMAGE FREQUENCY

	Initiating Event	Percent Contribution	CDF Contribution (A)	Base CDF Contribution (B)	Ratio (A/B)
1	IEV-SGTR	40.19	5.50E-06	6.79E-09	810
2	IEV-RCSLK	30.31	4.15E-06	1.71E-09	2425
3	IEV-ATWS	7.16	9.80E-07	3.61E-09	271
4	IEV-SLOCA	5.47	7.49E-07	1.81E-08	41
5	IEV-MLOCA	4.77	6.52E-07	1.61E-08	41
6	IEV-SI-LB	3.92	5.37E-07	9.5E-08	6
7	IEV-ATW-T	3.51	4.80E-07	7.12E-10	675
8	IEV-CMTLB	1.55	2.11E-07	3.68E-09	57
9	IEV-PRSTR	0.51	6.92E-08	5.02E-10	138
10	IEV-POWEX	0.47	6.48E-08	1.66E-09	39
11	IEV-SPADS	0.4	5.51E-08	2.96E-08	2
12	IEV-LLOCA	0.35	4.73E-08	4.5E-08	1
13	IEV-LOSP	0.33	4.55E-08	9.58E-10	48
14	IEV-TRANS	0.3	4.07E-08	3.08E-09	13
15	IEV-LCOND	0.22	2.99E-08	1.24E-09	24
16	IEV-LCAS	0.14	1.94E-08	6.72E-10	29
17	IEV-LMFW	0.1	1.40E-08	8.7E-10	16
18	IEV-SLB-V	0.1	1.40E-08	6.06E-10	23
19	IEV-RV-RP	0.07	1.00E-08	1E-08	1
20	IEV-LMFW1	0.04	6.15E-09	4.53E-10	14
21	IEV-ATW-S	0.03	4.41E-09	1.11E-10	40
22	IEV-LCCW	0.03	3.90E-09	3.23E-10	12
23	IEV-SLB-U	0.02	2.20E-09	1.31E-10	17
24	IEV-LRCS	0	3.65E-10	3.52E-11	10
25	IEV-SLB-D	0	2.45E-10	9.15E-12	27
26	IEV-ISLOC	0	5.00E-11	5E-11	1
	SUM	100.0	1.37E-05	2.41E-07	57

Table 50-16 (Sheet 1 of 2)

CASE 29 – TOP 50 DOMINANT CUTSETS

1	2.96E-06	2	IEV-RCSLK	IWX-XMTR	
2	1.85E-06	2	IEV-SGTR	IWX-XMTR	
3	1.63E-06	2	IEV-SGTR	RPX-CB-GO	
4	4.00E-07	2	IEV-SGTR	CCX-INPUT-LOGIC	
5	3.80E-07	3	IEV-ATWS	CCX-PMS-HARDWARE	DAS
6	3.66E-07	2	IEV-RCSLK	ADX-EV-SA2	
7	2.67E-07	3	IEV-ATW-T	CCX-XMTR	CCX-XMTR195
8	2.41E-07	2	IEV-SGTR	CCX-AV-LA	
9	2.39E-07	2	IEV-SLOCA	IWX-XMTR	
10	2.29E-07	2	IEV-SGTR	ADX-EV-SA2	
11	2.10E-07	2	IEV-SLOCA	RPX-CB-GO	
12	2.08E-07	2	IEV-MLOCA	IWX-XMTR	
13	1.98E-07	3	IEV-ATWS	CCX-PMS-HARDWARE	MSHTP002RI
14	1.98E-07	3	IEV-ATWS	CCX-PMS-HARDWARE	MSHTP001RI
15	1.98E-07	2	IEV-SGTR	CMX-CV-GO	
16	1.86E-07	2	IEV-RCSLK	ADX-EV-SA	
17	1.86E-07	2	IEV-RCSLK	IWX-CV-AO	
18	1.83E-07	2	IEV-MLOCA	RPX-CB-GO	
19	1.61E-07	2	IEV-RCSLK	IWX-EV-SA	
20	1.54E-07	2	IEV-SI-LB	CMA-PLUG	
21	1.16E-07	2	IEV-SGTR	IWX-CV-AO	
22	1.16E-07	2	IEV-SGTR	ADX-EV-SA	
23	1.10E-07	3	IEV-ATWS	CCX-XMTR	CCX-XMTR195
24	1.01E-07	2	IEV-SI-LB	IWX-XMTR	
25	1.01E-07	2	IEV-SGTR	IWX-EV-SA	
26	9.48E-08	3	IEV-ATW-T	RCX-RB-FA	DAS
27	8.90E-08	2	IEV-SI-LB	RPX-CB-GO	
28	7.44E-08	2	IEV-RCSLK	IWX-FL-GP	

Table 50-16 (Sheet 2 of 2)

CASE 29 – TOP 50 DOMINANT CUTSETS

29	7.44E-08	2	IEV-RCSLK	REX-FL-GP	
30	6.84E-08	3	IEV-SGTR	RC1CB053GO	RC1CB054GO
31	6.84E-08	3	IEV-SGTR	RC1CB061GO	RC1CB062GO
32	6.84E-08	3	IEV-SGTR	RC1CB051GO	RC1CB052GO
33	6.84E-08	3	IEV-SGTR	RC1CB063GO	RC1CB064GO
34	6.82E-08	2	IEV-RCSLK	CCX-PMXMOD1-SW	
35	6.77E-08	2	IEV-CMTLB	CMA-PLUG	
36	6.41E-08	2	IEV-PRSTR	IWX-XMTR	
37	5.34E-08	2	IEV-RCSLK	CCX-EP-SAM	
38	5.15E-08	2	IEV-SLOCA	CCX-INPUT-LOGIC	
39	5.09E-08	2	IEV-SI-LB	IWA-PLUG	
40	4.96E-08	3	IEV-ATW-T	RCX-RB-FA	MSHTP002RI
41	4.96E-08	3	IEV-ATW-T	RCX-RB-FA	MSHTP001RI
42	4.66E-08	2	IEV-SGTR	IWX-FL-GP	
43	4.66E-08	2	IEV-SGTR	REX-FL-GP	
44	4.49E-08	2	IEV-MLOCA	CCX-INPUT-LOGIC	
45	4.45E-08	2	IEV-CMTLB	IWX-XMTR	
46	4.27E-08	2	IEV-SGTR	CCX-PMXMOD1-SW	
47	3.91E-08	2	IEV-CMTLB	RPX-CB-GO	
48	3.90E-08	3	IEV-ATWS	RCX-RB-FA	DAS
49	3.34E-08	2	IEV-SGTR	CCX-EP-SAM	
50	3.10E-08	2	IEV-SLOCA	CCX-AV-LA	

Table 50-17 (Sheet 1 of 2)

CASE 30 – TOP 50 DOMINANT CUTSETS

	Cutset Prob.	Number of Basic Events	Cutset Identifier		
1	5.09E-08	2	IEV-SI-LB	IWA-PLUG	
2	1.25E-08	2	IEV-SI-LB	ADX-EV-SA2	
3	1.00E-08	1	IEV-RV-RP		
4	8.75E-09	2	IEV-LLOCA	ACACV029GO	
5	8.75E-09	2	IEV-LLOCA	ACACV028GO	
6	8.75E-09	2	IEV-LLOCA	ACBCV029GO	
7	8.75E-09	2	IEV-LLOCA	ACBCV028GO	
8	6.36E-09	2	IEV-SI-LB	IWX-CV-AO	
9	6.36E-09	2	IEV-SI-LB	ADX-EV-SA	
10	6.00E-09	2	IEV-SLOCA	REX-FL-GP	
11	5.56E-09	2	IEV-SPADS	CCX-INPUT-LOGIC	
12	5.51E-09	2	IEV-SI-LB	IWX-EV-SA	
13	5.23E-09	2	IEV-MLOCA	REX-FL-GP	
14	3.64E-09	2	IEV-LLOCA	ACAOR001SP	
15	3.64E-09	2	IEV-LLOCA	ACBOR001SP	
16	3.35E-09	2	IEV-SPADS	CCX-AV-LA	
17	3.19E-09	2	IEV-SPADS	ADX-EV-SA2	
18	2.75E-09	2	IEV-SPADS	CMX-CV-GO	
19	2.75E-09	2	IEV-SPADS	ACX-CV-GO	
20	2.54E-09	2	IEV-SI-LB	REX-FL-GP	
21	2.07E-09	2	IEV-SPADS	CMX-VS-FA	
22	1.62E-09	2	IEV-SPADS	IWX-CV-AO	
23	1.62E-09	2	IEV-SPADS	ADX-EV-SA	
24	1.40E-09	2	IEV-SPADS	IWX-EV-SA	
25	1.23E-09	2	IEV-SI-LB	IWX-EV1-SA	
26	1.12E-09	2	IEV-CMTLB	REX-FL-GP	

Table 50-17 (Sheet 2 of 2)

CASE 30 – TOP 50 DOMINANT CUTSETS

	Cutset Prob.	Number of Basic Events	Cutset Identifier		
27	6.49E-10	3	IEV-SI-LB	IWACV122AO	IWACV124AO
28	6.48E-10	2	IEV-SPADS	REX-FL-GP	
29	6.48E-10	2	IEV-SPADS	IWX-FL-GP	
30	5.94E-10	2	IEV-SPADS	CCX-IN-LOGIC-SW	
31	5.94E-10	2	IEV-SPADS	CCX-PMXMOD2-SW	
32	5.94E-10	2	IEV-SPADS	CCX-PMXMOD1-SW	
33	5.42E-10	3	IEV-SI-LB	IWACV122AO	IRWMOD06
34	5.42E-10	3	IEV-SI-LB	IRWMOD05	IWACV124AO
35	5.40E-10	3	IEV-POWEX	OTH-PRSOV	REX-FL-GP
36	5.15E-10	2	IEV-LLOCA	CCX-INPUT-LOGIC	
37	5.12E-10	3	IEV-TRANS	CCX-SFTW	ED3MOD07
38	4.65E-10	2	IEV-SPADS	CCX-EP-SAM	
39	4.52E-10	3	IEV-SI-LB	IRWMOD05	IRWMOD06
40	4.27E-10	3	IEV-SGTR	CCX-PMXMOD1-SW	MDAS
41	4.16E-10	3	IEV-SLOCA	ADX-EV-SA2	RN55MOD1
42	4.16E-10	3	IEV-SLOCA	ADX-EV-SA2	RN11MOD3
43	4.16E-10	3	IEV-SLOCA	ADX-EV-SA2	RN22MOD4
44	4.16E-10	3	IEV-SLOCA	ADX-EV-SA2	RN23MOD5
45	3.63E-10	3	IEV-MLOCA	ADX-EV-SA2	RN55MOD1
46	3.63E-10	3	IEV-MLOCA	ADX-EV-SA2	RN11MOD3
47	3.63E-10	3	IEV-MLOCA	ADX-EV-SA2	RN22MOD4
48	3.63E-10	3	IEV-MLOCA	ADX-EV-SA2	RN23MOD5
49	3.34E-10	3	IEV-SGTR	CCX-EP-SAM	MDAS
50	3.25E-10	3	IEV-SI-LB	IWACV122AO	IWDRS125AFA

Table 50-18 (Sheet 1 of 3)

CASE 31 – TOP 50 DOMINANT CUTSETS

	Cutset Prob.	Number of Basic Events	Cutset Identifier					
1	1.85E-07	3	IEV-SGTR	ALL-IND-FAIL	IWX-XMTR			
2	1.63E-07	3	IEV-SGTR	ALL-IND-FAIL	RPX-CB-GO			
3	5.09E-08	2	IEV-SI-LB	IWA-PLUG				
4	4.12E-08	5	IEV-SGTR	CIB-MAN01	RPX-CB-GO	REC-MANDASC	LPM-MAN01C	
5	4.12E-08	5	IEV-SGTR	CIB-MAN00	RPX-CB-GO	REC-MANDASC	ADN-MAN01C	
6	4.12E-08	5	IEV-SGTR	CIB-MAN00	RPX-CB-GO	REC-MANDASC	LPM-MAN01C	
7	4.00E-08	3	IEV-SGTR	ALL-IND-FAIL	CCX-INPUT-LOGIC			
8	2.96E-08	4	IEV-RCSLK	OTH-SDMAN	IWX-XMTR	REN-MAN04		
9	2.41E-08	3	IEV-SGTR	ALL-IND-FAIL	CCX-AV-LA			
10	2.39E-08	3	IEV-SLOCA	IWX-XMTR	REN-MAN04			
11	2.39E-08	3	IEV-SLOCA	ALL-IND-FAIL	IWX-XMTR			
12	2.29E-08	3	IEV-SGTR	ALL-IND-FAIL	ADX-EV-SA2			
13	2.10E-08	3	IEV-SLOCA	RPX-CB-GO	ALL-IND-FAIL			
14	2.08E-08	3	IEV-MLOCA	IWX-XMTR	REN-MAN04			
15	2.08E-08	3	IEV-MLOCA	ALL-IND-FAIL	IWX-XMTR			
16	2.06E-08	6	IEV-SGTR	CVN-MAN00	ADF-MAN01	RPX-CB-GO	REC-MANDASC	ADN-MAN01C
17	1.98E-08	3	IEV-SGTR	ALL-IND-FAIL	CMX-CV-GO			

Table 50-18 (Sheet 2 of 3)

CASE 31 – TOP 50 DOMINANT CUTSETS

	Cutset Prob.	Number of Basic Events	Cutset Identifier					
18	1.85E-08	4	IEV-SGTR	CIB-MAN01	IWX-XMTR	REN-MAN04		
19	1.85E-08	4	IEV-SGTR	CIB-MAN00	IWX-XMTR	REN-MAN04		
20	1.83E-08	3	IEV-MLOCA	RPX-CB-GO	ALL-IND-FAIL			
21	1.54E-08	3	IEV-SI-LB	CMA-PLUG	ALL-IND-FAIL			
22	1.34E-08	5	IEV-ATW-T	ATW-MAN05	CCX-XMTR	CCX-XMTR195	ATW-MAN06C	
23	1.25E-08	2	IEV-SI-LB	ADX-EV-SA2				
24	1.16E-08	3	IEV-SGTR	ALL-IND-FAIL	ADX-EV-SA			
25	1.16E-08	3	IEV-SGTR	ALL-IND-FAIL	IWX-CV-AO			
26	1.06E-08	4	IEV-SLOCA	RPX-CB-GO	REC-MANDASC	ADN-MAN01		
27	1.06E-08	4	IEV-SLOCA	RPX-CB-GO	REC-MANDASC	LPM-MAN01		
28	1.01E-08	3	IEV-SI-LB	IWX-XMTR	ALL-IND-FAIL			
29	1.01E-08	3	IEV-SI-LB	IWX-XMTR	REN-MAN04			
30	1.01E-08	5	IEV-SGTR	CIB-MAN00	REC-MANDASC	CCX-INPUT-LOGIC	LPM-MAN01C	
31	1.01E-08	5	IEV-SGTR	CIB-MAN00	REC-MANDASC	CCX-INPUT-LOGIC	ADN-MAN01C	
32	1.01E-08	3	IEV-SGTR	ALL-IND-FAIL	IWX-EV-SA			
33	1.00E-08	1	IEV-RV-RP					
34	9.48E-09	4	IEV-ATW-T	RCX-RB-FA	DAS	ALL-IND-FAIL		
35	9.27E-09	4	IEV-MLOCA	RPX-CB-GO	REC-MANDASC	LPM-MAN02		

Table 50-18 (Sheet 3 of 3)

CASE 31 – TOP 50 DOMINANT CUTSETS

	Cutset Prob.	Number of Basic Events	Cutset Identifier					
36	9.27E-09	4	IEV-MLOCA	RPX-CB-GO	REC-MANDASC	ADN-MAN01		
37	8.90E-09	3	IEV-SI-LB	RPX-CB-GO	ALL-IND-FAIL			
38	8.75E-09	2	IEV-LLOCA	ACBCV029GO				
39	8.75E-09	2	IEV-LLOCA	ACBCV028GO				
40	8.75E-09	2	IEV-LLOCA	ACACV028GO				
41	8.75E-09	2	IEV-LLOCA	ACACV029GO				
42	8.25E-09	5	IEV-SGTR	DUMP-MAN01	RPX-CB-GO	REC-MANDASC	ADN-MAN01	
43	8.25E-09	5	IEV-SGTR	DUMP-MAN01	RPX-CB-GO	REC-MANDASC	LPM-MAN01	
44	8.25E-09	5	IEV-SGTR	CIB-MAN01	RPX-CB-GO	REC-MANDASC	ADN-MAN01	
45	7.80E-09	4	IEV-SI-LB	CMA-PLUG	REC-MANDASC	ADN-MAN01		
46	7.80E-09	4	IEV-SI-LB	CMA-PLUG	REC-MANDASC	LPM-MAN02		
47	7.44E-09	3	IEV-RCSLK	OTH-SDMAN	REX-FL-GP			
48	6.84E-09	4	IEV-SGTR	ALL-IND-FAIL	RC1CB063GO	RC1CB064GO		
49	6.84E-09	4	IEV-SGTR	ALL-IND-FAIL	RC1CB051GO	RC1CB052GO		
50	6.84E-09	4	IEV-SGTR	ALL-IND-FAIL	RC1CB053GO	RC1CB054GO		
51	6.84E-09	4	IEV-SGTR	ALL-IND-FAIL	RC1CB061GO	RC1CB062GO		

Table 50-19

PASSIVE SYSTEM CHECK VALVES IN "CMTOT.OUT" FILE

Basic Event ID	Base Case Failure Probability (/d.)	New Failure Probability (/d.)
ACACV028GO	1.75E-03	1.75E-02
ACACV029GO	1.75E-03	1.75E-02
ACBCV028GO	1.75E-03	1.75E-02
ACBCV029GO	1.75E-03	1.75E-02
ACX-CV-GO	5.10E-05	5.10E-04
CMA-CV	2.00E-06	2.00E-05
CMB-CV	2.00E-06	2.00E-05
CMX-CV-GO	5.10E-05	5.10E-04
IWACV122AO	1.75E-03	1.75E-02
IWACV124AO	1.75E-03	1.75E-02
IWBCV122AO	1.75E-03	1.75E-02
IWBCV124AO	1.75E-03	1.75E-02
IWX-CV-AO	3.00E-05	3.00E-04
IWX-CV1-AO	5.40E-07	5.40E-06
REACV119GO	1.75E-03	1.75E-02
REBCV119GO	1.75E-03	1.75E-02

Table 50-20

SENSITIVITY CASE 36 – CONTRIBUTION OF INITIATING EVENTS TO CDF

	Initiating Event	Percent Contribution	Number of Cutsets	CDFContribution	IEV Frequency
1	IEV-TRANS	26.91	923	1.99E-06	1.40E+00
2	IEV-LOSP	23.72	61	1.76E-06	1.20E-01
3	IEV-RCSLK	16.45	53	1.22E-06	6.20E-03
4	IEV-SGTR	8.37	1080	6.20E-07	3.88E-03
5	IEV-LMFW	7.41	393	5.49E-07	3.35E-01
6	IEV-LMFW1	3.58	521	2.65E-07	1.92E-01
7	IEV-LCOND	3.14	169	2.33E-07	1.12E-01
8	IEV-LCCW	2.77	538	2.05E-07	1.44E-01
9	IEV-SLOCA	1.37	390	1.01E-07	5.00E-04
10	IEV-SI-LB	1.37	987	1.01E-07	2.12E-04
11	IEV-MLOCA	1.2	458	8.92E-08	4.36E-04
12	IEV-ATWS	0.81	22	6.02E-08	4.81E-01
13	IEV-LLOCA	0.61	280	4.50E-08	5.00E-06
14	IEV-SPADS	0.4	1016	2.96E-08	5.40E-05
15	IEV-SLB-V	0.37	112	2.78E-08	1.21E-03
16	IEV-LRCS	0.33	119	2.46E-08	1.80E-02
17	IEV-CMTLB	0.26	303	1.95E-08	9.31E-05
18	IEV-POWEX	0.21	192	1.52E-08	4.50E-03
19	IEV-SLB-D	0.17	7	1.24E-08	5.96E-04
20	IEV-RV-RP	0.14	1	1.00E-08	1.00E-08
21	IEV-LCAS	0.13	139	9.93E-09	3.48E-02
22	IEV-SLB-U	0.11	57	8.33E-09	3.72E-04
23	IEV-PRSTR	0.08	155	6.01E-09	1.34E-04
24	IEV-ATW-S	0.03	18	2.42E-09	1.48E-02
25	IEV-ATW-T	0.03	5	2.36E-09	1.17E+00
26	IEV-ISLOC	0	1	5.00E-11	5.00E-11
	SUM	**100.0**	**8000**	**7.41E-06**	**2.37E+00**

Table 50-21 (Sheet 1 of 8)

SENSITIVITY CASE 36 – TOP 50 CDF CUTSETS

Number	Cutset Prob.	Percent	Basic Event Name	Event Prob.	Identifier
1	1.68E-06	22.68	TRANSIENT WITH MFW INITIATING EVENT OCCURS	1.40E+00	IEV-TRANS
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
2	9.24E-07	12.47	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS	1.20E-01	IEV-LOSP
			FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES	7.00E-01	OTH-R05
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-05	CCX-PMXMOD1-SW
3	7.24E-07	9.77	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS	1.20E-01	IEV-LOSP
			FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES	7.00E-01	OTH-R05
			CCF OF EPO BOARDS IN PMS	8.62E-06	CCX-EP-SAM
4	4.07E-07	5.49	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAKERS	4.20E-04	RPX-CB-GO
			COND. PROB. OF ADN-MAN01 (OPER. FAILS TO ACT. ADS)	5.00E-01	ADN-MAN01C
5	4.02E-07	5.43	LOSS OF MAIN FEEDWATER INITIATING EVENT OCCURS	3.35E-01	IEV-LMFW
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
6	3.66E-07	4.94	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
7	2.30E-07	3.11	LOSS OF MFW TO ONE SG INITIATING EVENT OCCURS	1.92E-01	IEV-LMFW1
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW

Table 50-21 (Sheet 2 of 8)

SENSITIVITY CASE 36 – TOP 50 CDF CUTSETS

Number	Cutset Prob.	Percent	Basic Event Name	Event Prob.	Identifier
8	2.17E-07	2.93	TRANSIENT WITH MFW INITIATING EVENT OCCURS	1.40E+00	IEV-TRANS
			CCF NON-SAFETY TRANSMITTERS INTERFACING SYSTEM PRESSURE	4.78E-04	CCX-TRNSM
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVS	3.24E-04	ADX-MV3-GO
9	1.86E-07	2.51	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			CCF OF 4 GRAVITY INJECTION CVs	3.00E-05	IWX-CV-AO
10	1.86E-07	2.51	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.00E-05	ADX-EV-SA
11	1.73E-07	2.34	LOSS OF CCW/SW INITIATING EVENT OCCURS	1.44E-01	IEV-LCCW
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
12	1.61E-07	2.17	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	2.60E-05	IWX-EV-SA
13	1.34E-07	1.81	LOSS OF CONDENSER INITIATING EVENT OCCURS	1.12E-01	IEV-LCOND
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
14	1.01E-07	1.36	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS	1.20E-01	IEV-LOSP
			FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES	7.00E-01	OTH-R05
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW

Table 50-21 (Sheet 3 of 8)

SENSITIVITY CASE 36 – TOP 50 CDF CUTSETS

Number	Cutset Prob.	Percent	Basic Event Name	Event Prob.	Identifier
15	7.44E-08	1	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
16	7.44E-08	1	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	1.20E-05	REX-FL-GP
17	6.82E-08	0.92	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-05	CCX-PMXMOD1-SW
18	6.01E-08	0.81	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE OF 4 AOVS TO OPEN	6.20E-05	CCX-AV-LA
			COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	5.00E-01	ADN-MAN01C
19	5.34E-08	0.72	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			CCF OF EPO BOARDS IN PMS	8.62E-06	CCX-EP-SAM
20	5.19E-08	0.7	LOSS OF MAIN FEEDWATER INITIATING EVENT OCCURS	3.35E-01	IEV-LMFW
			CCF OF SAFETY PT LT CONTINUOSLY INTERFACING HIGH PRESSURE	4.78E-04	CCX-XMTR
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVS	3.24E-04	ADX-MV3-GO
21	5.19E-08	0.7	LOSS OF MAIN FEEDWATER INITIATING EVENT OCCURS	3.35E-01	IEV-LMFW
			CCF NON-SAFETY TRANSMITTERS INTERFACING SYSTEM PRESSURE	4.78E-04	CCX-TRNSM
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVS	3.24E-04	ADX-MV3-GO

Table 50-21 (Sheet 4 of 8)

SENSITIVITY CASE 36 – TOP 50 CDF CUTSETS

Number	Cutset Prob.	Percent	Basic Event Name	Event Prob.	Identifier
22	5.09E-08	0.69	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			IWRST DISCHARGE LINE "A" STRAINER PLUGGED	2.40E-04	IWA-PLUG
23	4.95E-08	0.67	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	5.10E-05	CMX-CV-GO
			COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	5.00E-01	ADN-MAN01C
24	4.27E-08	0.58	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-05	CCX-PMXMOD1-SW
25	3.34E-08	0.45	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			CCF OF EPO BOARDS IN PMS	8.62E-06	CCX-EP-SAM
26	3.00E-08	0.41	ATWS PRECURSOR WITH NO MFW INITIATING EVENT OCCURS	4.81E-01	IEV-ATWS
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
			OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS	5.20E-02	ATW-MAN03
27	2.97E-08	0.4	LOSS OF MFW TO ONE SG INITIATING EVENT OCCURS	1.92E-01	IEV-LMFW1
			CCF NON-SAFETY TRANSMITTERS INTERFACING SYSTEM PRESSURE	4.78E-04	CCX-TRNSM
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVS	3.24E-04	ADX-MV3-GO

Table 50-21 (Sheet 5 of 8)

SENSITIVITY CASE 36 – TOP 50 CDF CUTSETS

Number	Cutset Prob.	Percent	Basic Event Name	Event Prob.	Identifier
28	2.96E-08	0.4	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE	1.00E-02	REN-MAN04
29	2.95E-08	0.4	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
30	2.59E-08	0.35	LOSS OF CONDENSER INITIATING EVENT OCCURS	1.12E-01	IEV-LCOND
			ANY SECOND. SIDE RELIEF VALVE FAILS TO CLOSE (2 SV + PORV)	2.10E-02	OTH-SLSOV1
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-05	CCX-PMXMOD1-SW
31	2.57E-08	0.35	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
32	2.23E-08	0.3	LOSS OF CCW/SW INITIATING EVENT OCCURS	1.44E-01	IEV-LCCW
			CCF NON-SAFETY TRANSMITTERS INTERFACING SYSTEM PRESSURE	4.78E-04	CCX-TRNSM
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVS	3.24E-04	ADX-MV3-GO
33	2.16E-08	0.29	LOSS OF RSC FLOW INITIATING EVENT OCCURS	1.80E-02	IEV-LRCS
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
34	2.03E-08	0.27	LOSS OF CONDENSER INITIATING EVENT OCCURS	1.12E-01	IEV-LCOND
			ANY SECOND. SIDE RELIEF VALVE FAILS TO CLOSE (2 SV + PORV)	2.10E-02	OTH-SLSOV1
			CCF OF EPO BOARDS IN PMS	8.62E-06	CCX-EP-SAM

Table 50-21 (Sheet 6 of 8)

SENSITIVITY CASE 36 – TOP 50 CDF CUTSETS

Number	Cutset Prob.	Percent	Basic Event Name	Event Prob.	Identifier
35	2.01E-08	0.27	TRANSIENT WITH MFW INITIATING EVENT OCCURS	1.40E+00	IEV-TRANS
			CCF NON-SAFETY TRANSMITTERS INTERFACING SYSTEM PRESSURE	4.78E-04	CCX-TRNSM
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.00E-05	ADX-EV-SA
36	2.01E-08	0.27	TRANSIENT WITH MFW INITIATING EVENT OCCURS	1.40E+00	IEV-TRANS
			CCF NON-SAFETY TRANSMITTERS INTERFACING SYSTEM PRESSURE	4.78E-04	CCX-TRNSM
			CCF OF 4 GRAVITY INJECTION CVs	3.00E-05	IWX-CV-AO
37	1.74E-08	0.23	TRANSIENT WITH MFW INITIATING EVENT OCCURS	1.40E+00	IEV-TRANS
			CCF NON-SAFETY TRANSMITTERS INTERFACING SYSTEM PRESSURE	4.78E-04	CCX-TRNSM
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	2.60E-05	IWX-EV-SA
38	1.73E-08	0.23	LOSS OF CONDENSER INITIATING EVENT OCCURS	1.12E-01	IEV-LCOND
			CCF OF SAFETY PT LT CONTINUOSLY INTERFACING HIGH PRESSURE	4.78E-04	CCX-XMTR
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVS	3.24E-04	ADX-MV3-GO
39	1.73E-08	0.23	LOSS OF CONDENSER INITIATING EVENT OCCURS	1.12E-01	IEV-LCOND
			CCF NON-SAFETY TRANSMITTERS INTERFACING SYSTEM PRESSURE	4.78E-04	CCX-TRNSM
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVS	3.24E-04	ADX-MV3-GO

Table 50-21 (Sheet 7 of 8)

SENSITIVITY CASE 36 – TOP 50 CDF CUTSETS

Number	Cutset Prob.	Percent	Basic Event Name	Event Prob.	Identifier
40	1.50E-08	0.2	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.00E-05	ADX-EV-SA
41	1.50E-08	0.2	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 4 GRAVITY INJECTION CVs	3.00E-05	IWX-CV-AO
42	1.33E-08	0.18	MAIN STEAM LINE STUCK-OPEN SV INITIATING EVENT OCCURS	1.21E-03	IEV-SLB-V
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-05	CCX-PMXMOD1-SW
43	1.31E-08	0.18	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 4 GRAVITY INJECTION CVs	3.00E-05	IWX-CV-AO
44	1.31E-08	0.18	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.00E-05	ADX-EV-SA
45	1.30E-08	0.18	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	2.60E-05	IWX-EV-SA
46	1.25E-08	0.17	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
47	1.13E-08	0.15	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	2.60E-05	IWX-EV-SA

Table 50-21 (Sheet 8 of 8)

SENSITIVITY CASE 36 – TOP 50 CDF CUTSETS

Number	Cutset Prob.	Percent	Basic Event Name	Event Prob.	Identifier
48	1.04E-08	0.14	MAIN STEAM LINE STUCK-OPEN SV INITIATING EVENT OCCURS	1.21E-03	IEV-SLB-V
			CCF OF EPO BOARDS IN PMS	8.62E-06	CCX-EP-SAM
49	1.04E-08	0.14	LOSS OF MAIN FEEDWATER INITIATING EVENT OCCURS	3.35E-01	IEV-LMFW
			FAILURE OF PRHR DUE TO COMMON CAUSE OF AOVs	9.60E-05	PXX-AV-LA
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVS	3.24E-04	ADX-MV3-GO
50	1.04E-08	0.14	LOSS OF MAIN FEEDWATER INITIATING EVENT OCCURS	3.35E-01	IEV-LMFW
			PXX-AV-LA1	9.60E-05	PXX-AV-LA1
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVS	3.24E-04	ADX-MV3-GO

Table 50-22 (Sheet 1 of 13)

RISK IMPORTANCES SORTED BY BASIC EVENT IDENTIFICATION

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IRISK, REV.0

        RISK IMPORTANCE CALCULATIONS


        Input Filename        = cmtot.out
        Output Filename       = cmtot.imp


        CMF                   =  2.409E-07
        Number of Basic Events =   599
        Number of Cutsets     = 19374
```

	BASIC EVENT ID	CUTSETS	BEV PROB. Q	BIRN A	CMF0 B	CMF1	RINC	RDEC	RAW	RRW	FV
1	ACACV028GO	141	1.750E-03	5.536E-06	2.312E-07	5.767E-06	5.526E-06	9.688E-09	2.394E+01	1.042E+00	4.021E-02
2	ACACV029GO	141	1.750E-03	5.536E-06	2.312E-07	5.767E-06	5.526E-06	9.688E-09	2.394E+01	1.042E+00	4.021E-02
3	ACAOR001EB	7	7.200E-07	5.492E-06	2.409E-07	5.733E-06	5.492E-06	3.954E-12	2.380E+01	1.000E+00	1.641E-05
4	ACAOR001SP	95	7.270E-04	5.542E-06	2.369E-07	5.779E-06	5.538E-06	4.029E-09	2.399E+01	1.017E+00	1.672E-02
5	ACATK001AF	8	2.400E-06	5.505E-06	2.409E-07	5.746E-06	5.505E-06	1.321E-11	2.385E+01	1.000E+00	5.484E-05
6	ACBCV028GO	73	1.750E-03	5.230E-06	2.318E-07	5.462E-06	5.221E-06	9.153E-09	2.267E+01	1.039E+00	3.799E-02
7	ACBCV029GO	73	1.750E-03	5.230E-06	2.318E-07	5.462E-06	5.221E-06	9.153E-09	2.267E+01	1.039E+00	3.799E-02
8	ACBOR001EB	4	7.200E-07	5.228E-06	2.409E-07	5.469E-06	5.228E-06	3.764E-12	2.270E+01	1.000E+00	1.562E-05
9	ACBOR001SP	35	7.270E-04	5.237E-06	2.371E-07	5.474E-06	5.233E-06	3.807E-09	2.272E+01	1.016E+00	1.580E-02
10	ACBTK001AF	4	2.400E-06	5.228E-06	2.409E-07	5.469E-06	5.228E-06	1.255E-11	2.270E+01	1.000E+00	5.208E-05
11	ACX-CV-GO	179	5.100E-05	5.958E-05	2.379E-07	5.982E-05	5.957E-05	3.038E-09	2.483E+02	1.013E+00	1.261E-02
12	ACX-TK-AF	3	1.200E-07	5.918E-05	2.409E-07	5.942E-05	5.918E-05	7.102E-12	2.467E+02	1.000E+00	2.948E-05
13	AD1MOD05	6	5.640E-02	1.555E-12	2.409E-07	2.409E-07	1.467E-12	8.770E-14	1.000E+00	1.000E+00	3.640E-07
14	AD1MOD06	11	5.640E-02	1.251E-11	2.409E-07	2.409E-07	1.181E-11	7.057E-13	1.000E+00	1.000E+00	2.929E-06
15	AD2MOD01	75	5.640E-02	5.307E-10	2.409E-07	2.414E-07	5.008E-10	2.993E-11	1.002E+00	1.000E+00	1.242E-04
16	AD2MOD02	75	5.640E-02	5.307E-10	2.409E-07	2.414E-07	5.008E-10	2.993E-11	1.002E+00	1.000E+00	1.242E-04
17	AD3MOD03	75	5.640E-02	5.307E-10	2.409E-07	2.414E-07	5.008E-10	2.993E-11	1.002E+00	1.000E+00	1.242E-04
18	AD3MOD04	75	5.640E-02	5.307E-10	2.409E-07	2.414E-07	5.008E-10	2.993E-11	1.002E+00	1.000E+00	1.242E-04
19	AD4MOD07	510	5.800E-04	6.610E-07	2.405E-07	9.015E-07	6.606E-07	3.834E-10	3.742E+00	1.002E+00	1.591E-03
20	AD4MOD07A	16	8.760E-04	7.664E-10	2.409E-07	2.417E-07	7.658E-10	6.714E-13	1.003E+00	1.000E+00	2.787E-06
21	AD4MOD07C	42	8.760E-04	2.405E-09	2.409E-07	2.433E-07	2.402E-09	2.106E-12	1.010E+00	1.000E+00	8.743E-06
22	AD4MOD08	510	5.800E-04	6.610E-07	2.405E-07	9.015E-07	6.606E-07	3.834E-10	3.742E+00	1.002E+00	1.591E-03
23	AD4MOD08B	16	8.760E-04	7.664E-10	2.409E-07	2.417E-07	7.658E-10	6.714E-13	1.003E+00	1.000E+00	2.787E-06
24	AD4MOD08D	42	8.760E-04	2.405E-09	2.409E-07	2.433E-07	2.402E-09	2.106E-12	1.010E+00	1.000E+00	8.743E-06
25	AD4MOD09	510	5.800E-04	6.610E-07	2.405E-07	9.015E-07	6.606E-07	3.834E-10	3.742E+00	1.002E+00	1.591E-03
26	AD4MOD09A	16	8.760E-04	7.664E-10	2.409E-07	2.417E-07	7.658E-10	6.714E-13	1.003E+00	1.000E+00	2.787E-06
27	AD4MOD09C	42	8.760E-04	2.405E-09	2.409E-07	2.433E-07	2.402E-09	2.106E-12	1.010E+00	1.000E+00	8.743E-06
28	AD4MOD10	510	5.800E-04	6.610E-07	2.405E-07	9.015E-07	6.606E-07	3.834E-10	3.742E+00	1.002E+00	1.591E-03
29	AD4MOD10B	16	8.760E-04	7.664E-10	2.409E-07	2.417E-07	7.658E-10	6.714E-13	1.003E+00	1.000E+00	2.787E-06
30	AD4MOD10D	42	8.760E-04	2.405E-09	2.409E-07	2.433E-07	2.402E-09	2.106E-12	1.010E+00	1.000E+00	8.743E-06
31	ADF-MAN01	374	5.000E-01	2.029E-09	2.399E-07	2.419E-07	1.015E-09	1.015E-09	1.004E+00	1.004E+00	4.212E-03

Table 50-22 (Sheet 2 of 13)

RISK IMPORTANCES SORTED BY BASIC EVENT IDENTIFICATION

32	ADN-MAN01	680	3.020E-03	7.843E-07	2.386E-07	1.023E-06	7.820E-07	2.369E-09	4.246E+00	1.010E+00	9.832E-03
33	ADN-MAN01C	13	5.000E-01	3.993E-09	2.389E-07	2.429E-07	1.996E-09	1.996E-09	1.008E+00	1.008E+00	8.287E-03
34	ADX-EV-SA	1678	3.000E-05	3.949E-04	2.291E-07	3.952E-04	3.949E-04	1.185E-08	1.640E+03	1.052E+00	4.918E-02
35	ADX-EV-SA2	1607	5.900E-05	3.898E-04	2.179E-07	3.900E-04	3.898E-04	2.300E-08	1.619E+03	1.106E+00	9.547E-02
36	ADX-MV-GO	75	7.480E-04	6.857E-08	2.409E-07	3.094E-07	6.852E-08	5.129E-11	1.284E+00	1.000E+00	2.129E-04
37	ADX-MV3-GO	2324	3.240E-04	1.033E-05	2.376E-07	1.056E-05	1.032E-05	3.346E-09	4.385E+01	1.014E+00	1.389E-02
38	ALL-IND-FAIL	63	1.000E-06	7.487E-06	2.409E-07	7.728E-06	7.487E-06	7.487E-12	3.208E+01	1.000E+00	3.108E-05
39	ATW-MAN01	6	3.300E-02	1.802E-11	2.409E-07	2.409E-07	1.743E-11	5.947E-13	1.000E+00	1.000E+00	2.468E-06
40	ATW-MAN01C	9	5.170E-01	5.922E-11	2.409E-07	2.409E-07	2.860E-11	3.062E-11	1.000E+00	1.000E+00	1.271E-04
41	ATW-MAN03	104	5.200E-02	7.075E-08	2.372E-07	3.080E-07	6.707E-08	3.679E-09	1.278E+00	1.016E+00	1.527E-02
42	ATW-MAN04	26	5.200E-02	2.974E-10	2.409E-07	2.412E-07	2.819E-10	1.547E-11	1.001E+00	1.000E+00	6.419E-05
43	ATW-MAN04C	34	5.260E-01	6.695E-09	2.374E-07	2.441E-07	3.174E-09	3.522E-09	1.013E+00	1.015E+00	1.462E-02
44	ATW-MAN05	5	5.200E-03	1.369E-07	2.402E-07	3.771E-07	1.362E-07	7.118E-10	1.565E+00	1.003E+00	2.954E-03
45	ATW-MAN06	1	5.200E-03	2.173E-12	2.409E-07	2.409E-07	2.162E-12	1.130E-14	1.000E+00	1.000E+00	4.690E-08
46	ATW-MAN06C	1	5.000E-01	1.390E-09	2.402E-07	2.416E-07	6.950E-10	6.950E-10	1.003E+00	1.003E+00	2.885E-03
47	CA9EPCMPASA	10	1.710E-04	3.138E-09	2.409E-07	2.441E-07	3.137E-09	5.366E-13	1.013E+00	1.000E+00	2.227E-06
48	CABCM00BTM	20	1.500E-03	6.929E-10	2.409E-07	2.416E-07	6.919E-10	1.039E-12	1.003E+00	1.000E+00	4.314E-06
49	CANAV014LA	88	8.760E-03	7.581E-09	2.409E-07	2.484E-07	7.514E-09	6.641E-11	1.031E+00	1.000E+00	2.756E-04
50	CANCV015GC	415	2.450E-02	4.976E-09	2.408E-07	2.458E-07	4.854E-09	1.219E-10	1.020E+00	1.001E+00	5.060E-04
51	CANTP011RI	705	5.230E-03	1.770E-07	2.400E-07	4.170E-07	1.760E-07	9.255E-10	1.731E+00	1.004E+00	3.841E-03
52	CASMOD01	63	2.410E-03	4.384E-09	2.409E-07	2.453E-07	4.374E-09	1.057E-11	1.018E+00	1.000E+00	4.386E-05
53	CASMOD02	101	2.310E-02	9.210E-10	2.409E-07	2.418E-07	8.997E-10	2.128E-11	1.004E+00	1.000E+00	8.831E-05
54	CASMOD03	10	2.310E-02	6.295E-11	2.409E-07	2.410E-07	6.150E-11	1.454E-12	1.000E+00	1.000E+00	6.036E-06
55	CASPPRUPT	6	2.000E-06	1.198E-07	2.409E-07	3.607E-07	1.198E-07	2.396E-13	1.497E+00	1.000E+00	9.945E-07
56	CAX-CM-ER	58	1.200E-04	1.556E-07	2.409E-07	3.965E-07	1.556E-07	1.867E-11	1.646E+00	1.000E+00	7.749E-05
57	CCAMOD02	1	7.100E-03	1.352E-11	2.409E-07	2.409E-07	1.343E-11	9.600E-14	1.000E+00	1.000E+00	3.985E-07
58	CCAMOD03	26	6.140E-04	7.159E-09	2.409E-07	2.481E-07	7.155E-09	4.396E-12	1.030E+00	1.000E+00	1.825E-05
59	CCBMOD01	48	4.800E-02	2.259E-10	2.409E-07	2.411E-07	2.150E-10	1.084E-11	1.001E+00	1.000E+00	4.500E-05
60	CCX-AV-LA	133	6.200E-05	6.786E-05	2.367E-07	6.810E-05	6.786E-05	4.207E-09	2.827E+02	1.018E+00	1.746E-02
61	CCX-BC-SA	7	8.400E-06	2.451E-07	2.409E-07	4.860E-07	2.451E-07	2.059E-12	2.017E+00	1.000E+00	8.545E-06
62	CCX-BL-ER	2	1.200E-05	1.041E-07	2.409E-07	3.450E-07	1.041E-07	1.249E-12	1.432E+00	1.000E+00	5.184E-06
63	CCX-BY-PN	968	4.700E-05	3.777E-05	2.391E-07	3.801E-05	3.777E-05	1.775E-09	1.578E+02	1.007E+00	7.368E-03
64	CCX-BY-PN1	5	5.700E-05	4.589E-09	2.409E-07	2.455E-07	4.589E-09	2.616E-13	1.019E+00	1.000E+00	1.086E-06
65	CCX-EAI	10	1.270E-05	1.357E-07	2.409E-07	3.767E-07	1.357E-07	1.724E-12	1.563E+00	1.000E+00	7.155E-06
66	CCX-EAO	10	3.230E-06	1.361E-07	2.409E-07	3.770E-07	1.361E-07	4.396E-13	1.565E+00	1.000E+00	1.825E-06
67	CCX-EP-SA	46	8.620E-06	1.410E-06	2.409E-07	1.651E-06	1.410E-06	1.215E-11	6.853E+00	1.000E+00	5.045E-05
68	CCX-EP-SAM	298	8.620E-06	1.921E-04	2.393E-07	1.923E-04	1.921E-04	1.656E-09	7.983E+02	1.007E+00	6.873E-03
69	CCX-HE-AF	4	1.200E-06	1.080E-07	2.409E-07	3.489E-07	1.080E-07	1.296E-13	1.448E+00	1.000E+00	5.379E-07
70	CCX-IN-LOGIC-SW	22	1.100E-05	6.269E-05	2.402E-07	6.293E-05	6.269E-05	6.896E-10	2.612E+02	1.003E+00	2.862E-03
71	CCX-INPUT-LOGIC	43	1.030E-04	6.635E-05	2.341E-07	6.659E-05	6.635E-05	6.834E-09	2.764E+02	1.029E+00	2.837E-02
72	CCX-IV-XR	160	2.400E-05	1.666E-06	2.409E-07	1.907E-06	1.666E-06	3.999E-11	7.915E+00	1.000E+00	1.660E-04
73	CCX-IV-XR1	6	2.400E-05	8.821E-09	2.409E-07	2.497E-07	8.821E-09	2.117E-13	1.037E+00	1.000E+00	8.787E-07
74	CCX-PL2MOD1	4	1.410E-04	3.546E-09	2.409E-07	2.445E-07	3.546E-09	5.000E-13	1.015E+00	1.000E+00	2.075E-06
75	CCX-PL2MOD5	41	6.980E-05	1.527E-07	2.409E-07	3.936E-07	1.527E-07	1.066E-11	1.634E+00	1.000E+00	4.425E-05
76	CCX-PL2MOD5-SW	10	1.100E-05	1.359E-07	2.409E-07	3.768E-07	1.359E-07	1.495E-12	1.564E+00	1.000E+00	6.204E-06
77	CCX-PL303	41	9.690E-05	1.757E-07	2.409E-07	4.166E-07	1.757E-07	1.702E-11	1.729E+00	1.000E+00	7.066E-05
78	CCX-PL3EH0	2	4.030E-06	1.040E-07	2.409E-07	3.449E-07	1.040E-07	4.190E-13	1.432E+00	1.000E+00	1.739E-06
79	CCX-PL3MOD1	59	1.410E-04	1.888E-07	2.409E-07	4.297E-07	1.888E-07	2.662E-11	1.784E+00	1.000E+00	1.105E-04

Table 50-22 (Sheet 3 of 13)

RISK IMPORTANCES SORTED BY BASIC EVENT IDENTIFICATION

80	CCX-PL3MOD1-SW	2	1.100E-05	1.040E-07	2.409E-07	3.449E-07	1.040E-07	1.144E-12	1.432E+00	1.000E+00	4.748E-06
81	CCX-PL3MOD5	40	6.980E-05	1.511E-07	2.409E-07	3.920E-07	1.511E-07	1.055E-11	1.627E+00	1.000E+00	4.378E-05
82	CCX-PL3MOD5-SW	10	1.100E-05	1.359E-07	2.409E-07	3.768E-07	1.359E-07	1.495E-12	1.564E+00	1.000E+00	6.204E-06
83	CCX-PL403	47	9.690E-05	1.745E-07	2.409E-07	4.154E-07	1.745E-07	1.691E-11	1.724E+00	1.000E+00	7.019E-05
84	CCX-PL4EHO	14	4.030E-06	1.608E-07	2.409E-07	4.017E-07	1.608E-07	6.480E-13	1.667E+00	1.000E+00	2.690E-06
85	CCX-PL4MOD1	49	1.410E-04	1.757E-07	2.409E-07	4.166E-07	1.757E-07	2.477E-11	1.729E+00	1.000E+00	1.028E-04
86	CCX-PL4MOD1-SW	19	1.100E-05	1.682E-07	2.409E-07	4.091E-07	1.682E-07	1.850E-12	1.698E+00	1.000E+00	7.680E-06
87	CCX-PL903	53	9.690E-05	1.551E-07	2.409E-07	3.960E-07	1.550E-07	1.502E-11	1.644E+00	1.000E+00	6.236E-05
88	CCX-PL9MOD1	61	1.410E-04	1.557E-07	2.409E-07	3.966E-07	1.557E-07	2.196E-11	1.646E+00	1.000E+00	9.115E-05
89	CCX-PL9MOD1-SW	10	1.100E-05	1.359E-07	2.409E-07	3.768E-07	1.359E-07	1.495E-12	1.564E+00	1.000E+00	6.204E-06
90	CCX-PLA03	4	9.690E-05	2.341E-09	2.409E-07	2.433E-07	2.340E-09	2.268E-13	1.010E+00	1.000E+00	9.414E-07
91	CCX-PLAMOD1	6	1.410E-04	2.527E-09	2.409E-07	2.434E-07	2.527E-09	3.563E-13	1.010E+00	1.000E+00	1.479E-06
92	CCX-PLB03	19	9.690E-05	3.260E-08	2.409E-07	2.735E-07	3.260E-08	3.159E-12	1.135E+00	1.000E+00	1.311E-05
93	CCX-PLBEHO	4	4.030E-06	2.779E-08	2.409E-07	2.687E-07	2.779E-08	1.120E-13	1.115E+00	1.000E+00	4.649E-07
94	CCX-PLBMOD1	23	1.410E-04	3.295E-08	2.409E-07	2.739E-07	3.295E-08	4.646E-12	1.137E+00	1.000E+00	1.929E-05
95	CCX-PLBMOD1-SW	6	1.100E-05	3.004E-08	2.409E-07	2.710E-07	3.004E-08	3.304E-13	1.125E+00	1.000E+00	1.371E-06
96	CCX-PLD03	1	9.690E-05	1.847E-09	2.409E-07	2.428E-07	1.847E-09	1.790E-13	1.008E+00	1.000E+00	7.430E-07
97	CCX-PLDMOD1	1	1.410E-04	1.851E-09	2.409E-07	2.428E-07	1.851E-09	2.610E-13	1.008E+00	1.000E+00	1.083E-06
98	CCX-PLMMOD4	31	4.980E-05	1.736E-07	2.409E-07	4.145E-07	1.736E-07	8.645E-12	1.720E+00	1.000E+00	3.588E-05
99	CCX-PLMMOD4-SW	20	1.100E-05	1.694E-07	2.409E-07	4.104E-07	1.694E-07	1.864E-12	1.703E+00	1.000E+00	7.736E-06
100	CCX-PLMOD3	54	1.030E-04	1.552E-07	2.409E-07	3.961E-07	1.552E-07	1.598E-11	1.644E+00	1.000E+00	6.634E-05
101	CCX-PLMOD3-SW	10	1.100E-05	1.359E-07	2.409E-07	3.768E-07	1.359E-07	1.495E-12	1.564E+00	1.000E+00	6.204E-06
102	CCX-PLSMOD6	84	2.530E-04	1.636E-07	2.409E-07	4.045E-07	1.636E-07	4.140E-11	1.679E+00	1.000E+00	1.718E-04
103	CCX-PLSMOD6-SW	10	1.100E-05	1.359E-07	2.409E-07	3.768E-07	1.359E-07	1.495E-12	1.564E+00	1.000E+00	6.204E-06
104	CCX-PM-ER	14	1.400E-05	2.430E-07	2.409E-07	4.839E-07	2.430E-07	3.402E-12	2.009E+00	1.000E+00	1.412E-05
105	CCX-PMA030	105	9.690E-05	2.354E-07	2.409E-07	4.763E-07	2.354E-07	2.281E-11	1.977E+00	1.000E+00	9.467E-05
106	CCX-PMAEHO	14	4.030E-06	1.608E-07	2.409E-07	4.017E-07	1.608E-07	6.480E-13	1.667E+00	1.000E+00	2.690E-06
107	CCX-PMAMOD1	124	1.410E-04	2.388E-07	2.409E-07	4.797E-07	2.387E-07	3.367E-11	1.991E+00	1.000E+00	1.397E-04
108	CCX-PMAMOD2	51	3.040E-04	4.041E-08	2.409E-07	2.813E-07	4.040E-08	1.229E-11	1.168E+00	1.000E+00	5.099E-05
109	CCX-PMAMOD4	29	4.980E-05	1.716E-07	2.409E-07	4.125E-07	1.716E-07	8.544E-12	1.712E+00	1.000E+00	3.546E-05
110	CCX-PMB030	63	9.690E-05	9.547E-08	2.409E-07	3.364E-07	9.546E-08	9.251E-12	1.396E+00	1.000E+00	3.840E-05
111	CCX-PMBMOD1	75	1.410E-04	9.720E-08	2.409E-07	3.381E-07	9.719E-08	1.371E-11	1.403E+00	1.000E+00	5.689E-05
112	CCX-PMBMOD2	51	3.040E-04	4.041E-08	2.409E-07	2.813E-07	4.040E-08	1.229E-11	1.168E+00	1.000E+00	5.099E-05
113	CCX-PMC030	43	9.690E-05	4.605E-08	2.409E-07	2.870E-07	4.605E-08	4.462E-12	1.191E+00	1.000E+00	1.852E-05
114	CCX-PMCMOD1	53	1.410E-04	4.766E-08	2.409E-07	2.886E-07	4.765E-08	6.720E-12	1.198E+00	1.000E+00	2.789E-05
115	CCX-PMCMOD2	51	3.040E-04	4.041E-08	2.409E-07	2.813E-07	4.040E-08	1.229E-11	1.168E+00	1.000E+00	5.099E-05
116	CCX-PMD030	107	9.690E-05	2.639E-07	2.409E-07	5.048E-07	2.638E-07	2.557E-11	2.095E+00	1.000E+00	1.061E-04
117	CCX-PMDEHO	14	4.030E-06	1.608E-07	2.409E-07	4.017E-07	1.608E-07	6.480E-13	1.667E+00	1.000E+00	2.690E-06
118	CCX-PMDMOD1	119	1.410E-04	2.666E-07	2.409E-07	5.075E-07	2.665E-07	3.759E-11	2.106E+00	1.000E+00	1.560E-04
119	CCX-PMDMOD2	51	3.040E-04	4.041E-08	2.409E-07	2.813E-07	4.040E-08	1.229E-11	1.168E+00	1.000E+00	5.099E-05
120	CCX-PMDMOD4	29	4.980E-05	1.895E-07	2.409E-07	4.304E-07	1.895E-07	9.435E-12	1.786E+00	1.000E+00	3.916E-05
121	CCX-PMS-HARDWARE	52	7.890E-05	1.179E-06	2.408E-07	1.420E-06	1.179E-06	9.302E-11	5.893E+00	1.000E+00	3.861E-04
122	CCX-PMXMOD1-SW	347	1.100E-05	1.926E-04	2.388E-07	1.929E-04	1.926E-04	2.119E-09	8.005E+02	1.009E+00	8.795E-03
123	CCX-PMXMOD2-SW	22	1.100E-05	6.269E-05	2.402E-07	6.293E-05	6.269E-05	6.896E-10	2.612E+02	1.003E+00	2.862E-03
124	CCX-PMXMOD4-SW	54	1.100E-05	3.462E-06	2.409E-07	3.703E-06	3.462E-06	3.808E-11	1.537E+01	1.000E+00	1.581E-04
125	CCX-SFTW	262	1.200E-06	1.904E-03	2.386E-07	1.905E-03	1.904E-03	2.287E-09	7.906E+03	1.010E+00	9.494E-03
126	CCX-TRNSM	556	4.780E-04	8.126E-07	2.405E-07	1.053E-06	8.122E-07	3.884E-10	4.371E+00	1.002E+00	1.612E-03
127	CCX-TT-UF	139	1.170E-04	9.364E-07	2.408E-07	1.177E-06	9.363E-07	1.096E-10	4.886E+00	1.000E+00	4.547E-04

Table 50-22 (Sheet 4 of 13)

RISK IMPORTANCES SORTED BY BASIC EVENT IDENTIFICATION

128	CCX-VS-FA	17	3.840E-05	6.787E-07	2.409E-07	9.196E-07	6.787E-07	2.606E-11	3.817E+00	1.000E+00	1.082E-04
129	CCX-XMTR	579	4.780E-04	8.755E-06	2.367E-07	8.992E-06	8.751E-06	4.185E-09	3.732E+01	1.018E+00	1.737E-02
130	CCX-XMTR1	153	4.780E-04	3.124E-07	2.408E-07	5.531E-07	3.122E-07	1.493E-10	2.296E+00	1.001E+00	6.198E-04
131	CCX-XMTR195	280	4.780E-04	8.449E-06	2.369E-07	8.686E-06	8.445E-06	4.039E-09	3.605E+01	1.017E+00	1.676E-02
132	CDNTF01BRI	82	5.230E-03	7.195E-09	2.409E-07	2.481E-07	7.157E-09	3.763E-11	1.030E+00	1.000E+00	1.562E-04
133	CDNTK02AF	2	2.400E-06	2.083E-08	2.409E-07	2.618E-07	2.083E-08	5.000E-14	1.086E+00	1.000E+00	2.075E-07
134	CIAEP014SA	8	1.710E-04	7.147E-09	2.409E-07	2.481E-07	7.146E-09	1.222E-12	1.030E+00	1.000E+00	5.073E-06
135	CIB-MAN00	320	1.840E-03	1.288E-06	2.386E-07	1.527E-06	1.286E-06	2.370E-09	6.337E+00	1.010E+00	9.838E-03
136	CIB-MAN01	280	1.340E-03	5.540E-07	2.402E-07	7.941E-07	5.532E-07	7.423E-10	3.296E+00	1.003E+00	3.081E-03
137	CIX-AV-LA	194	7.700E-04	3.134E-07	2.407E-07	5.541E-07	3.132E-07	2.413E-10	2.300E+00	1.001E+00	1.002E-03
138	CLP-UNAVAILABLE	299	1.000E-02	1.876E-07	2.390E-07	4.267E-07	1.857E-07	1.876E-09	1.771E+00	1.008E+00	7.787E-03
139	CMA-CV	16	2.000E-06	2.293E-06	2.409E-07	2.534E-06	2.293E-06	4.585E-12	1.052E+01	1.000E+00	1.903E-05
140	CMA-PLUG	65	7.270E-04	2.319E-06	2.392E-07	2.559E-06	2.318E-06	1.686E-09	1.062E+01	1.007E+00	6.999E-03
141	CMAAV014LA	17	1.590E-03	3.653E-09	2.409E-07	2.446E-07	3.647E-09	5.809E-12	1.015E+00	1.000E+00	2.411E-05
142	CMAAV015LA	17	1.590E-03	3.653E-09	2.409E-07	2.446E-07	3.647E-09	5.809E-12	1.015E+00	1.000E+00	2.411E-05
143	CMAOR001EB	14	7.200E-07	2.280E-06	2.409E-07	2.521E-06	2.280E-06	1.642E-12	1.046E+01	1.000E+00	6.815E-06
144	CMATK002AF	17	2.400E-06	2.297E-06	2.409E-07	2.538E-06	2.297E-06	5.513E-12	1.053E+01	1.000E+00	2.288E-05
145	CMB-CV	1	2.000E-06	3.925E-08	2.409E-07	2.802E-07	3.925E-08	7.850E-14	1.163E+00	1.000E+00	3.258E-07
146	CMB-PLUG	11	7.270E-04	4.508E-08	2.409E-07	2.860E-07	4.505E-08	3.277E-11	1.187E+00	1.000E+00	1.360E-04
147	CMBAV014LA	1	1.590E-03	6.239E-11	2.409E-07	2.410E-07	6.229E-11	9.920E-14	1.000E+00	1.000E+00	4.118E-07
148	CMBAV015LA	1	1.590E-03	6.239E-11	2.409E-07	2.410E-07	6.229E-11	9.920E-14	1.000E+00	1.000E+00	4.118E-07
149	CMBOR001EB	1	7.200E-07	3.931E-08	2.409E-07	2.802E-07	3.931E-08	2.830E-14	1.163E+00	1.000E+00	1.175E-07
150	CMBTK002AF	1	2.400E-06	3.925E-08	2.409E-07	2.802E-07	3.925E-08	9.420E-14	1.163E+00	1.000E+00	3.910E-07
151	CMX-AV-LA	36	9.600E-05	2.273E-06	2.407E-07	2.514E-06	2.273E-06	2.182E-10	1.043E+01	1.001E+00	9.058E-04
152	CMX-CV-GO	93	5.100E-05	6.542E-05	2.376E-07	6.565E-05	6.541E-05	3.336E-09	2.725E+02	1.014E+00	1.385E-02
153	CMX-TK-AF	5	1.200E-07	6.115E-05	2.409E-07	6.140E-05	6.115E-05	7.339E-12	2.548E+02	1.000E+00	3.046E-05
154	CMX-VS-FA	75	3.840E-05	6.542E-05	2.384E-07	6.566E-05	6.542E-05	2.512E-09	2.725E+02	1.011E+00	1.043E-02
155	CONDVACUUM	35	1.000E-03	1.132E-08	2.409E-07	2.522E-07	1.131E-08	1.132E-11	1.047E+00	1.000E+00	4.698E-05
156	CV3EPCPASA	4	1.710E-04	3.901E-09	2.409E-07	2.448E-07	3.900E-09	6.670E-13	1.016E+00	1.000E+00	2.769E-06
157	CV3EPCPBSA	2	1.710E-04	1.778E-09	2.409E-07	2.427E-07	1.777E-09	3.040E-13	1.007E+00	1.000E+00	1.262E-06
158	CVAEP084SA	3	1.710E-04	2.462E-10	2.409E-07	2.412E-07	2.462E-10	4.210E-14	1.001E+00	1.000E+00	1.747E-07
159	CVBEP081SA	3	1.710E-04	2.462E-10	2.409E-07	2.412E-07	2.462E-10	4.210E-14	1.001E+00	1.000E+00	1.747E-07
160	CVBPM01BTM	68	2.190E-02	5.457E-09	2.408E-07	2.463E-07	5.338E-09	1.195E-10	1.022E+00	1.000E+00	4.961E-04
161	CVMOD01	75	2.210E-04	2.013E-07	2.409E-07	4.421E-07	2.012E-07	4.448E-11	1.835E+00	1.000E+00	1.846E-04
162	CVMOD02	13	1.410E-03	5.121E-09	2.409E-07	2.460E-07	5.113E-09	7.220E-12	1.021E+00	1.000E+00	2.997E-05
163	CVMOD03	44	1.120E-02	5.308E-09	2.409E-07	2.462E-07	5.249E-09	5.945E-11	1.022E+00	1.000E+00	2.468E-04
164	CVMOD04	111	7.370E-04	2.101E-07	2.408E-07	4.509E-07	2.099E-07	1.548E-10	1.871E+00	1.001E+00	6.427E-04
165	CVMOD05	163	2.880E-02	3.197E-09	2.408E-07	2.440E-07	3.105E-09	9.207E-11	1.013E+00	1.000E+00	3.821E-04
166	CVMOD07	148	2.710E-02	3.195E-09	2.408E-07	2.440E-07	3.109E-09	8.660E-11	1.013E+00	1.000E+00	3.594E-04
167	CVN-MAN00	33	3.100E-03	2.673E-07	2.401E-07	5.074E-07	2.664E-07	8.285E-10	2.106E+00	1.003E+00	3.439E-03
168	CVN-MAN02	2	1.580E-03	1.570E-11	2.409E-07	2.409E-07	1.567E-11	2.480E-14	1.000E+00	1.000E+00	1.029E-07
169	CVN-MAN03	11	1.070E-03	4.064E-09	2.409E-07	2.450E-07	4.060E-09	4.349E-12	1.017E+00	1.000E+00	1.805E-05
170	CVNMV090GC	11	8.760E-02	2.499E-12	2.409E-07	2.409E-07	2.280E-12	2.189E-13	1.000E+00	1.000E+00	9.086E-07
171	CVNMV091GC	11	8.760E-02	2.499E-12	2.409E-07	2.409E-07	2.280E-12	2.189E-13	1.000E+00	1.000E+00	9.086E-07
172	CVX-MV-GC2	4	4.400E-03	1.684E-11	2.409E-07	2.409E-07	1.677E-11	7.410E-14	1.000E+00	1.000E+00	3.076E-07
173	CVX-PM-ER	7	3.700E-05	1.284E-07	2.409E-07	3.693E-07	1.283E-07	4.749E-12	1.533E+00	1.000E+00	1.971E-05
174	DAS	322	1.000E-02	1.007E-07	2.399E-07	3.406E-07	9.967E-08	1.007E-09	1.414E+00	1.004E+00	4.179E-03
175	DUMP-MAN01	31	1.320E-03	4.945E-09	2.409E-07	2.459E-07	4.939E-09	6.528E-12	1.020E+00	1.000E+00	2.709E-05

Table 50-22 (Sheet 5 of 13)

RISK IMPORTANCES SORTED BY BASIC EVENT IDENTIFICATION

176	EC0MOD01	1460	5.080E-03	9.180E-08	2.405E-07	3.323E-07	9.133E-08	4.663E-10	1.379E+00	1.002E+00	1.936E-03
177	EC1BS001LF	33	4.800E-06	3.745E-07	2.409E-07	6.155E-07	3.745E-07	1.798E-12	2.555E+00	1.000E+00	7.462E-06
178	EC1BS001TM	1288	2.700E-03	7.530E-07	2.389E-07	9.918E-07	7.509E-07	2.033E-09	4.117E+00	1.009E+00	8.438E-03
179	EC1BS011TM	329	2.700E-03	2.448E-08	2.409E-07	2.653E-07	2.441E-08	6.608E-11	1.101E+00	1.000E+00	2.743E-04
180	EC1BS012TM	1041	2.700E-03	6.818E-07	2.391E-07	9.209E-07	6.800E-07	1.841E-09	3.822E+00	1.008E+00	7.641E-03
181	EC1BS013TM	192	2.700E-03	2.534E-08	2.409E-07	2.662E-07	2.527E-08	6.842E-11	1.105E+00	1.000E+00	2.840E-04
182	EC1BS111TM	163	2.700E-03	4.704E-09	2.409E-07	2.456E-07	4.691E-09	1.270E-11	1.019E+00	1.000E+00	5.272E-05
183	EC1BS112TM	62	2.700E-03	1.090E-08	2.409E-07	2.518E-07	1.087E-08	2.942E-11	1.045E+00	1.000E+00	1.221E-04
184	EC1BS121TM	258	2.700E-03	8.138E-08	2.407E-07	3.221E-07	8.116E-08	2.197E-10	1.337E+00	1.001E+00	9.120E-04
185	EC1BS122TM	235	2.700E-03	1.879E-07	2.404E-07	4.283E-07	1.874E-07	5.073E-10	1.778E+00	1.002E+00	2.106E-03
186	EC1BS131TM	62	2.700E-03	1.090E-08	2.409E-07	2.518E-07	1.087E-08	2.942E-11	1.045E+00	1.000E+00	1.221E-04
187	EC1CB100RQ	2	1.440E-05	2.535E-09	2.409E-07	2.435E-07	2.535E-09	3.650E-14	1.011E+00	1.000E+00	1.515E-07
188	EC1CB100VO	133	4.200E-03	3.638E-09	2.409E-07	2.445E-07	3.623E-09	1.528E-11	1.015E+00	1.000E+00	6.342E-05
189	EC1MOD01	1	6.910E-05	1.505E-10	2.409E-07	2.411E-07	1.505E-10	1.040E-14	1.001E+00	1.000E+00	4.317E-08
190	EC1MOD11	4	4.800E-05	2.496E-09	2.409E-07	2.434E-07	2.496E-09	1.198E-13	1.010E+00	1.000E+00	4.973E-07
191	EC1MOD12	142	4.800E-05	5.589E-07	2.409E-07	7.998E-07	5.589E-07	2.683E-11	3.320E+00	1.000E+00	1.114E-04
192	EC1MOD121	8	1.680E-05	6.514E-08	2.409E-07	3.061E-07	6.514E-08	1.094E-12	1.270E+00	1.000E+00	4.543E-06
193	EC1MOD122	19	1.680E-05	1.681E-07	2.409E-07	4.090E-07	1.681E-07	2.824E-12	1.698E+00	1.000E+00	1.172E-05
194	EC1MOD13	8	4.800E-05	4.612E-09	2.409E-07	2.455E-07	4.612E-09	2.214E-13	1.019E+00	1.000E+00	9.190E-07
195	EC2BS002LF	6	4.800E-06	6.304E-08	2.409E-07	3.040E-07	6.304E-08	3.026E-13	1.262E+00	1.000E+00	1.256E-06
196	EC2BS002TM	501	2.700E-03	1.173E-07	2.406E-07	3.579E-07	1.169E-07	3.166E-10	1.485E+00	1.001E+00	1.314E-03
197	EC2BS021TM	89	2.700E-03	1.033E-08	2.409E-07	2.512E-07	1.030E-08	2.789E-11	1.043E+00	1.000E+00	1.158E-04
198	EC2BS022TM	337	2.700E-03	1.048E-07	2.406E-07	3.454E-07	1.045E-07	2.829E-10	1.434E+00	1.001E+00	1.174E-03
199	EC2BS023TM	101	2.700E-03	1.795E-08	2.409E-07	2.588E-07	1.790E-08	4.846E-11	1.074E+00	1.000E+00	2.011E-04
200	EC2BS211TM	28	2.700E-03	3.860E-10	2.409E-07	2.413E-07	3.850E-10	1.042E-12	1.002E+00	1.000E+00	4.326E-06
201	EC2BS212TM	31	2.700E-03	8.884E-09	2.409E-07	2.498E-07	8.860E-09	2.399E-11	1.037E+00	1.000E+00	9.956E-05
202	EC2BS221TM	260	2.700E-03	9.117E-08	2.407E-07	3.318E-07	9.092E-08	2.462E-10	1.377E+00	1.001E+00	1.022E-03
203	EC2BS222TM	29	2.700E-03	1.121E-09	2.409E-07	2.420E-07	1.118E-09	3.026E-12	1.005E+00	1.000E+00	1.256E-05
204	EC2BS231TM	31	2.700E-03	8.884E-09	2.409E-07	2.498E-07	8.860E-09	2.399E-11	1.037E+00	1.000E+00	9.956E-05
205	EC2CB200VO	21	4.200E-03	7.334E-10	2.409E-07	2.417E-07	7.303E-10	3.080E-12	1.003E+00	1.000E+00	1.279E-05
206	EC2MOD22	18	4.800E-05	6.821E-08	2.409E-07	3.091E-07	6.821E-08	3.274E-12	1.283E+00	1.000E+00	1.359E-05
207	EC2MOD221	8	1.680E-05	6.514E-08	2.409E-07	3.061E-07	6.514E-08	1.094E-12	1.270E+00	1.000E+00	4.543E-06
208	EC2MOD23	8	4.800E-05	4.612E-09	2.409E-07	2.455E-07	4.612E-09	2.214E-13	1.019E+00	1.000E+00	9.190E-07
209	EC3BS003TM	1	2.700E-03	4.667E-11	2.409E-07	2.410E-07	4.654E-11	1.260E-13	1.000E+00	1.000E+00	5.230E-07
210	ECX-CB-GC	48	7.300E-04	1.227E-08	2.409E-07	2.532E-07	1.226E-08	8.957E-12	1.051E+00	1.000E+00	3.718E-05
211	ECX-CB-GO	34	4.200E-04	1.112E-08	2.409E-07	2.520E-07	1.111E-08	4.669E-12	1.046E+00	1.000E+00	1.938E-05
212	ED1BSDS1LF	15	4.800E-06	1.631E-07	2.409E-07	4.040E-07	1.631E-07	7.828E-13	1.677E+00	1.000E+00	3.249E-06
213	ED1BSDS1TM	137	3.000E-04	2.641E-07	2.408E-07	5.050E-07	2.640E-07	7.924E-11	2.096E+00	1.000E+00	3.289E-04
214	ED1MOD01	35	5.040E-04	1.000E-08	2.409E-07	2.509E-07	9.997E-09	5.041E-12	1.041E+00	1.000E+00	2.092E-05
215	ED1MOD02	2	1.920E-04	1.490E-10	2.409E-07	2.411E-07	1.489E-10	2.860E-14	1.001E+00	1.000E+00	1.187E-07
216	ED1MOD03	168	2.700E-03	2.142E-08	2.409E-07	2.623E-07	2.136E-08	5.783E-11	1.089E+00	1.000E+00	2.400E-04
217	ED1MOD06	8	3.480E-04	3.063E-10	2.409E-07	2.412E-07	3.062E-10	1.066E-13	1.001E+00	1.000E+00	4.425E-07
218	ED1MOD07	31	3.050E-04	8.922E-09	2.409E-07	2.498E-07	8.919E-09	2.721E-12	1.037E+00	1.000E+00	1.130E-05
219	ED1MOD11	119	3.170E-04	2.510E-07	2.408E-07	4.919E-07	2.510E-07	7.958E-11	2.042E+00	1.000E+00	3.303E-04
220	ED1MOD113	119	3.170E-04	2.510E-07	2.408E-07	4.919E-07	2.510E-07	7.958E-11	2.042E+00	1.000E+00	3.303E-04
221	ED1MOD13	31	3.170E-04	8.917E-09	2.409E-07	2.498E-07	8.914E-09	2.827E-12	1.037E+00	1.000E+00	1.173E-05
222	ED2BSDS1TM	52	3.000E-04	1.633E-08	2.409E-07	2.572E-07	1.632E-08	4.898E-12	1.068E+00	1.000E+00	2.033E-05
223	ED2MOD01	12	5.040E-04	8.750E-10	2.409E-07	2.418E-07	8.746E-10	4.410E-13	1.004E+00	1.000E+00	1.830E-06

Table 50-22 (Sheet 6 of 13)

RISK IMPORTANCES SORTED BY BASIC EVENT IDENTIFICATION

224	ED2MOD03	71	2.700E-03	3.370E-09	2.409E-07	2.443E-07	3.361E-09	9.100E-12	1.014E+00	1.000E+00	3.777E-05
225	ED2MOD06	2	3.480E-04	7.184E-11	2.409E-07	2.410E-07	7.181E-11	2.500E-14	1.000E+00	1.000E+00	1.038E-07
226	ED2MOD07	2	3.050E-04	7.213E-11	2.409E-07	2.410E-07	7.211E-11	2.200E-14	1.000E+00	1.000E+00	9.132E-08
227	ED2MOD11	48	3.170E-04	1.576E-08	2.409E-07	2.567E-07	1.576E-08	4.997E-12	1.065E+00	1.000E+00	2.074E-05
228	ED2MOD13	2	3.170E-04	7.192E-11	2.409E-07	2.410E-07	7.190E-11	2.280E-14	1.000E+00	1.000E+00	9.464E-08
229	ED3BSDS1TM	65	3.000E-04	1.742E-08	2.409E-07	2.583E-07	1.741E-08	5.226E-12	1.072E+00	1.000E+00	2.169E-05
230	ED3MOD01	102	5.040E-04	2.339E-08	2.409E-07	2.643E-07	2.338E-08	1.179E-11	1.097E+00	1.000E+00	4.893E-05
231	ED3MOD03	104	2.700E-03	3.426E-09	2.409E-07	2.443E-07	3.416E-09	9.249E-12	1.014E+00	1.000E+00	3.839E-05
232	ED3MOD04	73	2.190E-02	5.306E-10	2.409E-07	2.414E-07	5.190E-10	1.162E-11	1.002E+00	1.000E+00	4.824E-05
233	ED3MOD06	1	3.480E-04	2.819E-10	2.409E-07	2.412E-07	2.818E-10	9.810E-14	1.001E+00	1.000E+00	4.072E-07
234	ED3MOD07	387	3.050E-04	3.840E-06	2.397E-07	4.080E-06	3.839E-06	1.171E-09	1.693E+01	1.005E+00	4.861E-03
235	ED3MOD11	8	3.170E-04	8.656E-10	2.409E-07	2.418E-07	8.653E-10	2.744E-13	1.004E+00	1.000E+00	1.139E-06
236	ED3MOD111	8	3.170E-04	8.656E-10	2.409E-07	2.418E-07	8.653E-10	2.744E-13	1.004E+00	1.000E+00	1.139E-06
237	ED4BSDS1TM	190	3.000E-04	5.431E-08	2.409E-07	2.952E-07	5.429E-08	1.629E-11	1.225E+00	1.000E+00	6.762E-05
238	ED4MOD03	2	2.700E-03	9.111E-11	2.409E-07	2.410E-07	9.087E-11	2.460E-13	1.000E+00	1.000E+00	1.021E-06
239	ED4MOD11	194	3.170E-04	5.482E-08	2.409E-07	2.957E-07	5.481E-08	1.738E-11	1.227E+00	1.000E+00	7.214E-05
240	ED4MOD111	8	3.170E-04	8.656E-10	2.409E-07	2.418E-07	8.653E-10	2.744E-13	1.004E+00	1.000E+00	1.139E-06
241	ED4MOD112	172	3.170E-04	5.050E-08	2.409E-07	2.914E-07	5.048E-08	1.601E-11	1.210E+00	1.000E+00	6.644E-05
242	FSMOD255A	14	5.800E-04	4.424E-09	2.409E-07	2.453E-07	4.422E-09	2.566E-12	1.018E+00	1.000E+00	1.065E-05
243	FWA-CV-EO	4	1.000E-04	5.930E-10	2.409E-07	2.415E-07	5.929E-10	5.930E-14	1.002E+00	1.000E+00	2.461E-07
244	FWACV012GO	8	2.190E-04	8.658E-10	2.409E-07	2.418E-07	8.656E-10	1.896E-13	1.004E+00	1.000E+00	7.870E-07
245	FWBCV012GO	8	2.190E-04	8.658E-10	2.409E-07	2.418E-07	8.656E-10	1.896E-13	1.004E+00	1.000E+00	7.870E-07
246	FWMOD013A	155	1.410E-02	1.590E-09	2.409E-07	2.425E-07	1.568E-09	2.242E-11	1.007E+00	1.000E+00	9.307E-05
247	FWMOD013B	135	1.410E-02	1.384E-09	2.409E-07	2.423E-07	1.365E-09	1.952E-11	1.006E+00	1.000E+00	8.101E-05
248	FWMOD03A	184	1.700E-02	1.626E-09	2.409E-07	2.425E-07	1.598E-09	2.764E-11	1.007E+00	1.000E+00	1.147E-04
249	FWMOD03B	154	1.700E-02	1.407E-09	2.409E-07	2.423E-07	1.383E-09	2.392E-11	1.006E+00	1.000E+00	9.927E-05
250	FWX-CV2-GO	4	6.400E-06	2.781E-08	2.409E-07	2.687E-07	2.781E-08	1.780E-13	1.115E+00	1.000E+00	7.388E-07
251	FWX-MV2-GO	62	5.500E-04	3.900E-08	2.409E-07	2.799E-07	3.898E-08	2.145E-11	1.162E+00	1.000E+00	8.903E-05
252	FWX-PM2-ER	4	5.900E-06	2.783E-08	2.409E-07	2.688E-07	2.783E-08	1.642E-13	1.116E+00	1.000E+00	6.816E-07
253	FWX-PM2-FS	62	5.400E-04	3.900E-08	2.409E-07	2.799E-07	3.898E-08	2.106E-11	1.162E+00	1.000E+00	8.741E-05
254	HPM-MAN01	6	5.020E-04	2.298E-09	2.409E-07	2.432E-07	2.296E-09	1.153E-12	1.010E+00	1.000E+00	4.787E-06
255	IDABSDD1LF	31	4.800E-06	1.052E-06	2.409E-07	1.293E-06	1.052E-06	5.049E-12	5.366E+00	1.000E+00	2.096E-05
256	IDABSDD1TM	239	3.000E-04	1.192E-06	2.406E-07	1.433E-06	1.192E-06	3.577E-10	5.947E+00	1.001E+00	1.485E-03
257	IDABSDK1LF	15	4.800E-06	1.631E-07	2.409E-07	4.040E-07	1.631E-07	7.828E-13	1.677E+00	1.000E+00	3.249E-06
258	IDABSDK1TM	71	3.000E-04	2.037E-07	2.409E-07	4.445E-07	2.036E-07	6.110E-11	1.845E+00	1.000E+00	2.536E-04
259	IDABSDS1LF	31	4.800E-06	1.052E-06	2.409E-07	1.293E-06	1.052E-06	5.049E-12	5.366E+00	1.000E+00	2.096E-05
260	IDABSDS1TM	264	3.000E-04	1.197E-06	2.406E-07	1.437E-06	1.196E-06	3.590E-10	5.965E+00	1.001E+00	1.490E-03
261	IDAFD003RQ	45	1.200E-05	1.080E-06	2.409E-07	1.321E-06	1.080E-06	1.296E-11	5.484E+00	1.000E+00	5.381E-05
262	IDAFD004RQ	19	1.200E-05	1.681E-07	2.409E-07	4.090E-07	1.681E-07	2.017E-12	1.698E+00	1.000E+00	8.374E-06
263	IDAMOD04	53	3.170E-04	1.014E-08	2.409E-07	2.511E-07	1.014E-08	3.215E-12	1.042E+00	1.000E+00	1.335E-05
264	IDAMOD05	47	5.160E-04	5.203E-09	2.409E-07	2.461E-07	5.200E-09	2.685E-12	1.022E+00	1.000E+00	1.114E-05
265	IDAMOD07	6	2.190E-02	3.973E-12	2.409E-07	2.409E-07	3.886E-12	8.700E-14	1.000E+00	1.000E+00	3.611E-07
266	IDAMOD08	6	3.170E-04	2.845E-10	2.409E-07	2.412E-07	2.845E-10	9.020E-14	1.001E+00	1.000E+00	3.744E-07
267	IDBBSDD1LF	46	4.800E-06	2.063E-06	2.409E-07	2.304E-06	2.063E-06	9.902E-12	9.563E+00	1.000E+00	4.110E-05
268	IDBBSDD1TM	581	3.000E-04	2.561E-06	2.402E-07	2.801E-06	2.560E-06	7.683E-10	1.163E+01	1.003E+00	3.189E-03
269	IDBBSDK1LF	15	4.800E-06	1.631E-07	2.409E-07	4.040E-07	1.631E-07	7.828E-13	1.677E+00	1.000E+00	3.249E-06
270	IDBBSDK1TM	64	3.000E-04	1.803E-07	2.409E-07	4.212E-07	1.803E-07	5.410E-11	1.748E+00	1.000E+00	2.246E-04
271	IDBBSDS1LF	46	4.800E-06	2.063E-06	2.409E-07	2.304E-06	2.063E-06	9.902E-12	9.563E+00	1.000E+00	4.110E-05

Table 50-22 (Sheet 7 of 13)

RISK IMPORTANCES SORTED BY BASIC EVENT IDENTIFICATION

272	IDBBSDS1TM	606	3.000E-04	2.566E-06	2.402E-07	2.806E-06	2.565E-06	7.697E-10	1.165E+01	1.003E+00	3.195E-03
273	IDBFD013RQ	83	1.200E-05	2.140E-06	2.409E-07	2.381E-06	2.140E-06	2.568E-11	9.882E+00	1.000E+00	1.066E-04
274	IDBFD014RQ	19	1.200E-05	1.681E-07	2.409E-07	4.090E-07	1.681E-07	2.017E-12	1.698E+00	1.000E+00	8.374E-06
275	IDBMOD24	42	3.170E-04	9.625E-09	2.409E-07	2.505E-07	9.622E-09	3.051E-12	1.040E+00	1.000E+00	1.266E-05
276	IDBMOD25	39	5.160E-04	4.837E-09	2.409E-07	2.458E-07	4.834E-09	2.496E-12	1.020E+00	1.000E+00	1.036E-05
277	IDBMOD27	6	2.190E-02	3.973E-12	2.409E-07	2.409E-07	3.886E-12	8.700E-14	1.000E+00	1.000E+00	3.611E-07
278	IDBMOD36	2	3.170E-04	1.013E-10	2.409E-07	2.410E-07	1.012E-10	3.210E-14	1.000E+00	1.000E+00	1.332E-07
279	IDCBSDD1LF	16	4.800E-06	8.887E-07	2.409E-07	1.130E-06	8.887E-07	4.266E-12	4.689E+00	1.000E+00	1.771E-05
280	IDCBSDD1TM	308	3.000E-04	1.089E-06	2.406E-07	1.330E-06	1.089E-06	3.268E-10	5.520E+00	1.001E+00	1.356E-03
281	IDCBSDS1LF	16	4.800E-06	8.887E-07	2.409E-07	1.130E-06	8.887E-07	4.266E-12	4.689E+00	1.000E+00	1.771E-05
282	IDCBSDS1TM	333	3.000E-04	1.094E-06	2.406E-07	1.334E-06	1.093E-06	3.281E-10	5.538E+00	1.001E+00	1.362E-03
283	IDCFD007RQ	35	1.200E-05	9.257E-07	2.409E-07	1.167E-06	9.257E-07	1.111E-11	4.842E+00	1.000E+00	4.611E-05
284	IDCMOD28	42	3.170E-04	9.625E-09	2.409E-07	2.505E-07	9.622E-09	3.051E-12	1.040E+00	1.000E+00	1.266E-05
285	IDCMOD29	39	5.160E-04	4.837E-09	2.409E-07	2.458E-07	4.834E-09	2.496E-12	1.020E+00	1.000E+00	1.036E-05
286	IDCMOD31	6	2.190E-02	3.973E-12	2.409E-07	2.409E-07	3.886E-12	8.700E-14	1.000E+00	1.000E+00	3.611E-07
287	IDCMOD37	2	3.170E-04	1.013E-10	2.409E-07	2.410E-07	1.012E-10	3.210E-14	1.000E+00	1.000E+00	1.332E-07
288	IDDBSDD1LF	31	4.800E-06	1.900E-06	2.409E-07	2.141E-06	1.900E-06	9.119E-12	8.886E+00	1.000E+00	3.785E-05
289	IDDBSDD1TM	207	3.000E-04	2.053E-06	2.403E-07	2.293E-06	2.052E-06	6.159E-10	9.519E+00	1.003E+00	2.557E-03
290	IDDBSDS1LF	31	4.800E-06	1.900E-06	2.409E-07	2.141E-06	1.900E-06	9.119E-12	8.886E+00	1.000E+00	3.785E-05
291	IDDBSDS1TM	253	3.000E-04	2.058E-06	2.403E-07	2.299E-06	2.058E-06	6.175E-10	9.542E+00	1.003E+00	2.563E-03
292	IDDFD019RQ	52	1.200E-05	1.955E-06	2.409E-07	2.196E-06	1.955E-06	2.346E-11	9.116E+00	1.000E+00	9.739E-05
293	IDDMOD32	67	3.170E-04	1.081E-08	2.409E-07	2.517E-07	1.081E-08	3.428E-12	1.045E+00	1.000E+00	1.423E-05
294	IDDMOD33	63	5.160E-04	5.936E-09	2.409E-07	2.469E-07	5.933E-09	3.063E-12	1.025E+00	1.000E+00	1.271E-05
295	IDDMOD35	6	2.190E-02	3.973E-12	2.409E-07	2.409E-07	3.886E-12	8.700E-14	1.000E+00	1.000E+00	3.611E-07
296	IDDMOD38	6	3.170E-04	2.845E-10	2.409E-07	2.412E-07	2.845E-10	9.020E-14	1.001E+00	1.000E+00	3.744E-07
297	IEV-ATW-S	55	1.480E-02	7.475E-09	2.408E-07	2.483E-07	7.364E-09	1.106E-10	1.031E+00	1.000E+00	4.592E-04
298	IEV-ATW-T	13	1.170E+00	6.086E-10	2.402E-07	2.408E-07	-1.035E-10	7.120E-10	9.996E-01	1.003E+00	2.955E-03
299	IEV-ATWS	136	4.810E-01	7.495E-09	2.373E-07	2.448E-07	3.890E-09	3.605E-09	1.016E+00	1.015E+00	1.496E-02
300	IEV-CMTLB	987	9.310E-05	3.954E-05	2.372E-07	3.978E-05	3.954E-05	3.682E-09	1.651E+02	1.016E+00	1.528E-02
301	IEV-ISLOC	1	5.000E-11	1.000E+00	2.409E-07	1.000E+00	1.000E+00	5.000E-11	4.151E+06	1.000E+00	2.075E-04
302	IEV-LCAS	417	3.480E-02	1.932E-08	2.402E-07	2.596E-07	1.865E-08	6.725E-10	1.077E+00	1.003E+00	2.791E-03
303	IEV-LCCW	690	1.440E-01	2.241E-09	2.406E-07	2.428E-07	1.919E-09	3.228E-10	1.008E+00	1.001E+00	1.340E-03
304	IEV-LCOND	858	1.120E-01	1.111E-08	2.397E-07	2.508E-07	9.862E-09	1.244E-09	1.041E+00	1.005E+00	5.163E-03
305	IEV-LLOCA	286	5.000E-06	8.958E-03	1.960E-07	8.958E-03	8.958E-03	4.496E-08	3.718E+04	1.229E+00	1.866E-01
306	IEV-LMFW	1334	3.350E-01	2.596E-09	2.401E-07	2.426E-07	1.726E-09	8.697E-10	1.007E+00	1.004E+00	3.610E-03
307	IEV-LMFW1	763	1.920E-01	2.359E-09	2.405E-07	2.428E-07	1.906E-09	4.528E-10	1.008E+00	1.002E+00	1.880E-03
308	IEV-LOSP	530	1.200E-01	7.981E-09	2.400E-07	2.479E-07	7.023E-09	9.577E-10	1.029E+00	1.004E+00	3.975E-03
309	IEV-LRCS	143	1.800E-02	1.957E-09	2.409E-07	2.428E-07	1.921E-09	3.522E-11	1.008E+00	1.000E+00	1.462E-04
310	IEV-MLOCA	1681	4.360E-04	3.696E-05	2.248E-07	3.718E-05	3.694E-05	1.611E-08	1.543E+02	1.072E+00	6.688E-02
311	IEV-POWEX	701	4.500E-03	3.687E-07	2.393E-07	6.080E-07	3.671E-07	1.659E-09	2.524E+00	1.007E+00	6.887E-03
312	IEV-PRSTR	317	1.340E-04	3.743E-06	2.404E-07	3.983E-06	3.742E-06	5.015E-10	1.653E+01	1.002E+00	2.082E-03
313	IEV-RCSLK	1526	6.200E-03	2.750E-07	2.392E-07	5.142E-07	2.733E-07	1.705E-09	2.134E+00	1.007E+00	7.078E-03
314	IEV-RV-RP	1	1.000E-08	1.000E+00	2.309E-07	1.000E+00	1.000E+00	1.000E-08	4.151E+06	1.043E+00	4.151E-02
315	IEV-SGTR	3076	3.880E-03	1.751E-06	2.341E-07	1.985E-06	1.744E-06	6.792E-09	8.238E+00	1.029E+00	2.819E-02
316	IEV-SI-LB	1160	2.120E-04	4.480E-04	1.459E-07	4.482E-04	4.479E-04	9.499E-08	1.860E+03	1.651E+00	3.943E-01
317	IEV-SLB-D	18	5.960E-04	1.535E-08	2.409E-07	2.563E-07	1.534E-08	9.150E-12	1.064E+00	1.000E+00	3.798E-05
318	IEV-SLB-U	160	3.720E-04	3.513E-07	2.408E-07	5.921E-07	3.512E-07	1.307E-10	2.458E+00	1.001E+00	5.425E-04
319	IEV-SLB-V	305	1.210E-03	5.010E-07	2.403E-07	7.414E-07	5.004E-07	6.063E-10	3.077E+00	1.003E+00	2.516E-03

Table 50-22 (Sheet 8 of 13)

RISK IMPORTANCES SORTED BY BASIC EVENT IDENTIFICATION

320	IEV-SLOCA	1638	5.000E-04	3.616E-05	2.228E-07	3.638E-05	3.614E-05	1.808E-08	1.510E+02	1.081E+00	7.504E-02
321	IEV-SPADS	1078	5.400E-05	5.476E-04	2.113E-07	5.478E-04	5.475E-04	2.958E-08	2.274E+03	1.140E+00	1.228E-01
322	IEV-TRANS	1500	1.400E+00	2.203E-09	2.378E-07	2.400E-07	-8.814E-10	3.085E-09	9.963E-01	1.013E+00	1.280E-02
323	IRBEP123ASA	16	1.710E-04	2.333E-08	2.409E-07	2.642E-07	2.332E-08	3.989E-12	1.097E+00	1.000E+00	1.656E-05
324	IRBEP123BSA	16	1.710E-04	2.333E-08	2.409E-07	2.642E-07	2.332E-08	3.989E-12	1.097E+00	1.000E+00	1.656E-05
325	IRCEP118ASA	9	1.710E-04	2.852E-08	2.409E-07	2.694E-07	2.852E-08	4.877E-12	1.118E+00	1.000E+00	2.024E-05
326	IRDEP118BSA	9	1.710E-04	2.852E-08	2.409E-07	2.694E-07	2.852E-08	4.877E-12	1.118E+00	1.000E+00	2.024E-05
327	IRWMOD05	17	1.460E-03	1.000E-06	2.395E-07	1.240E-06	9.987E-07	1.460E-09	5.146E+00	1.006E+00	6.061E-03
328	IRWMOD06	21	1.460E-03	1.000E-06	2.395E-07	1.240E-06	9.989E-07	1.460E-09	5.146E+00	1.006E+00	6.062E-03
329	IRWMOD07	3	1.460E-03	5.295E-11	2.409E-07	2.410E-07	5.287E-11	7.730E-14	1.000E+00	1.000E+00	3.209E-07
330	IRWMOD08	7	1.460E-03	1.877E-10	2.409E-07	2.411E-07	1.875E-10	2.741E-13	1.001E+00	1.000E+00	1.138E-06
331	IRWMOD09	67	1.460E-03	3.239E-08	2.409E-07	2.733E-07	3.234E-08	4.728E-11	1.134E+00	1.000E+00	1.963E-04
332	IRWMOD10	71	1.460E-03	4.649E-09	2.409E-07	2.456E-07	4.643E-09	6.788E-12	1.019E+00	1.000E+00	2.818E-05
333	IRWMOD11	67	1.460E-03	3.239E-08	2.409E-07	2.733E-07	3.234E-08	4.728E-11	1.134E+00	1.000E+00	1.963E-04
334	IRWMOD12	71	1.460E-03	4.649E-09	2.409E-07	2.456E-07	4.643E-09	6.788E-12	1.019E+00	1.000E+00	2.818E-05
335	IWA-PLUG	68	2.400E-04	2.121E-04	1.900E-07	2.123E-04	2.121E-04	5.091E-08	8.813E+02	1.268E+00	2.113E-01
336	IWACV122AO	20	1.750E-03	9.997E-07	2.392E-07	1.239E-06	9.979E-07	1.749E-09	5.142E+00	1.007E+00	7.262E-03
337	IWACV124AO	26	1.750E-03	9.998E-07	2.392E-07	1.239E-06	9.981E-07	1.750E-09	5.143E+00	1.007E+00	7.263E-03
338	IWARS118BFA	43	8.760E-04	3.185E-08	2.409E-07	2.727E-07	3.183E-08	2.790E-11	1.132E+00	1.000E+00	1.158E-04
339	IWARS123BFA	2	8.760E-04	4.167E-11	2.409E-07	2.410E-07	4.163E-11	3.650E-14	1.000E+00	1.000E+00	1.515E-07
340	IWB-PLUG	67	2.400E-04	3.961E-08	2.409E-07	2.805E-07	3.960E-08	9.506E-12	1.164E+00	1.000E+00	3.946E-05
341	IWBCV122AO	3	1.750E-03	5.297E-11	2.409E-07	2.410E-07	5.288E-11	9.270E-14	1.000E+00	1.000E+00	3.848E-07
342	IWBCV124AO	9	1.750E-03	2.011E-10	2.409E-07	2.411E-07	2.007E-10	3.519E-13	1.001E+00	1.000E+00	1.461E-06
343	IWBRS118AFA	43	8.760E-04	3.185E-08	2.409E-07	2.727E-07	3.183E-08	2.790E-11	1.132E+00	1.000E+00	1.158E-04
344	IWBRS123AFA	16	8.760E-04	1.000E-06	2.400E-07	1.240E-06	9.992E-07	8.761E-10	5.148E+00	1.004E+00	3.636E-03
345	IWCRS120BFA	44	8.760E-04	4.127E-09	2.409E-07	2.450E-07	4.124E-09	3.616E-12	1.017E+00	1.000E+00	1.501E-05
346	IWCRS125BFA	2	8.760E-04	4.167E-11	2.409E-07	2.410E-07	4.163E-11	3.650E-14	1.000E+00	1.000E+00	1.515E-07
347	IWDRS120AFA	44	8.760E-04	4.127E-09	2.409E-07	2.450E-07	4.124E-09	3.616E-12	1.017E+00	1.000E+00	1.501E-05
348	IWDRS125AFA	16	8.760E-04	1.000E-06	2.400E-07	1.240E-06	9.992E-07	8.761E-10	5.148E+00	1.004E+00	3.636E-03
349	IWNTK001AF	194	2.400E-06	1.677E-05	2.409E-07	1.701E-05	1.677E-05	4.024E-11	7.060E+01	1.000E+00	1.670E-04
350	IWX-CV-AO	1617	3.000E-05	3.929E-04	2.291E-07	3.931E-04	3.929E-04	1.179E-08	1.632E+03	1.051E+00	4.893E-02
351	IWX-CV1-AO	1	5.400E-07	2.111E-04	2.408E-07	2.114E-04	2.111E-04	1.140E-10	8.773E+02	1.000E+00	4.732E-04
352	IWX-EV-SA	1686	2.600E-05	3.993E-04	2.305E-07	3.996E-04	3.993E-04	1.038E-08	1.658E+03	1.045E+00	4.310E-02
353	IWX-EV1-SA	1	5.800E-06	2.121E-04	2.397E-07	2.123E-04	2.121E-04	1.230E-09	8.812E+02	1.005E+00	5.105E-03
354	IWX-EV2-SA	7	5.800E-06	7.947E-08	2.409E-07	3.204E-07	7.947E-08	4.609E-13	1.330E+00	1.000E+00	1.913E-06
355	IWX-EV4-SA	59	5.800E-05	5.999E-08	2.409E-07	3.009E-07	5.998E-08	3.479E-12	1.249E+00	1.000E+00	1.444E-05
356	IWX-FL-GP	993	1.200E-05	1.797E-04	2.388E-07	1.799E-04	1.797E-04	2.156E-09	7.468E+02	1.009E+00	8.951E-03
357	IWX-XMTR	560	4.780E-04	1.495E-05	2.338E-07	1.518E-05	1.494E-05	7.146E-09	6.302E+01	1.031E+00	2.966E-02
358	LPM-MAN01	227	1.340E-03	3.085E-07	2.405E-07	5.490E-07	3.081E-07	4.134E-10	2.279E+00	1.002E+00	1.716E-03
359	LPM-MAN01C	5	5.000E-01	3.044E-09	2.394E-07	2.424E-07	1.522E-09	1.522E-09	1.006E+00	1.006E+00	6.317E-03
360	LPM-MAN02	282	3.300E-03	4.557E-07	2.394E-07	6.951E-07	4.542E-07	1.504E-09	2.885E+00	1.006E+00	6.242E-03
361	MDAS	799	1.000E-02	1.800E-07	2.391E-07	4.191E-07	1.782E-07	1.800E-09	1.740E+00	1.008E+00	7.471E-03
362	MSAEPSD1SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	5.860E-13	1.014E+00	1.000E+00	2.432E-06
363	MSAEPSD2SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	5.860E-13	1.014E+00	1.000E+00	2.432E-06
364	MSAEPSD3SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	5.860E-13	1.014E+00	1.000E+00	2.432E-06
365	MSAEPSD4SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	5.860E-13	1.014E+00	1.000E+00	2.432E-06
366	MSAEPSD5SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	5.860E-13	1.014E+00	1.000E+00	2.432E-06
367	MSAEPSD6SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	5.860E-13	1.014E+00	1.000E+00	2.432E-06

Table 50-22 (Sheet 9 of 13)

RISK IMPORTANCES SORTED BY BASIC EVENT IDENTIFICATION

368	MSAEPSD7SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	5.860E-13	1.014E+00	1.000E+00	2.432E-06
369	MSAEPSD8SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	5.860E-13	1.014E+00	1.000E+00	2.432E-06
370	MSHTP001RI	19	5.230E-03	2.054E-08	2.408E-07	2.614E-07	2.044E-08	1.074E-10	1.085E+00	1.000E+00	4.460E-04
371	MSHTP002RI	19	5.230E-03	2.054E-08	2.408E-07	2.614E-07	2.044E-08	1.074E-10	1.085E+00	1.000E+00	4.460E-04
372	MSMODV001	14	2.710E-02	1.201E-10	2.409E-07	2.410E-07	1.169E-10	3.255E-12	1.000E+00	1.000E+00	1.351E-05
373	MSMODV003	14	2.710E-02	1.201E-10	2.409E-07	2.410E-07	1.169E-10	3.255E-12	1.000E+00	1.000E+00	1.351E-05
374	MSX-AV2-FA	44	2.310E-03	5.315E-09	2.409E-07	2.462E-07	5.303E-09	1.228E-11	1.022E+00	1.000E+00	5.096E-05
375	MSX-AV4-FA	3	2.000E-04	3.430E-09	2.409E-07	2.443E-07	3.429E-09	6.860E-13	1.014E+00	1.000E+00	2.847E-06
376	OTH-BL	23	1.900E-01	9.931E-11	2.409E-07	2.410E-07	8.044E-11	1.887E-11	1.000E+00	1.000E+00	7.832E-05
377	OTH-MGSET	29	1.750E-03	5.281E-08	2.408E-07	2.936E-07	5.272E-08	9.242E-11	1.219E+00	1.000E+00	3.836E-04
378	OTH-PO	63	1.200E-04	3.078E-07	2.409E-07	5.487E-07	3.078E-07	3.694E-11	2.278E+00	1.000E+00	1.533E-04
379	OTH-PRES	52	2.000E-03	4.121E-08	2.408E-07	2.821E-07	4.113E-08	8.243E-11	1.171E+00	1.000E+00	3.421E-04
380	OTH-PRESU	15	2.000E-03	1.561E-08	2.409E-07	2.565E-07	1.557E-08	3.121E-11	1.065E+00	1.000E+00	1.295E-04
381	OTH-PRSOV	664	1.000E-02	1.653E-07	2.393E-07	4.046E-07	1.636E-07	1.653E-09	1.679E+00	1.007E+00	6.861E-03
382	OTH-R05	530	7.000E-01	1.368E-09	2.400E-07	2.413E-07	4.105E-10	9.577E-10	1.002E+00	1.004E+00	3.975E-03
383	OTH-SDMAN	96	7.700E-04	2.036E-07	2.408E-07	4.444E-07	2.035E-07	1.568E-10	1.845E+00	1.001E+00	6.508E-04
384	OTH-SGTR	989	1.000E-02	2.599E-07	2.383E-07	4.982E-07	2.573E-07	2.599E-09	2.068E+00	1.011E+00	1.079E-02
385	OTH-SGTR1	75	6.700E-03	1.196E-08	2.408E-07	2.528E-07	1.188E-08	8.014E-11	1.049E+00	1.000E+00	3.326E-04
386	OTH-SLSOV	321	1.100E-02	4.159E-08	2.405E-07	2.821E-07	4.113E-08	4.575E-10	1.171E+00	1.002E+00	1.899E-03
387	OTH-SLSOV1	557	2.100E-02	9.277E-08	2.390E-07	3.317E-07	9.082E-08	1.948E-09	1.377E+00	1.008E+00	8.086E-03
388	OTH-SLSOV2	97	1.000E-02	1.399E-08	2.408E-07	2.548E-07	1.385E-08	1.399E-10	1.057E+00	1.001E+00	5.807E-04
389	OTH-SLSOV3	511	5.400E-03	1.519E-08	2.408E-07	2.560E-07	1.510E-08	8.201E-11	1.063E+00	1.000E+00	3.404E-04
390	PCNHR001ML	194	2.400E-06	1.677E-05	2.409E-07	1.701E-05	1.677E-05	4.024E-11	7.060E+01	1.000E+00	1.670E-04
391	PL20301ASA	8	1.160E-03	3.822E-09	2.409E-07	2.447E-07	3.817E-09	4.433E-12	1.016E+00	1.000E+00	1.840E-05
392	PL20301BSA	8	1.160E-03	3.822E-09	2.409E-07	2.447E-07	3.817E-09	4.433E-12	1.016E+00	1.000E+00	1.840E-05
393	PL2MOD11	12	2.090E-03	4.127E-09	2.409E-07	2.450E-07	4.118E-09	8.625E-12	1.017E+00	1.000E+00	3.580E-05
394	PL2MOD51	16	8.740E-04	6.970E-10	2.409E-07	2.416E-07	6.964E-10	6.092E-13	1.003E+00	1.000E+00	2.529E-06
395	PL2MOD52	3	8.740E-04	5.684E-10	2.409E-07	2.415E-07	5.679E-10	4.968E-13	1.002E+00	1.000E+00	2.062E-06
396	PL30301ASA	12	1.160E-03	4.756E-09	2.409E-07	2.457E-07	4.751E-09	5.517E-12	1.020E+00	1.000E+00	2.290E-05
397	PL30301BSA	11	1.160E-03	4.670E-09	2.409E-07	2.456E-07	4.664E-09	5.417E-12	1.019E+00	1.000E+00	2.248E-05
398	PL30302ASA	2	1.160E-03	2.414E-10	2.409E-07	2.412E-07	2.411E-10	2.800E-13	1.001E+00	1.000E+00	1.162E-06
399	PL30302BSA	1	1.160E-03	1.552E-10	2.409E-07	2.411E-07	1.550E-10	1.800E-13	1.001E+00	1.000E+00	7.471E-07
400	PL3MOD11	20	2.090E-03	5.297E-09	2.409E-07	2.462E-07	5.286E-09	1.107E-11	1.022E+00	1.000E+00	4.595E-05
401	PL3MOD12	4	2.090E-03	3.895E-10	2.409E-07	2.413E-07	3.887E-10	8.140E-13	1.002E+00	1.000E+00	3.379E-06
402	PL3MOD51	24	8.740E-04	1.046E-09	2.409E-07	2.420E-07	1.045E-09	9.138E-13	1.004E+00	1.000E+00	3.793E-06
403	PL40301ASA	43	1.160E-03	1.319E-09	2.409E-07	2.422E-07	1.317E-09	1.530E-12	1.005E+00	1.000E+00	6.350E-06
404	PL40301BSA	35	1.160E-03	1.161E-09	2.409E-07	2.421E-07	1.160E-09	1.347E-12	1.005E+00	1.000E+00	5.591E-06
405	PL40302ASA	21	1.160E-03	4.944E-10	2.409E-07	2.414E-07	4.938E-10	5.735E-13	1.002E+00	1.000E+00	2.380E-06
406	PL40302BSA	13	1.160E-03	3.369E-10	2.409E-07	2.413E-07	3.365E-10	3.908E-13	1.001E+00	1.000E+00	1.622E-06
407	PL4MOD11	71	2.090E-03	1.604E-09	2.409E-07	2.425E-07	1.601E-09	3.353E-12	1.007E+00	1.000E+00	1.392E-05
408	PL4MOD12	41	2.090E-03	7.288E-10	2.409E-07	2.416E-07	7.272E-10	1.523E-12	1.003E+00	1.000E+00	6.322E-06
409	PL70302ASA	2	1.160E-03	5.026E-10	2.409E-07	2.414E-07	5.020E-10	5.830E-13	1.002E+00	1.000E+00	2.420E-06
410	PL70302BSA	2	1.160E-03	5.026E-10	2.409E-07	2.414E-07	5.020E-10	5.830E-13	1.002E+00	1.000E+00	2.420E-06
411	PL7MOD12	2	2.090E-03	5.029E-10	2.409E-07	2.414E-07	5.018E-10	1.051E-12	1.002E+00	1.000E+00	4.362E-06
412	PL90301ASA	32	1.160E-03	1.127E-09	2.409E-07	2.420E-07	1.126E-09	1.307E-12	1.005E+00	1.000E+00	5.427E-06
413	PL90301BSA	28	1.160E-03	1.002E-09	2.409E-07	2.419E-07	1.001E-09	1.162E-12	1.004E+00	1.000E+00	4.824E-06
414	PL90302ASA	16	1.160E-03	9.731E-10	2.409E-07	2.419E-07	9.720E-10	1.129E-12	1.004E+00	1.000E+00	4.685E-06
415	PL90302BSA	12	1.160E-03	8.479E-10	2.409E-07	2.418E-07	8.469E-10	9.836E-13	1.004E+00	1.000E+00	4.083E-06

Table 50-22 (Sheet 10 of 13)

RISK IMPORTANCES SORTED BY BASIC EVENT IDENTIFICATION

416	PL9MOD11	46	2.090E-03	1.318E-09	2.409E-07	2.422E-07	1.315E-09	2.754E-12	1.005E+00	1.000E+00	1.143E-05
417	PL9MOD12	32	2.090E-03	1.220E-09	2.409E-07	2.421E-07	1.217E-09	2.550E-12	1.005E+00	1.000E+00	1.058E-05
418	PLA0302ASA	2	1.160E-03	7.517E-11	2.409E-07	2.410E-07	7.509E-11	8.720E-14	1.000E+00	1.000E+00	3.619E-07
419	PLA0302BSA	2	1.160E-03	7.517E-11	2.409E-07	2.410E-07	7.509E-11	8.720E-14	1.000E+00	1.000E+00	3.619E-07
420	PLAMOD12	4	2.090E-03	1.336E-10	2.409E-07	2.411E-07	1.333E-10	2.792E-13	1.001E+00	1.000E+00	1.159E-06
421	PLB0301ASA	16	1.160E-03	2.928E-10	2.409E-07	2.412E-07	2.924E-10	3.396E-13	1.001E+00	1.000E+00	1.410E-06
422	PLB0301BSA	14	1.160E-03	2.686E-10	2.409E-07	2.412E-07	2.683E-10	3.116E-13	1.001E+00	1.000E+00	1.293E-06
423	PLB0302ASA	4	1.160E-03	6.776E-11	2.409E-07	2.410E-07	6.768E-11	7.860E-14	1.000E+00	1.000E+00	3.262E-07
424	PLB0302BSA	2	1.160E-03	4.362E-11	2.409E-07	2.410E-07	4.357E-11	5.060E-14	1.000E+00	1.000E+00	2.100E-07
425	PLBMOD11	20	2.090E-03	3.319E-10	2.409E-07	2.413E-07	3.312E-10	6.936E-13	1.001E+00	1.000E+00	2.879E-06
426	PLBMOD12	8	2.090E-03	1.065E-10	2.409E-07	2.410E-07	1.063E-10	2.226E-13	1.000E+00	1.000E+00	9.240E-07
427	PLMMOD41	33	6.350E-04	7.247E-09	2.409E-07	2.482E-07	7.243E-09	4.602E-12	1.030E+00	1.000E+00	1.910E-05
428	PLMMOD42	2	6.350E-04	3.512E-11	2.409E-07	2.410E-07	3.510E-11	2.230E-14	1.000E+00	1.000E+00	9.256E-08
429	PLSMOD61	26	3.460E-03	7.103E-10	2.409E-07	2.416E-07	7.078E-10	2.458E-12	1.003E+00	1.000E+00	1.020E-05
430	PLSMOD62	20	3.460E-03	6.649E-10	2.409E-07	2.416E-07	6.626E-10	2.300E-12	1.003E+00	1.000E+00	9.548E-06
431	PMA0301ASA	110	1.160E-03	6.475E-09	2.409E-07	2.474E-07	6.467E-09	7.511E-12	1.027E+00	1.000E+00	3.117E-05
432	PMA0301BSA	100	1.160E-03	6.289E-09	2.409E-07	2.472E-07	6.282E-09	7.296E-12	1.026E+00	1.000E+00	3.028E-05
433	PMA0302ASA	28	1.160E-03	6.935E-10	2.409E-07	2.416E-07	6.927E-10	8.045E-13	1.003E+00	1.000E+00	3.339E-06
434	PMA0302BSA	18	1.160E-03	5.082E-10	2.409E-07	2.414E-07	5.076E-10	5.895E-13	1.002E+00	1.000E+00	2.447E-06
435	PMAMOD11	190	2.090E-03	7.405E-09	2.409E-07	2.483E-07	7.389E-09	1.548E-11	1.031E+00	1.000E+00	6.424E-05
436	PMAMOD12	56	2.090E-03	9.911E-10	2.409E-07	2.419E-07	9.890E-10	2.071E-12	1.004E+00	1.000E+00	8.598E-06
437	PMAMOD21	98	4.070E-03	5.373E-09	2.409E-07	2.463E-07	5.351E-09	2.187E-11	1.022E+00	1.000E+00	9.077E-05
438	PMAMOD22	17	4.070E-03	2.693E-10	2.409E-07	2.412E-07	2.682E-10	1.096E-12	1.001E+00	1.000E+00	4.549E-06
439	PMAMOD31	46	5.020E-03	5.707E-09	2.409E-07	2.466E-07	5.679E-09	2.865E-11	1.024E+00	1.000E+00	1.189E-04
440	PMAMOD41	11	6.350E-04	4.176E-10	2.409E-07	2.413E-07	4.174E-10	2.652E-13	1.002E+00	1.000E+00	1.101E-06
441	PMAMOD42	2	6.350E-04	3.512E-11	2.409E-07	2.410E-07	3.510E-11	2.230E-14	1.000E+00	1.000E+00	9.256E-08
442	PMAXS00ASA	12	8.000E-05	3.709E-09	2.409E-07	2.446E-07	3.708E-09	2.967E-13	1.015E+00	1.000E+00	1.232E-06
443	PMB0301ASA	60	1.160E-03	5.177E-09	2.409E-07	2.461E-07	5.171E-09	6.005E-12	1.021E+00	1.000E+00	2.492E-05
444	PMB0301BSA	58	1.160E-03	5.149E-09	2.409E-07	2.461E-07	5.143E-09	5.973E-12	1.021E+00	1.000E+00	2.479E-05
445	PMB0302ASA	8	1.160E-03	2.081E-10	2.409E-07	2.411E-07	2.079E-10	2.414E-13	1.001E+00	1.000E+00	1.002E-06
446	PMB0302BSA	6	1.160E-03	1.803E-10	2.409E-07	2.411E-07	1.800E-10	2.091E-13	1.001E+00	1.000E+00	8.679E-07
447	PMBMOD11	112	2.090E-03	6.037E-09	2.409E-07	2.469E-07	6.024E-09	1.262E-11	1.025E+00	1.000E+00	5.237E-05
448	PMBMOD12	17	2.090E-03	3.157E-10	2.409E-07	2.412E-07	3.151E-10	6.599E-13	1.001E+00	1.000E+00	2.739E-06
449	PMBMOD21	98	4.070E-03	5.373E-09	2.409E-07	2.463E-07	5.351E-09	2.187E-11	1.022E+00	1.000E+00	9.077E-05
450	PMBMOD22	17	4.070E-03	2.693E-10	2.409E-07	2.412E-07	2.682E-10	1.096E-12	1.001E+00	1.000E+00	4.549E-06
451	PMBMOD32	46	5.020E-03	5.707E-09	2.409E-07	2.466E-07	5.679E-09	2.865E-11	1.024E+00	1.000E+00	1.189E-04
452	PMBXS00ASA	12	8.000E-05	3.709E-09	2.409E-07	2.446E-07	3.708E-09	2.967E-13	1.015E+00	1.000E+00	1.232E-06
453	PMC0301ASA	60	1.160E-03	5.177E-09	2.409E-07	2.461E-07	5.171E-09	6.005E-12	1.021E+00	1.000E+00	2.492E-05
454	PMC0301BSA	58	1.160E-03	5.149E-09	2.409E-07	2.461E-07	5.143E-09	5.973E-12	1.021E+00	1.000E+00	2.479E-05
455	PMC0302ASA	8	1.160E-03	2.081E-10	2.409E-07	2.411E-07	2.079E-10	2.414E-13	1.001E+00	1.000E+00	1.002E-06
456	PMC0302BSA	6	1.160E-03	1.803E-10	2.409E-07	2.411E-07	1.800E-10	2.091E-13	1.001E+00	1.000E+00	8.679E-07
457	PMCMOD11	97	2.090E-03	5.729E-09	2.409E-07	2.466E-07	5.717E-09	1.197E-11	1.024E+00	1.000E+00	4.970E-05
458	PMCMOD12	14	2.090E-03	2.598E-10	2.409E-07	2.412E-07	2.593E-10	5.430E-13	1.001E+00	1.000E+00	2.254E-06
459	PMCMOD21	98	4.070E-03	5.373E-09	2.409E-07	2.463E-07	5.351E-09	2.187E-11	1.022E+00	1.000E+00	9.077E-05
460	PMCMOD22	17	4.070E-03	2.693E-10	2.409E-07	2.412E-07	2.682E-10	1.096E-12	1.001E+00	1.000E+00	4.549E-06
461	PMCMOD33	27	5.020E-03	5.057E-09	2.409E-07	2.460E-07	5.032E-09	2.539E-11	1.021E+00	1.000E+00	1.054E-04
462	PMCXS00ASA	12	8.000E-05	3.709E-09	2.409E-07	2.446E-07	3.708E-09	2.967E-13	1.015E+00	1.000E+00	1.232E-06
463	PMD0301ASA	113	1.160E-03	6.897E-09	2.409E-07	2.478E-07	6.889E-09	8.001E-12	1.029E+00	1.000E+00	3.321E-05

Table 50-22 (Sheet 11 of 13)

RISK IMPORTANCES SORTED BY BASIC EVENT IDENTIFICATION

464	PMD0301BSA	103	1.160E-03	6.712E-09	2.409E-07	2.476E-07	6.704E-09	7.786E-12	1.028E+00	1.000E+00	3.232E-05
465	PMD0302ASA	28	1.160E-03	6.935E-10	2.409E-07	2.416E-07	6.927E-10	8.045E-13	1.003E+00	1.000E+00	3.339E-06
466	PMD0302BSA	18	1.160E-03	5.082E-10	2.409E-07	2.414E-07	5.076E-10	5.895E-13	1.002E+00	1.000E+00	2.447E-06
467	PMDMOD11	186	2.090E-03	7.809E-09	2.409E-07	2.487E-07	7.793E-09	1.632E-11	1.032E+00	1.000E+00	6.775E-05
468	PMDMOD12	53	2.090E-03	9.717E-10	2.409E-07	2.419E-07	9.697E-10	2.031E-12	1.004E+00	1.000E+00	8.430E-06
469	PMDMOD21	98	4.070E-03	5.373E-09	2.409E-07	2.463E-07	5.351E-09	2.187E-11	1.022E+00	1.000E+00	9.077E-05
470	PMDMOD22	17	4.070E-03	2.693E-10	2.409E-07	2.412E-07	2.682E-10	1.096E-12	1.001E+00	1.000E+00	4.549E-06
471	PMDMOD34	27	5.020E-03	5.057E-09	2.409E-07	2.460E-07	5.032E-09	2.539E-11	1.021E+00	1.000E+00	1.054E-04
472	PMDMOD41	29	6.350E-04	1.183E-09	2.409E-07	2.421E-07	1.182E-09	7.510E-13	1.005E+00	1.000E+00	3.117E-06
473	PMDMOD42	2	6.350E-04	3.512E-11	2.409E-07	2.410E-07	3.510E-11	2.230E-14	1.000E+00	1.000E+00	9.256E-08
474	PMDXS00ASA	12	8.000E-05	3.709E-09	2.409E-07	2.446E-07	3.708E-09	2.967E-13	1.015E+00	1.000E+00	1.232E-06
475	PRAAV108LA	208	1.090E-03	2.668E-08	2.409E-07	2.676E-07	2.665E-08	2.908E-11	1.111E+00	1.000E+00	1.207E-04
476	PRAAV108TM	109	5.000E-04	2.339E-08	2.409E-07	2.643E-07	2.337E-08	1.169E-11	1.097E+00	1.000E+00	4.853E-05
477	PRAAV130LA	208	1.090E-03	2.668E-08	2.409E-07	2.676E-07	2.665E-08	2.908E-11	1.111E+00	1.000E+00	1.207E-04
478	PRAAV130TM	109	5.000E-04	2.339E-08	2.409E-07	2.643E-07	2.337E-08	1.169E-11	1.097E+00	1.000E+00	4.853E-05
479	PRAMOD10	19	2.110E-03	3.423E-09	2.409E-07	2.443E-07	3.416E-09	7.223E-12	1.014E+00	1.000E+00	2.998E-05
480	PRAMOD9	51	1.410E-02	4.007E-09	2.409E-07	2.449E-07	3.951E-09	5.650E-11	1.016E+00	1.000E+00	2.345E-04
481	PRBAV108LA	208	1.090E-03	2.643E-08	2.409E-07	2.673E-07	2.641E-08	2.881E-11	1.110E+00	1.000E+00	1.196E-04
482	PRBAV108TM	109	5.000E-04	2.339E-08	2.409E-07	2.643E-07	2.337E-08	1.169E-11	1.097E+00	1.000E+00	4.853E-05
483	PRBAV130LA	208	1.090E-03	2.643E-08	2.409E-07	2.673E-07	2.641E-08	2.881E-11	1.110E+00	1.000E+00	1.196E-04
484	PRBAV130TM	109	5.000E-04	2.339E-08	2.409E-07	2.643E-07	2.337E-08	1.169E-11	1.097E+00	1.000E+00	4.853E-05
485	PRBMOD10	19	2.110E-03	3.423E-09	2.409E-07	2.443E-07	3.416E-09	7.223E-12	1.014E+00	1.000E+00	2.998E-05
486	PRCEP101SA	2	1.710E-04	2.251E-09	2.409E-07	2.432E-07	2.251E-09	3.850E-13	1.009E+00	1.000E+00	1.598E-06
487	PRCEP108SA	2	1.710E-04	2.251E-09	2.409E-07	2.432E-07	2.251E-09	3.850E-13	1.009E+00	1.000E+00	1.598E-06
488	PRDEP108SA	2	1.710E-04	2.251E-09	2.409E-07	2.432E-07	2.251E-09	3.850E-13	1.009E+00	1.000E+00	1.598E-06
489	PRI-MAN01	2	4.960E-04	2.250E-09	2.409E-07	2.432E-07	2.249E-09	1.116E-12	1.009E+00	1.000E+00	4.632E-06
490	PXX-AV-LA	1975	9.600E-05	1.860E-05	2.391E-07	1.884E-05	1.860E-05	1.785E-09	7.818E+01	1.007E+00	7.410E-03
491	PXX-AV-LA1	1975	9.600E-05	1.860E-05	2.391E-07	1.884E-05	1.860E-05	1.785E-09	7.818E+01	1.007E+00	7.410E-03
492	RC1CB051GO	186	4.200E-03	3.819E-08	2.408E-07	2.790E-07	3.803E-08	1.604E-10	1.158E+00	1.001E+00	6.658E-04
493	RC1CB052GO	174	4.200E-03	3.092E-08	2.408E-07	2.717E-07	3.079E-08	1.299E-10	1.128E+00	1.001E+00	5.391E-04
494	RC1CB053GO	186	4.200E-03	3.819E-08	2.408E-07	2.790E-07	3.803E-08	1.604E-10	1.158E+00	1.001E+00	6.658E-04
495	RC1CB054GO	174	4.200E-03	3.092E-08	2.408E-07	2.717E-07	3.079E-08	1.299E-10	1.128E+00	1.001E+00	5.391E-04
496	RC1CB061GO	186	4.200E-03	3.819E-08	2.408E-07	2.790E-07	3.803E-08	1.604E-10	1.158E+00	1.001E+00	6.658E-04
497	RC1CB062GO	146	4.200E-03	3.072E-08	2.408E-07	2.715E-07	3.059E-08	1.290E-10	1.127E+00	1.001E+00	5.355E-04
498	RC1CB063GO	186	4.200E-03	3.819E-08	2.408E-07	2.790E-07	3.803E-08	1.604E-10	1.158E+00	1.001E+00	6.658E-04
499	RC1CB064GO	146	4.200E-03	3.072E-08	2.408E-07	2.715E-07	3.059E-08	1.290E-10	1.127E+00	1.001E+00	5.355E-04
500	RCX-RB-FA	95	8.100E-06	4.578E-06	2.409E-07	4.819E-06	4.578E-06	3.708E-11	2.000E+01	1.000E+00	1.539E-04
501	REA-PLUG	232	2.400E-04	4.173E-07	2.408E-07	6.581E-07	4.172E-07	1.002E-10	2.732E+00	1.000E+00	4.157E-04
502	REACV119GO	79	1.750E-03	4.693E-09	2.409E-07	2.456E-07	4.685E-09	8.213E-12	1.019E+00	1.000E+00	3.409E-05
503	REB-PLUG	212	2.400E-04	4.090E-07	2.408E-07	6.498E-07	4.089E-07	9.816E-11	2.697E+00	1.000E+00	4.074E-04
504	REBCV119GO	79	1.750E-03	4.693E-09	2.409E-07	2.456E-07	4.685E-09	8.213E-12	1.019E+00	1.000E+00	3.409E-05
505	REC-MANDAS	381	1.160E-02	1.574E-07	2.391E-07	3.965E-07	1.555E-07	1.825E-09	1.646E+00	1.008E+00	7.577E-03
506	REC-MANDASC	723	5.060E-01	1.516E-08	2.333E-07	2.484E-07	7.487E-09	7.669E-09	1.031E+00	1.033E+00	3.183E-02
507	REG-MAN00	232	2.040E-01	2.560E-09	2.404E-07	2.430E-07	2.038E-09	5.223E-10	1.008E+00	1.002E+00	2.168E-03
508	REN-MAN04	495	1.000E-02	7.033E-07	2.339E-07	9.372E-07	6.962E-07	7.033E-09	3.890E+00	1.030E+00	2.919E-02
509	REX-FL-GP	849	1.200E-05	1.474E-03	2.232E-07	1.474E-03	1.474E-03	1.770E-08	6.119E+03	1.079E+00	7.346E-02
510	RHN-MAN01	168	2.900E-03	1.864E-07	2.404E-07	4.268E-07	1.859E-07	5.405E-10	1.771E+00	1.002E+00	2.244E-03
511	RN11MOD3	362	1.410E-02	1.879E-07	2.383E-07	4.262E-07	1.852E-07	2.649E-09	1.769E+00	1.011E+00	1.100E-02

Table 50-22 (Sheet 12 of 13)

RISK IMPORTANCES SORTED BY BASIC EVENT IDENTIFICATION

512	RN22MOD4	362	1.410E-02	1.879E-07	2.383E-07	4.262E-07	1.852E-07	2.649E-09	1.769E+00	1.011E+00	1.100E-02
513	RN23MOD5	362	1.410E-02	1.879E-07	2.383E-07	4.262E-07	1.852E-07	2.649E-09	1.769E+00	1.011E+00	1.100E-02
514	RN55MOD1	362	1.410E-02	1.879E-07	2.383E-07	4.262E-07	1.852E-07	2.649E-09	1.769E+00	1.011E+00	1.100E-02
515	RNAEP01ASA	19	1.710E-04	5.848E-09	2.409E-07	2.468E-07	5.847E-09	1.000E-12	1.024E+00	1.000E+00	4.151E-06
516	RNAEP01BSA	17	1.710E-04	5.699E-09	2.409E-07	2.466E-07	5.698E-09	9.745E-13	1.024E+00	1.000E+00	4.045E-06
517	RNAEP022SA	50	1.710E-04	1.758E-07	2.409E-07	4.167E-07	1.758E-07	3.007E-11	1.730E+00	1.000E+00	1.248E-04
518	RNAMOD06	312	3.400E-02	7.420E-09	2.407E-07	2.481E-07	7.167E-09	2.523E-10	1.030E+00	1.001E+00	1.047E-03
519	RNAMOD09	160	5.070E-02	9.436E-09	2.404E-07	2.499E-07	8.958E-09	4.784E-10	1.037E+00	1.002E+00	1.986E-03
520	RNBEP011SA	50	1.710E-04	1.758E-07	2.409E-07	4.167E-07	1.758E-07	3.007E-11	1.730E+00	1.000E+00	1.248E-04
521	RNBMOD07	199	3.400E-02	6.901E-09	2.407E-07	2.476E-07	6.667E-09	2.346E-10	1.028E+00	1.001E+00	9.739E-04
522	RNBMOD10	160	5.070E-02	9.436E-09	2.404E-07	2.499E-07	8.958E-09	4.784E-10	1.037E+00	1.002E+00	1.986E-03
523	RNDEP023SA	50	1.710E-04	1.758E-07	2.409E-07	4.167E-07	1.758E-07	3.007E-11	1.730E+00	1.000E+00	1.248E-04
524	RNNCV013GO	142	1.750E-03	1.857E-07	2.406E-07	4.263E-07	1.853E-07	3.249E-10	1.769E+00	1.001E+00	1.349E-03
525	RNNCV056GO	61	2.190E-04	1.788E-07	2.409E-07	4.197E-07	1.788E-07	3.916E-11	1.742E+00	1.000E+00	1.625E-04
526	RNX-CV-GO	25	5.100E-05	1.699E-07	2.409E-07	4.108E-07	1.699E-07	8.664E-12	1.705E+00	1.000E+00	3.596E-05
527	RNX-KV-GO	92	6.100E-04	1.833E-07	2.408E-07	4.241E-07	1.832E-07	1.118E-10	1.760E+00	1.000E+00	4.640E-04
528	RNX-KV1-GO	207	4.900E-03	1.869E-07	2.400E-07	4.269E-07	1.860E-07	9.160E-10	1.772E+00	1.004E+00	3.802E-03
529	RNX-PM-ER	19	1.600E-05	1.681E-07	2.409E-07	4.090E-07	1.681E-07	2.689E-12	1.698E+00	1.000E+00	1.116E-05
530	RNX-PM-FS	102	7.700E-04	1.838E-07	2.408E-07	4.246E-07	1.837E-07	1.415E-10	1.762E+00	1.001E+00	5.875E-04
531	RPTMOD01	107	8.760E-04	3.585E-08	2.409E-07	2.767E-07	3.582E-08	3.141E-11	1.149E+00	1.000E+00	1.304E-04
532	RPTMOD02	77	8.760E-04	2.839E-08	2.409E-07	2.693E-07	2.837E-08	2.487E-11	1.118E+00	1.000E+00	1.032E-04
533	RPTMOD03	107	8.760E-04	3.585E-08	2.409E-07	2.767E-07	3.582E-08	3.141E-11	1.149E+00	1.000E+00	1.304E-04
534	RPTMOD04	77	8.760E-04	2.839E-08	2.409E-07	2.693E-07	2.837E-08	2.487E-11	1.118E+00	1.000E+00	1.032E-04
535	RPTMOD05	107	8.760E-04	3.585E-08	2.409E-07	2.767E-07	3.582E-08	3.141E-11	1.149E+00	1.000E+00	1.304E-04
536	RPTMOD06	77	8.760E-04	2.839E-08	2.409E-07	2.693E-07	2.837E-08	2.487E-11	1.118E+00	1.000E+00	1.032E-04
537	RPTMOD07	107	8.760E-04	3.585E-08	2.409E-07	2.767E-07	3.582E-08	3.141E-11	1.149E+00	1.000E+00	1.304E-04
538	RPTMOD08	77	8.760E-04	2.839E-08	2.409E-07	2.693E-07	2.837E-08	2.487E-11	1.118E+00	1.000E+00	1.032E-04
539	RPX-CB-GO	426	4.200E-04	1.223E-05	2.358E-07	1.246E-05	1.222E-05	5.135E-09	5.172E+01	1.022E+00	2.131E-02
540	SFBEP013ASA	6	1.710E-04	7.661E-10	2.409E-07	2.417E-07	7.660E-10	1.310E-13	1.003E+00	1.000E+00	5.437E-07
541	SFBEP013BSA	6	1.710E-04	7.661E-10	2.409E-07	2.417E-07	7.660E-10	1.310E-13	1.003E+00	1.000E+00	5.437E-07
542	SFBEPSFPASA	6	1.710E-04	7.661E-10	2.409E-07	2.417E-07	7.660E-10	1.310E-13	1.003E+00	1.000E+00	5.437E-07
543	SFBEPSFPBSA	6	1.710E-04	7.661E-10	2.409E-07	2.417E-07	7.660E-10	1.310E-13	1.003E+00	1.000E+00	5.437E-07
544	SFNMV067GC	14	1.100E-02	3.182E-11	2.409E-07	2.410E-07	3.147E-11	3.500E-13	1.000E+00	1.000E+00	1.453E-06
545	SG2TF50ARI	18	5.230E-03	1.120E-09	2.409E-07	2.420E-07	1.114E-09	5.855E-12	1.005E+00	1.000E+00	2.430E-05
546	SGAAV040LA	2	1.090E-03	3.706E-11	2.409E-07	2.410E-07	3.702E-11	4.040E-14	1.000E+00	1.000E+00	1.677E-07
547	SGAOR--DAS-SP	7	7.220E-03	2.203E-10	2.409E-07	2.411E-07	2.187E-10	1.590E-12	1.001E+00	1.000E+00	6.601E-06
548	SGATL--DAS-UF	5	5.230E-03	2.038E-10	2.409E-07	2.411E-07	2.027E-10	1.066E-12	1.001E+00	1.000E+00	4.423E-06
549	SGBAV040LA	276	1.090E-03	1.346E-07	2.408E-07	3.754E-07	1.345E-07	1.467E-10	1.558E+00	1.001E+00	6.091E-04
550	SGBAV057LA	1	1.090E-03	1.000E-11	2.409E-07	2.409E-07	9.989E-12	1.090E-14	1.000E+00	1.000E+00	4.524E-08
551	SGBAV074LA	79	8.760E-03	1.089E-09	2.409E-07	2.420E-07	1.080E-09	9.542E-12	1.004E+00	1.000E+00	3.961E-05
552	SGBAV075LA	79	8.760E-03	1.089E-09	2.409E-07	2.420E-07	1.080E-09	9.542E-12	1.004E+00	1.000E+00	3.961E-05
553	SGBAV250LA	1	8.760E-03	1.244E-12	2.409E-07	2.409E-07	1.233E-12	1.090E-14	1.000E+00	1.000E+00	4.524E-08
554	SGBCV058GC	1	2.450E-02	4.449E-13	2.409E-07	2.409E-07	4.340E-13	1.090E-14	1.000E+00	1.000E+00	4.524E-08
555	SGBOR--DAS-SP	7	7.220E-03	2.203E-10	2.409E-07	2.411E-07	2.187E-10	1.590E-12	1.001E+00	1.000E+00	6.601E-06
556	SGBTL--DAS-UF	5	5.230E-03	2.038E-10	2.409E-07	2.411E-07	2.027E-10	1.066E-12	1.001E+00	1.000E+00	4.423E-06
557	SGX-AV-FA	4	6.300E-06	2.778E-08	2.409E-07	2.687E-07	2.778E-08	1.750E-13	1.115E+00	1.000E+00	7.264E-07
558	SGX-CV-GO	4	6.400E-06	2.781E-08	2.409E-07	2.687E-07	2.781E-08	1.780E-13	1.115E+00	1.000E+00	7.388E-07
559	SGX-MV-RP	4	7.670E-06	2.780E-08	2.409E-07	2.687E-07	2.780E-08	2.132E-13	1.115E+00	1.000E+00	8.849E-07

Table 50-22 (Sheet 13 of 13)

RISK IMPORTANCES SORTED BY BASIC EVENT IDENTIFICATION

560	SWAMOD03	44	6.340E-04	9.692E-09	2.409E-07	2.506E-07	9.686E-09	6.145E-12	1.040E+00	1.000E+00	2.550E-05
561	SWAMOD09T	82	2.520E-04	1.624E-07	2.409E-07	4.032E-07	1.623E-07	4.091E-11	1.674E+00	1.000E+00	1.698E-04
562	SWB-001TM	34	3.800E-02	2.149E-10	2.409E-07	2.411E-07	2.068E-10	8.168E-12	1.001E+00	1.000E+00	3.390E-05
563	SWBMOD02	31	2.440E-02	2.109E-10	2.409E-07	2.411E-07	2.057E-10	5.145E-12	1.001E+00	1.000E+00	2.136E-05
564	SWBMOD11P	6	1.410E-02	6.383E-11	2.409E-07	2.410E-07	6.293E-11	9.000E-13	1.000E+00	1.000E+00	3.736E-06
565	SWN-MAN03	55	4.000E-02	1.333E-09	2.409E-07	2.422E-07	1.280E-09	5.333E-11	1.005E+00	1.000E+00	2.214E-04
566	SWX-PM-ER	12	1.400E-05	1.391E-07	2.409E-07	3.800E-07	1.391E-07	1.947E-12	1.577E+00	1.000E+00	8.083E-06
567	TCBMOD01B	1	2.520E-02	5.000E-12	2.409E-07	2.409E-07	4.874E-12	1.260E-13	1.000E+00	1.000E+00	5.230E-07
568	VFIAV004	8	8.760E-03	3.066E-10	2.409E-07	2.412E-07	3.039E-10	2.686E-12	1.001E+00	1.000E+00	1.115E-05
569	VFIAV010	8	8.760E-03	3.066E-10	2.409E-07	2.412E-07	3.039E-10	2.686E-12	1.001E+00	1.000E+00	1.115E-05
570	VFOAV003	8	8.760E-03	3.066E-10	2.409E-07	2.412E-07	3.039E-10	2.686E-12	1.001E+00	1.000E+00	1.115E-05
571	VFOAV009	8	8.760E-03	3.066E-10	2.409E-07	2.412E-07	3.039E-10	2.686E-12	1.001E+00	1.000E+00	1.115E-05
572	VFSFRAC	16	1.200E-01	4.476E-11	2.409E-07	2.410E-07	3.939E-11	5.371E-12	1.000E+00	1.000E+00	2.229E-05
573	VW2EPTRBSA	4	1.710E-04	3.556E-09	2.409E-07	2.445E-07	3.555E-09	6.080E-13	1.015E+00	1.000E+00	2.524E-06
574	VWAMOD01	6	2.520E-04	5.758E-09	2.409E-07	2.467E-07	5.756E-09	1.451E-12	1.024E+00	1.000E+00	6.023E-06
575	VWAMOD02	14	6.120E-04	7.732E-09	2.409E-07	2.486E-07	7.727E-09	4.732E-12	1.032E+00	1.000E+00	1.964E-05
576	VWAMOD03	6	2.520E-04	5.758E-09	2.409E-07	2.467E-07	5.756E-09	1.451E-12	1.024E+00	1.000E+00	6.023E-06
577	VWBMOD04	141	1.830E-02	9.910E-09	2.407E-07	2.506E-07	9.729E-09	1.814E-10	1.040E+00	1.001E+00	7.527E-04
578	VWBMOD05	158	2.190E-02	9.985E-09	2.407E-07	2.507E-07	9.766E-09	2.187E-10	1.041E+00	1.001E+00	9.076E-04
579	VWBMOD06	33	5.180E-03	8.939E-09	2.409E-07	2.498E-07	8.893E-09	4.630E-11	1.037E+00	1.000E+00	1.922E-04
580	VWN-MAN01	33	5.160E-03	8.947E-09	2.409E-07	2.498E-07	8.901E-09	4.617E-11	1.037E+00	1.000E+00	1.916E-04
581	VWX-RF-ER	2	1.200E-05	1.041E-07	2.409E-07	3.450E-07	1.041E-07	1.249E-12	1.432E+00	1.000E+00	5.184E-06
582	WLIAV004LA	52	8.760E-03	2.682E-09	2.409E-07	2.436E-07	2.658E-09	2.349E-11	1.011E+00	1.000E+00	9.750E-05
583	WLIAV055LA	52	8.760E-03	2.682E-09	2.409E-07	2.436E-07	2.658E-09	2.349E-11	1.011E+00	1.000E+00	9.750E-05
584	WLOAV006LA	52	8.760E-03	2.682E-09	2.409E-07	2.436E-07	2.658E-09	2.349E-11	1.011E+00	1.000E+00	9.750E-05
585	WLOAV057LA	52	8.760E-03	2.682E-09	2.409E-07	2.436E-07	2.658E-09	2.349E-11	1.011E+00	1.000E+00	9.750E-05
586	ZANMOD01	54	8.400E-05	2.733E-08	2.409E-07	2.682E-07	2.733E-08	2.296E-12	1.113E+00	1.000E+00	9.528E-06
587	ZANTR-2AHF	14	2.880E-05	1.233E-08	2.409E-07	2.532E-07	1.233E-08	3.550E-13	1.051E+00	1.000E+00	1.474E-06
588	ZO1DG001TM	762	4.600E-02	5.727E-09	2.407E-07	2.464E-07	5.463E-09	2.634E-10	1.023E+00	1.001E+00	1.093E-03
589	ZO1MOD01	439	2.020E-02	5.150E-09	2.408E-07	2.460E-07	5.046E-09	1.040E-10	1.021E+00	1.000E+00	4.318E-04
590	ZO1MOD03	2	1.000E-04	2.810E-10	2.409E-07	2.412E-07	2.810E-10	2.810E-14	1.001E+00	1.000E+00	1.166E-07
591	ZO1MOD04	47	1.250E-03	2.652E-09	2.409E-07	2.436E-07	2.649E-09	3.315E-12	1.011E+00	1.000E+00	1.376E-05
592	ZO2DG002TM	230	4.600E-02	1.468E-09	2.409E-07	2.423E-07	1.401E-09	6.755E-11	1.006E+00	1.000E+00	2.804E-04
593	ZO2MOD01	112	2.020E-02	1.236E-09	2.409E-07	2.421E-07	1.211E-09	2.496E-11	1.005E+00	1.000E+00	1.036E-04
594	ZO2MOD04	7	1.250E-03	4.053E-10	2.409E-07	2.413E-07	4.048E-10	5.066E-13	1.002E+00	1.000E+00	2.103E-06
595	ZOX-BL-ES	1	6.000E-05	1.867E-09	2.409E-07	2.428E-07	1.867E-09	1.120E-13	1.008E+00	1.000E+00	4.649E-07
596	ZOX-DG-DR	36	4.400E-04	1.115E-08	2.409E-07	2.521E-07	1.115E-08	4.908E-12	1.046E+00	1.000E+00	2.037E-05
597	ZOX-DG-DS	20	2.800E-04	7.319E-09	2.409E-07	2.482E-07	7.317E-09	2.049E-12	1.030E+00	1.000E+00	8.507E-06
598	ZOX-PD-ER	6	1.300E-04	4.850E-09	2.409E-07	2.458E-07	4.849E-09	6.305E-13	1.020E+00	1.000E+00	2.617E-06
599	ZOX-PD-ES	93	2.000E-03	1.404E-08	2.409E-07	2.549E-07	1.402E-08	2.809E-11	1.058E+00	1.000E+00	1.166E-04

CALCULATED CMF = 2.409204E-07

Table 50-23 (Sheet 1 of 15)

RISK IMPORTANCES SORTED BY RISK INCREASE

SORTED BY RISK INCREASE IMPORTANCE

	BASIC EVENT ID	CUTSETS	BEV PROB. Q	BIRN A	CMF0 B	CMF1	RINC	RAW	WRINC %
1	IEV-ISLOC	1	5.000E-11	1.000E+00	2.409E-07	1.000E+00	1.000E+00	4.151E+06	4.151E+08
2	IEV-RV-RP	1	1.000E-08	1.000E+00	2.309E-07	1.000E+00	1.000E+00	4.151E+06	4.151E+08
3	IEV-LLOCA	286	5.000E-06	8.958E-03	1.960E-07	8.958E-03	8.958E-03	3.718E+04	3.718E+06
4	CCX-SFTW	262	1.200E-06	1.904E-03	2.386E-07	1.905E-03	1.904E-03	7.906E+03	7.905E+05
5	REX-FL-GP	849	1.200E-05	1.474E-03	2.232E-07	1.474E-03	1.474E-03	6.119E+03	6.118E+05
6	IEV-SPADS	1078	5.400E-05	5.476E-04	2.113E-07	5.478E-04	5.475E-04	2.274E+03	2.273E+05
7	IEV-SI-LB	1160	2.120E-04	4.480E-04	1.459E-07	4.482E-04	4.479E-04	1.860E+03	1.859E+05
8	IWX-EV-SA	1686	2.600E-05	3.993E-04	2.305E-07	3.996E-04	3.993E-04	1.658E+03	1.657E+05
9	ADX-EV-SA	1678	3.000E-05	3.949E-04	2.291E-07	3.952E-04	3.949E-04	1.640E+03	1.639E+05
10	IWX-CV-AO	1617	3.000E-05	3.929E-04	2.291E-07	3.931E-04	3.929E-04	1.632E+03	1.631E+05
11	ADX-EV-SA2	1607	5.900E-05	3.898E-04	2.179E-07	3.900E-04	3.898E-04	1.619E+03	1.618E+05
12	IWA-PLUG	68	2.400E-04	2.121E-04	1.900E-07	2.123E-04	2.121E-04	8.813E+02	8.803E+04
13	IWX-EV1-SA	1	5.800E-06	2.121E-04	2.397E-07	2.123E-04	2.121E-04	8.812E+02	8.802E+04
14	IWX-CV1-AO	1	5.400E-07	2.111E-04	2.408E-07	2.114E-04	2.111E-04	8.773E+02	8.763E+04
15	CCX-PMXMOD1-SW	347	1.100E-05	1.926E-04	2.388E-07	1.929E-04	1.926E-04	8.005E+02	7.995E+04
16	CCX-EP-SAM	298	8.620E-06	1.921E-04	2.393E-07	1.923E-04	1.921E-04	7.983E+02	7.973E+04
17	IWX-FL-GP	993	1.200E-05	1.797E-04	2.388E-07	1.799E-04	1.797E-04	7.468E+02	7.458E+04
18	CCX-AV-LA	133	6.200E-05	6.786E-05	2.367E-07	6.810E-05	6.786E-05	2.827E+02	2.817E+04
19	CCX-INPUT-LOGIC	43	1.030E-04	6.635E-05	2.341E-07	6.659E-05	6.635E-05	2.764E+02	2.754E+04
20	CMX-VS-FA	75	3.840E-05	6.542E-05	2.384E-07	6.566E-05	6.542E-05	2.725E+02	2.715E+04
21	CMX-CV-GO	93	5.100E-05	6.542E-05	2.376E-07	6.565E-05	6.541E-05	2.725E+02	2.715E+04
22	CCX-IN-LOGIC-SW	22	1.100E-05	6.269E-05	2.402E-07	6.293E-05	6.269E-05	2.612E+02	2.602E+04
23	CCX-PMXMOD2-SW	22	1.100E-05	6.269E-05	2.402E-07	6.293E-05	6.269E-05	2.612E+02	2.602E+04
24	CMX-TK-AF	5	1.200E-07	6.115E-05	2.409E-07	6.140E-05	6.115E-05	2.548E+02	2.538E+04
25	ACX-CV-GO	179	5.100E-05	5.958E-05	2.379E-07	5.982E-05	5.957E-05	2.483E+02	2.473E+04
26	ACX-TK-AF	3	1.200E-07	5.918E-05	2.409E-07	5.942E-05	5.918E-05	2.467E+02	2.457E+04
27	IEV-CMTLB	987	9.310E-05	3.954E-05	2.372E-07	3.978E-05	3.954E-05	1.651E+02	1.641E+04
28	CCX-BY-PN	968	4.700E-05	3.777E-05	2.391E-07	3.801E-05	3.777E-05	1.578E+02	1.568E+04
29	IEV-MLOCA	1681	4.360E-04	3.696E-05	2.248E-07	3.718E-05	3.694E-05	1.543E+02	1.533E+04
30	IEV-SLOCA	1638	5.000E-04	3.616E-05	2.228E-07	3.638E-05	3.614E-05	1.510E+02	1.500E+04
31	PXX-AV-LA	1975	9.600E-05	1.860E-05	2.391E-07	1.884E-05	1.860E-05	7.818E+01	7.718E+03
32	PXX-AV-LA1	1975	9.600E-05	1.860E-05	2.391E-07	1.884E-05	1.860E-05	7.818E+01	7.718E+03
33	PCNHR001ML	194	2.400E-06	1.677E-05	2.409E-07	1.701E-05	1.677E-05	7.060E+01	6.960E+03
34	IWNTK001AF	194	2.400E-06	1.677E-05	2.409E-07	1.701E-05	1.677E-05	7.060E+01	6.960E+03
35	IWX-XMTR	560	4.780E-04	1.495E-05	2.338E-07	1.518E-05	1.494E-05	6.302E+01	6.202E+03
36	RPX-CB-GO	426	4.200E-04	1.223E-05	2.358E-07	1.246E-05	1.222E-05	5.172E+01	5.072E+03

Table 50-23 (Sheet 2 of 15)

RISK IMPORTANCES SORTED BY RISK INCREASE

37	ADX-MV3-GO	2324	3.240E-04	1.033E-05	2.376E-07	1.056E-05	1.032E-05	4.385E+01	4.285E+03
38	CCX-XMTR	579	4.780E-04	8.755E-06	2.367E-07	8.992E-06	8.751E-06	3.732E+01	3.632E+03
39	CCX-XMTR195	280	4.780E-04	8.449E-06	2.369E-07	8.686E-06	8.445E-06	3.605E+01	3.505E+03
40	ALL-IND-FAIL	63	1.000E-06	7.487E-06	2.409E-07	7.728E-06	7.487E-06	3.208E+01	3.108E+03
41	ACAOR001SP	95	7.270E-04	5.542E-06	2.369E-07	5.779E-06	5.538E-06	2.399E+01	2.299E+03
42	ACACV028GO	141	1.750E-03	5.536E-06	2.312E-07	5.767E-06	5.526E-06	2.394E+01	2.294E+03
43	ACACV029GO	141	1.750E-03	5.536E-06	2.312E-07	5.767E-06	5.526E-06	2.394E+01	2.294E+03
44	ACATK001AF	8	2.400E-06	5.505E-06	2.409E-07	5.746E-06	5.505E-06	2.385E+01	2.285E+03
45	ACAOR001EB	7	7.200E-07	5.492E-06	2.409E-07	5.733E-06	5.492E-06	2.380E+01	2.280E+03
46	ACBOR001SP	35	7.270E-04	5.237E-06	2.371E-07	5.474E-06	5.233E-06	2.272E+01	2.172E+03
47	ACBTK001AF	4	2.400E-06	5.228E-06	2.409E-07	5.469E-06	5.228E-06	2.270E+01	2.170E+03
48	ACBOR001EB	4	7.200E-07	5.228E-06	2.409E-07	5.469E-06	5.228E-06	2.270E+01	2.170E+03
49	ACBCV029GO	73	1.750E-03	5.230E-06	2.318E-07	5.462E-06	5.221E-06	2.267E+01	2.167E+03
50	ACBCV028GO	73	1.750E-03	5.230E-06	2.318E-07	5.462E-06	5.221E-06	2.267E+01	2.167E+03
51	RCX-RB-FA	95	8.100E-06	4.578E-06	2.409E-07	4.819E-06	4.578E-06	2.000E+01	1.900E+03
52	ED3MOD07	387	3.050E-04	3.840E-06	2.397E-07	4.080E-06	3.839E-06	1.693E+01	1.593E+03
53	IEV-PRSTR	317	1.340E-04	3.743E-06	2.404E-07	3.983E-06	3.742E-06	1.653E+01	1.553E+03
54	CCX-PMXMOD4-SW	54	1.100E-05	3.462E-06	2.409E-07	3.703E-06	3.462E-06	1.537E+01	1.437E+03
55	IDBBSDS1TM	606	3.000E-04	2.566E-06	2.402E-07	2.806E-06	2.565E-06	1.165E+01	1.065E+03
56	IDBBSDD1TM	581	3.000E-04	2.561E-06	2.402E-07	2.801E-06	2.560E-06	1.163E+01	1.063E+03
57	CMA-PLUG	65	7.270E-04	2.319E-06	2.392E-07	2.559E-06	2.318E-06	1.062E+01	9.620E+02
58	CMATK002AF	17	2.400E-06	2.297E-06	2.409E-07	2.538E-06	2.297E-06	1.053E+01	9.534E+02
59	CMA-CV	16	2.000E-06	2.293E-06	2.409E-07	2.534E-06	2.293E-06	1.052E+01	9.516E+02
60	CMAOR001EB	14	7.200E-07	2.280E-06	2.409E-07	2.521E-06	2.280E-06	1.046E+01	9.465E+02
61	CMX-AV-LA	36	9.600E-05	2.273E-06	2.407E-07	2.514E-06	2.273E-06	1.043E+01	9.434E+02
62	IDBFD013RQ	83	1.200E-05	2.140E-06	2.409E-07	2.381E-06	2.140E-06	9.882E+00	8.882E+02
63	IDBBSDS1LF	46	4.800E-06	2.063E-06	2.409E-07	2.304E-06	2.063E-06	9.563E+00	8.563E+02
64	IDBBSDD1LF	46	4.800E-06	2.063E-06	2.409E-07	2.304E-06	2.063E-06	9.563E+00	8.563E+02
65	IDDBSDS1TM	253	3.000E-04	2.058E-06	2.403E-07	2.299E-06	2.058E-06	9.542E+00	8.542E+02
66	IDDBSDD1TM	207	3.000E-04	2.053E-06	2.403E-07	2.293E-06	2.052E-06	9.519E+00	8.519E+02
67	IDDFD019RQ	52	1.200E-05	1.955E-06	2.409E-07	2.196E-06	1.955E-06	9.116E+00	8.116E+02
68	IDDBSDS1LF	31	4.800E-06	1.900E-06	2.409E-07	2.141E-06	1.900E-06	8.886E+00	7.886E+02
69	IDDBSDD1LF	31	4.800E-06	1.900E-06	2.409E-07	2.141E-06	1.900E-06	8.886E+00	7.886E+02
70	IEV-SGTR	3076	3.880E-03	1.751E-06	2.341E-07	1.985E-06	1.744E-06	8.238E+00	7.238E+02
71	CCX-IV-XR	160	2.400E-05	1.666E-06	2.409E-07	1.907E-06	1.666E-06	7.915E+00	6.915E+02
72	CCX-EP-SA	46	8.620E-06	1.410E-06	2.409E-07	1.651E-06	1.410E-06	6.853E+00	5.853E+02
73	CIB-MAN00	320	1.840E-03	1.288E-06	2.386E-07	1.527E-06	1.286E-06	6.337E+00	5.337E+02
74	IDABSDS1TM	264	3.000E-04	1.197E-06	2.406E-07	1.437E-06	1.196E-06	5.965E+00	4.965E+02
75	IDABSDD1TM	239	3.000E-04	1.192E-06	2.406E-07	1.433E-06	1.192E-06	5.947E+00	4.947E+02
76	CCX-PMS-HARDWARE	52	7.890E-05	1.179E-06	2.408E-07	1.420E-06	1.179E-06	5.893E+00	4.893E+02
77	IDCBSDS1TM	333	3.000E-04	1.094E-06	2.406E-07	1.334E-06	1.093E-06	5.538E+00	4.538E+02
78	IDCBSDD1TM	308	3.000E-04	1.089E-06	2.406E-07	1.330E-06	1.089E-06	5.520E+00	4.520E+02

Table 50-23 (Sheet 3 of 15)

RISK IMPORTANCES SORTED BY RISK INCREASE

79	IDAFD003RQ	45	1.200E-05	1.080E-06	2.409E-07	1.321E-06	1.080E-06	5.484E+00	4.484E+02
80	IDABSDD1LF	31	4.800E-06	1.052E-06	2.409E-07	1.293E-06	1.052E-06	5.366E+00	4.366E+02
81	IDABSDS1LF	31	4.800E-06	1.052E-06	2.409E-07	1.293E-06	1.052E-06	5.366E+00	4.366E+02
82	IWBRS123AFA	16	8.760E-04	1.000E-06	2.400E-07	1.240E-06	9.992E-07	5.148E+00	4.148E+02
83	IWDRS125AFA	16	8.760E-04	1.000E-06	2.400E-07	1.240E-06	9.992E-07	5.148E+00	4.148E+02
84	IRWMOD06	21	1.460E-03	1.000E-06	2.395E-07	1.240E-06	9.989E-07	5.146E+00	4.146E+02
85	IRWMOD05	17	1.460E-03	1.000E-06	2.395E-07	1.240E-06	9.987E-07	5.146E+00	4.146E+02
86	IWACV124AO	26	1.750E-03	9.998E-07	2.392E-07	1.239E-06	9.981E-07	5.143E+00	4.143E+02
87	IWACV122AO	20	1.750E-03	9.997E-07	2.392E-07	1.239E-06	9.979E-07	5.142E+00	4.142E+02
88	CCX-TT-UF	139	1.170E-04	9.364E-07	2.408E-07	1.177E-06	9.363E-07	4.886E+00	3.886E+02
89	IDCFD007RQ	35	1.200E-05	9.257E-07	2.409E-07	1.167E-06	9.257E-07	4.842E+00	3.842E+02
90	IDCBSDS1LF	16	4.800E-06	8.887E-07	2.409E-07	1.130E-06	8.887E-07	4.689E+00	3.689E+02
91	IDCBSDD1LF	16	4.800E-06	8.887E-07	2.409E-07	1.130E-06	8.887E-07	4.689E+00	3.689E+02
92	CCX-TRNSM	556	4.780E-04	8.126E-07	2.405E-07	1.053E-06	8.122E-07	4.371E+00	3.371E+02
93	ADN-MAN01	680	3.020E-03	7.843E-07	2.386E-07	1.023E-06	7.820E-07	4.246E+00	3.246E+02
94	EC1BS001TM	1288	2.700E-03	7.530E-07	2.389E-07	9.918E-07	7.509E-07	4.117E+00	3.117E+02
95	REN-MAN04	495	1.000E-02	7.033E-07	2.339E-07	9.372E-07	6.962E-07	3.890E+00	2.890E+02
96	EC1BS012TM	1041	2.700E-03	6.818E-07	2.391E-07	9.209E-07	6.800E-07	3.822E+00	2.822E+02
97	CCX-VS-FA	17	3.840E-05	6.787E-07	2.409E-07	9.196E-07	6.787E-07	3.817E+00	2.817E+02
98	AD4MOD09	510	5.800E-04	6.610E-07	2.405E-07	9.015E-07	6.606E-07	3.742E+00	2.742E+02
99	AD4MOD08	510	5.800E-04	6.610E-07	2.405E-07	9.015E-07	6.606E-07	3.742E+00	2.742E+02
100	AD4MOD07	510	5.800E-04	6.610E-07	2.405E-07	9.015E-07	6.606E-07	3.742E+00	2.742E+02
101	AD4MOD10	510	5.800E-04	6.610E-07	2.405E-07	9.015E-07	6.606E-07	3.742E+00	2.742E+02
102	EC1MOD12	142	4.800E-05	5.589E-07	2.409E-07	7.998E-07	5.589E-07	3.320E+00	2.320E+02
103	CIB-MAN01	280	1.340E-03	5.540E-07	2.402E-07	7.941E-07	5.532E-07	3.296E+00	2.296E+02
104	IEV-SLB-V	305	1.210E-03	5.010E-07	2.403E-07	7.414E-07	5.004E-07	3.077E+00	2.077E+02
105	LPM-MAN02	282	3.300E-03	4.557E-07	2.394E-07	6.951E-07	4.542E-07	2.885E+00	1.885E+02
106	REA-PLUG	232	2.400E-04	4.173E-07	2.408E-07	6.581E-07	4.172E-07	2.732E+00	1.732E+02
107	REB-PLUG	212	2.400E-04	4.090E-07	2.408E-07	6.498E-07	4.089E-07	2.697E+00	1.697E+02
108	EC1BS001LF	33	4.800E-06	3.745E-07	2.409E-07	6.155E-07	3.745E-07	2.555E+00	1.555E+02
109	IEV-POWEX	701	4.500E-03	3.687E-07	2.393E-07	6.080E-07	3.671E-07	2.524E+00	1.524E+02
110	IEV-SLB-U	160	3.720E-04	3.513E-07	2.408E-07	5.921E-07	3.512E-07	2.458E+00	1.458E+02
111	CIX-AV-LA	194	7.700E-04	3.134E-07	2.407E-07	5.541E-07	3.132E-07	2.300E+00	1.300E+02
112	CCX-XMTR1	153	4.780E-04	3.124E-07	2.408E-07	5.531E-07	3.122E-07	2.296E+00	1.296E+02
113	LPM-MAN01	227	1.340E-03	3.085E-07	2.405E-07	5.490E-07	3.081E-07	2.279E+00	1.279E+02
114	OTH-PO	63	1.200E-04	3.078E-07	2.409E-07	5.487E-07	3.078E-07	2.278E+00	1.278E+02
115	IEV-RCSLK	1526	6.200E-03	2.750E-07	2.392E-07	5.142E-07	2.733E-07	2.134E+00	1.134E+02
116	CCX-PMDMOD1	119	1.410E-04	2.666E-07	2.409E-07	5.075E-07	2.665E-07	2.106E+00	1.106E+02
117	CVN-MAN00	33	3.100E-03	2.673E-07	2.401E-07	5.074E-07	2.664E-07	2.106E+00	1.106E+02
118	ED1BSDS1TM	137	3.000E-04	2.641E-07	2.408E-07	5.050E-07	2.640E-07	2.096E+00	1.096E+02
119	CCX-PMD030	107	9.690E-05	2.639E-07	2.409E-07	5.048E-07	2.638E-07	2.095E+00	1.095E+02
120	OTH-SGTR	989	1.000E-02	2.599E-07	2.383E-07	4.982E-07	2.573E-07	2.068E+00	1.068E+02

Table 50-23 (Sheet 4 of 15)

RISK IMPORTANCES SORTED BY RISK INCREASE

121	ED1MOD113	119	3.170E-04	2.510E-07	2.408E-07	4.919E-07	2.510E-07	2.042E+00	1.042E+02
122	ED1MOD11	119	3.170E-04	2.510E-07	2.408E-07	4.919E-07	2.510E-07	2.042E+00	1.042E+02
123	CCX-BC-SA	7	8.400E-06	2.451E-07	2.409E-07	4.860E-07	2.451E-07	2.017E+00	1.017E+02
124	CCX-PM-ER	14	1.400E-05	2.430E-07	2.409E-07	4.839E-07	2.430E-07	2.009E+00	1.009E+02
125	CCX-PMAMOD1	124	1.410E-04	2.388E-07	2.409E-07	4.797E-07	2.387E-07	1.991E+00	9.909E+01
126	CCX-PMA030	105	9.690E-05	2.354E-07	2.409E-07	4.763E-07	2.354E-07	1.977E+00	9.769E+01
127	CVMOD04	111	7.370E-04	2.101E-07	2.408E-07	4.509E-07	2.099E-07	1.871E+00	8.714E+01
128	IDABSDK1TM	71	3.000E-04	2.037E-07	2.409E-07	4.445E-07	2.036E-07	1.845E+00	8.451E+01
129	OTH-SDMAN	96	7.700E-04	2.036E-07	2.408E-07	4.444E-07	2.035E-07	1.845E+00	8.445E+01
130	CVMOD01	75	2.210E-04	2.013E-07	2.409E-07	4.421E-07	2.012E-07	1.835E+00	8.352E+01
131	CCX-PMDMOD4	29	4.980E-05	1.895E-07	2.409E-07	4.304E-07	1.895E-07	1.786E+00	7.864E+01
132	CCX-PL3MOD1	59	1.410E-04	1.888E-07	2.409E-07	4.297E-07	1.888E-07	1.784E+00	7.836E+01
133	EC1BS122TM	235	2.700E-03	1.879E-07	2.404E-07	4.283E-07	1.874E-07	1.778E+00	7.778E+01
134	RNX-KV1-GO	207	4.900E-03	1.869E-07	2.400E-07	4.269E-07	1.860E-07	1.772E+00	7.721E+01
135	RHN-MAN01	168	2.900E-03	1.864E-07	2.404E-07	4.268E-07	1.859E-07	1.771E+00	7.714E+01
136	CLP-UNAVAILABLE	299	1.000E-02	1.876E-07	2.390E-07	4.267E-07	1.857E-07	1.771E+00	7.709E+01
137	RNNCV013GO	142	1.750E-03	1.857E-07	2.406E-07	4.263E-07	1.853E-07	1.769E+00	7.693E+01
138	RN11MOD3	362	1.410E-02	1.879E-07	2.383E-07	4.262E-07	1.852E-07	1.769E+00	7.689E+01
139	RN22MOD4	362	1.410E-02	1.879E-07	2.383E-07	4.262E-07	1.852E-07	1.769E+00	7.689E+01
140	RN23MOD5	362	1.410E-02	1.879E-07	2.383E-07	4.262E-07	1.852E-07	1.769E+00	7.689E+01
141	RN55MOD1	362	1.410E-02	1.879E-07	2.383E-07	4.262E-07	1.852E-07	1.769E+00	7.689E+01
142	RNX-PM-FS	102	7.700E-04	1.838E-07	2.408E-07	4.246E-07	1.837E-07	1.762E+00	7.624E+01
143	RNX-KV-GO	92	6.100E-04	1.833E-07	2.408E-07	4.241E-07	1.832E-07	1.760E+00	7.603E+01
144	IDBBSDK1TM	64	3.000E-04	1.803E-07	2.409E-07	4.212E-07	1.803E-07	1.748E+00	7.483E+01
145	RNNCV056GO	61	2.190E-04	1.788E-07	2.409E-07	4.197E-07	1.788E-07	1.742E+00	7.420E+01
146	MDAS	799	1.000E-02	1.800E-07	2.391E-07	4.191E-07	1.782E-07	1.740E+00	7.396E+01
147	CANTP011RI	705	5.230E-03	1.770E-07	2.400E-07	4.170E-07	1.760E-07	1.731E+00	7.307E+01
148	RNDEP023SA	50	1.710E-04	1.758E-07	2.409E-07	4.167E-07	1.758E-07	1.730E+00	7.297E+01
149	RNBEP011SA	50	1.710E-04	1.758E-07	2.409E-07	4.167E-07	1.758E-07	1.730E+00	7.297E+01
150	RNAEP022SA	50	1.710E-04	1.758E-07	2.409E-07	4.167E-07	1.758E-07	1.730E+00	7.297E+01
151	CCX-PL303	41	9.690E-05	1.757E-07	2.409E-07	4.166E-07	1.757E-07	1.729E+00	7.291E+01
152	CCX-PL4MOD1	49	1.410E-04	1.757E-07	2.409E-07	4.166E-07	1.757E-07	1.729E+00	7.291E+01
153	CCX-PL403	47	9.690E-05	1.745E-07	2.409E-07	4.154E-07	1.745E-07	1.724E+00	7.243E+01
154	CCX-PLMMOD4	31	4.980E-05	1.736E-07	2.409E-07	4.145E-07	1.736E-07	1.720E+00	7.205E+01
155	CCX-PMAMOD4	29	4.980E-05	1.716E-07	2.409E-07	4.125E-07	1.716E-07	1.712E+00	7.121E+01
156	RNX-CV-GO	25	5.100E-05	1.699E-07	2.409E-07	4.108E-07	1.699E-07	1.705E+00	7.051E+01
157	CCX-PLMMOD4-SW	20	1.100E-05	1.694E-07	2.409E-07	4.104E-07	1.694E-07	1.703E+00	7.033E+01
158	CCX-PL4MOD1-SW	19	1.100E-05	1.682E-07	2.409E-07	4.091E-07	1.682E-07	1.698E+00	6.981E+01
159	IDAFD004RQ	19	1.200E-05	1.681E-07	2.409E-07	4.090E-07	1.681E-07	1.698E+00	6.978E+01
160	IDBFD014RQ	19	1.200E-05	1.681E-07	2.409E-07	4.090E-07	1.681E-07	1.698E+00	6.978E+01
161	EC1MOD122	19	1.680E-05	1.681E-07	2.409E-07	4.090E-07	1.681E-07	1.698E+00	6.978E+01
162	RNX-PM-ER	19	1.600E-05	1.681E-07	2.409E-07	4.090E-07	1.681E-07	1.698E+00	6.976E+01

Table 50-23 (Sheet 5 of 15)

RISK IMPORTANCES SORTED BY RISK INCREASE

163	OTH-PRSOV	664	1.000E-02	1.653E-07	2.393E-07	4.046E-07	1.636E-07	1.679E+00	6.793E+01
164	CCX-PLSMOD6	84	2.530E-04	1.636E-07	2.409E-07	4.045E-07	1.636E-07	1.679E+00	6.791E+01
165	IDBBSDK1LF	15	4.800E-06	1.631E-07	2.409E-07	4.040E-07	1.631E-07	1.677E+00	6.769E+01
166	IDABSDK1LF	15	4.800E-06	1.631E-07	2.409E-07	4.040E-07	1.631E-07	1.677E+00	6.769E+01
167	ED1BSDS1LF	15	4.800E-06	1.631E-07	2.409E-07	4.040E-07	1.631E-07	1.677E+00	6.769E+01
168	SWAMOD09T	82	2.520E-04	1.624E-07	2.409E-07	4.032E-07	1.623E-07	1.674E+00	6.737E+01
169	CCX-PMAEHO	14	4.030E-06	1.608E-07	2.409E-07	4.017E-07	1.608E-07	1.667E+00	6.674E+01
170	CCX-PL4EHO	14	4.030E-06	1.608E-07	2.409E-07	4.017E-07	1.608E-07	1.667E+00	6.674E+01
171	CCX-PMDEHO	14	4.030E-06	1.608E-07	2.409E-07	4.017E-07	1.608E-07	1.667E+00	6.674E+01
172	CCX-PL9MOD1	61	1.410E-04	1.557E-07	2.409E-07	3.966E-07	1.557E-07	1.646E+00	6.464E+01
173	CAX-CM-ER	58	1.200E-04	1.556E-07	2.409E-07	3.965E-07	1.556E-07	1.646E+00	6.457E+01
174	REC-MANDAS	381	1.160E-02	1.574E-07	2.391E-07	3.965E-07	1.555E-07	1.646E+00	6.456E+01
175	CCX-PLMOD3	54	1.030E-04	1.552E-07	2.409E-07	3.961E-07	1.552E-07	1.644E+00	6.440E+01
176	CCX-PL903	53	9.690E-05	1.551E-07	2.409E-07	3.960E-07	1.550E-07	1.644E+00	6.435E+01
177	CCX-PL2MOD5	41	6.980E-05	1.527E-07	2.409E-07	3.936E-07	1.527E-07	1.634E+00	6.338E+01
178	CCX-PL3MOD5	40	6.980E-05	1.511E-07	2.409E-07	3.920E-07	1.511E-07	1.627E+00	6.272E+01
179	SWX-PM-ER	12	1.400E-05	1.391E-07	2.409E-07	3.800E-07	1.391E-07	1.577E+00	5.774E+01
180	ATW-MAN05	5	5.200E-03	1.369E-07	2.402E-07	3.771E-07	1.362E-07	1.565E+00	5.652E+01
181	CCX-EAO	10	3.230E-06	1.361E-07	2.409E-07	3.770E-07	1.361E-07	1.565E+00	5.649E+01
182	CCX-PL2MOD5-SW	10	1.100E-05	1.359E-07	2.409E-07	3.768E-07	1.359E-07	1.564E+00	5.640E+01
183	CCX-PLMOD3-SW	10	1.100E-05	1.359E-07	2.409E-07	3.768E-07	1.359E-07	1.564E+00	5.640E+01
184	CCX-PL9MOD1-SW	10	1.100E-05	1.359E-07	2.409E-07	3.768E-07	1.359E-07	1.564E+00	5.640E+01
185	CCX-PL3MOD5-SW	10	1.100E-05	1.359E-07	2.409E-07	3.768E-07	1.359E-07	1.564E+00	5.640E+01
186	CCX-PLSMOD6-SW	10	1.100E-05	1.359E-07	2.409E-07	3.768E-07	1.359E-07	1.564E+00	5.640E+01
187	CCX-EAI	10	1.270E-05	1.357E-07	2.409E-07	3.767E-07	1.357E-07	1.563E+00	5.634E+01
188	SGBAV040LA	276	1.090E-03	1.346E-07	2.408E-07	3.754E-07	1.345E-07	1.558E+00	5.582E+01
189	CVX-PM-ER	7	3.700E-05	1.284E-07	2.409E-07	3.693E-07	1.283E-07	1.533E+00	5.327E+01
190	CASPPRUPT	6	2.000E-06	1.198E-07	2.409E-07	3.607E-07	1.198E-07	1.497E+00	4.973E+01
191	EC2BS002TM	501	2.700E-03	1.173E-07	2.406E-07	3.579E-07	1.169E-07	1.485E+00	4.854E+01
192	CCX-HE-AF	4	1.200E-06	1.080E-07	2.409E-07	3.489E-07	1.080E-07	1.448E+00	4.483E+01
193	EC2BS022TM	337	2.700E-03	1.048E-07	2.406E-07	3.454E-07	1.045E-07	1.434E+00	4.337E+01
194	CCX-BL-ER	2	1.200E-05	1.041E-07	2.409E-07	3.450E-07	1.041E-07	1.432E+00	4.320E+01
195	VWX-RF-ER	2	1.200E-05	1.041E-07	2.409E-07	3.450E-07	1.041E-07	1.432E+00	4.320E+01
196	CCX-PL3MOD1-SW	2	1.100E-05	1.040E-07	2.409E-07	3.449E-07	1.040E-07	1.432E+00	4.317E+01
197	CCX-PL3EHO	2	4.030E-06	1.040E-07	2.409E-07	3.449E-07	1.040E-07	1.432E+00	4.316E+01
198	DAS	322	1.000E-02	1.007E-07	2.399E-07	3.406E-07	9.967E-08	1.414E+00	4.137E+01
199	CCX-PMBMOD1	75	1.410E-04	9.720E-08	2.409E-07	3.381E-07	9.719E-08	1.403E+00	4.034E+01
200	CCX-PMB030	63	9.690E-05	9.547E-08	2.409E-07	3.364E-07	9.546E-08	1.396E+00	3.962E+01
201	EC0MOD01	1460	5.080E-03	9.180E-08	2.405E-07	3.323E-07	9.133E-08	1.379E+00	3.791E+01
202	EC2BS221TM	260	2.700E-03	9.117E-08	2.407E-07	3.318E-07	9.092E-08	1.377E+00	3.774E+01
203	OTH-SLSOV1	557	2.100E-02	9.277E-08	2.390E-07	3.317E-07	9.082E-08	1.377E+00	3.770E+01
204	EC1BS121TM	258	2.700E-03	8.138E-08	2.407E-07	3.221E-07	8.116E-08	1.337E+00	3.369E+01

Table 50-23 (Sheet 6 of 15)

RISK IMPORTANCES SORTED BY RISK INCREASE

205	IWX-EV2-SA	7	5.800E-06	7.947E-08	2.409E-07	3.204E-07	7.947E-08	1.330E+00	3.298E+01
206	ADX-MV-GO	75	7.480E-04	6.857E-08	2.409E-07	3.094E-07	6.852E-08	1.284E+00	2.844E+01
207	EC2MOD22	18	4.800E-05	6.821E-08	2.409E-07	3.091E-07	6.821E-08	1.283E+00	2.831E+01
208	ATW-MAN03	104	5.200E-02	7.075E-08	2.372E-07	3.080E-07	6.707E-08	1.278E+00	2.784E+01
209	EC1MOD121	8	1.680E-05	6.514E-08	2.409E-07	3.061E-07	6.514E-08	1.270E+00	2.704E+01
210	EC2MOD221	8	1.680E-05	6.514E-08	2.409E-07	3.061E-07	6.514E-08	1.270E+00	2.704E+01
211	EC2BS002LF	6	4.800E-06	6.304E-08	2.409E-07	3.040E-07	6.304E-08	1.262E+00	2.617E+01
212	IWX-EV4-SA	59	5.800E-05	5.999E-08	2.409E-07	3.009E-07	5.998E-08	1.249E+00	2.490E+01
213	ED4MOD11	194	3.170E-04	5.482E-08	2.409E-07	2.957E-07	5.481E-08	1.227E+00	2.275E+01
214	ED4BSDS1TM	190	3.000E-04	5.431E-08	2.409E-07	2.952E-07	5.429E-08	1.225E+00	2.253E+01
215	OTH-MGSET	29	1.750E-03	5.281E-08	2.408E-07	2.936E-07	5.272E-08	1.219E+00	2.188E+01
216	ED4MOD112	172	3.170E-04	5.050E-08	2.409E-07	2.914E-07	5.048E-08	1.210E+00	2.095E+01
217	CCX-PMCMOD1	53	1.410E-04	4.766E-08	2.409E-07	2.886E-07	4.765E-08	1.198E+00	1.978E+01
218	CCX-PMC030	43	9.690E-05	4.605E-08	2.409E-07	2.870E-07	4.605E-08	1.191E+00	1.911E+01
219	CMB-PLUG	11	7.270E-04	4.508E-08	2.409E-07	2.860E-07	4.505E-08	1.187E+00	1.870E+01
220	OTH-SLSOV	321	1.100E-02	4.159E-08	2.405E-07	2.821E-07	4.113E-08	1.171E+00	1.707E+01
221	OTH-PRES	52	2.000E-03	4.121E-08	2.408E-07	2.821E-07	4.113E-08	1.171E+00	1.707E+01
222	CCX-PMDMOD2	51	3.040E-04	4.041E-08	2.409E-07	2.813E-07	4.040E-08	1.168E+00	1.677E+01
223	CCX-PMAMOD2	51	3.040E-04	4.041E-08	2.409E-07	2.813E-07	4.040E-08	1.168E+00	1.677E+01
224	CCX-PMCMOD2	51	3.040E-04	4.041E-08	2.409E-07	2.813E-07	4.040E-08	1.168E+00	1.677E+01
225	CCX-PMBMOD2	51	3.040E-04	4.041E-08	2.409E-07	2.813E-07	4.040E-08	1.168E+00	1.677E+01
226	IWB-PLUG	67	2.400E-04	3.961E-08	2.409E-07	2.805E-07	3.960E-08	1.164E+00	1.644E+01
227	CMBOR001EB	1	7.200E-07	3.931E-08	2.409E-07	2.802E-07	3.931E-08	1.163E+00	1.631E+01
228	CMB-CV	1	2.000E-06	3.925E-08	2.409E-07	2.802E-07	3.925E-08	1.163E+00	1.629E+01
229	CMBTK002AF	1	2.400E-06	3.925E-08	2.409E-07	2.802E-07	3.925E-08	1.163E+00	1.629E+01
230	FWX-MV2-GO	62	5.500E-04	3.900E-08	2.409E-07	2.799E-07	3.898E-08	1.162E+00	1.618E+01
231	FWX-PM2-FS	62	5.400E-04	3.900E-08	2.409E-07	2.799E-07	3.898E-08	1.162E+00	1.618E+01
232	RC1CB063GO	186	4.200E-03	3.819E-08	2.408E-07	2.790E-07	3.803E-08	1.158E+00	1.579E+01
233	RC1CB061GO	186	4.200E-03	3.819E-08	2.408E-07	2.790E-07	3.803E-08	1.158E+00	1.579E+01
234	RC1CB053GO	186	4.200E-03	3.819E-08	2.408E-07	2.790E-07	3.803E-08	1.158E+00	1.579E+01
235	RC1CB051GO	186	4.200E-03	3.819E-08	2.408E-07	2.790E-07	3.803E-08	1.158E+00	1.579E+01
236	RPTMOD01	107	8.760E-04	3.585E-08	2.409E-07	2.767E-07	3.582E-08	1.149E+00	1.487E+01
237	RPTMOD03	107	8.760E-04	3.585E-08	2.409E-07	2.767E-07	3.582E-08	1.149E+00	1.487E+01
238	RPTMOD05	107	8.760E-04	3.585E-08	2.409E-07	2.767E-07	3.582E-08	1.149E+00	1.487E+01
239	RPTMOD07	107	8.760E-04	3.585E-08	2.409E-07	2.767E-07	3.582E-08	1.149E+00	1.487E+01
240	CCX-PLBMOD1	23	1.410E-04	3.295E-08	2.409E-07	2.739E-07	3.295E-08	1.137E+00	1.368E+01
241	CCX-PLB03	19	9.690E-05	3.260E-08	2.409E-07	2.735E-07	3.260E-08	1.135E+00	1.353E+01
242	IRWMOD09	67	1.460E-03	3.239E-08	2.409E-07	2.733E-07	3.234E-08	1.134E+00	1.342E+01
243	IRWMOD11	67	1.460E-03	3.239E-08	2.409E-07	2.733E-07	3.234E-08	1.134E+00	1.342E+01
244	IWARS118BFA	43	8.760E-04	3.185E-08	2.409E-07	2.727E-07	3.183E-08	1.132E+00	1.321E+01
245	IWBRS118AFA	43	8.760E-04	3.185E-08	2.409E-07	2.727E-07	3.183E-08	1.132E+00	1.321E+01
246	RC1CB052GO	174	4.200E-03	3.092E-08	2.408E-07	2.717E-07	3.079E-08	1.128E+00	1.278E+01

Table 50-23 (Sheet 7 of 15)

RISK IMPORTANCES SORTED BY RISK INCREASE

247	RC1CB054GO	174	4.200E-03	3.092E-08	2.408E-07	2.717E-07	3.079E-08	1.128E+00	1.278E+01
248	RC1CB064GO	146	4.200E-03	3.072E-08	2.408E-07	2.715E-07	3.059E-08	1.127E+00	1.270E+01
249	RC1CB062GO	146	4.200E-03	3.072E-08	2.408E-07	2.715E-07	3.059E-08	1.127E+00	1.270E+01
250	CCX-PLBMOD1-SW	6	1.100E-05	3.004E-08	2.409E-07	2.710E-07	3.004E-08	1.125E+00	1.247E+01
251	IRDEP118BSA	9	1.710E-04	2.852E-08	2.409E-07	2.694E-07	2.852E-08	1.118E+00	1.184E+01
252	IRCEP118ASA	9	1.710E-04	2.852E-08	2.409E-07	2.694E-07	2.852E-08	1.118E+00	1.184E+01
253	RPTMOD08	77	8.760E-04	2.839E-08	2.409E-07	2.693E-07	2.837E-08	1.118E+00	1.178E+01
254	RPTMOD06	77	8.760E-04	2.839E-08	2.409E-07	2.693E-07	2.837E-08	1.118E+00	1.178E+01
255	RPTMOD04	77	8.760E-04	2.839E-08	2.409E-07	2.693E-07	2.837E-08	1.118E+00	1.178E+01
256	RPTMOD02	77	8.760E-04	2.839E-08	2.409E-07	2.693E-07	2.837E-08	1.118E+00	1.178E+01
257	FWX-PM2-ER	4	5.900E-06	2.783E-08	2.409E-07	2.688E-07	2.783E-08	1.116E+00	1.155E+01
258	FWX-CV2-GO	4	6.400E-06	2.781E-08	2.409E-07	2.687E-07	2.781E-08	1.115E+00	1.154E+01
259	SGX-CV-GO	4	6.400E-06	2.781E-08	2.409E-07	2.687E-07	2.781E-08	1.115E+00	1.154E+01
260	SGX-MV-RP	4	7.670E-06	2.780E-08	2.409E-07	2.687E-07	2.780E-08	1.115E+00	1.154E+01
261	CCX-PLBEHO	4	4.030E-06	2.779E-08	2.409E-07	2.687E-07	2.779E-08	1.115E+00	1.154E+01
262	SGX-AV-FA	4	6.300E-06	2.778E-08	2.409E-07	2.687E-07	2.778E-08	1.115E+00	1.153E+01
263	ZANMOD01	54	8.400E-05	2.733E-08	2.409E-07	2.682E-07	2.733E-08	1.113E+00	1.134E+01
264	PRAAV108LA	208	1.090E-03	2.668E-08	2.409E-07	2.676E-07	2.665E-08	1.111E+00	1.106E+01
265	PRAAV130LA	208	1.090E-03	2.668E-08	2.409E-07	2.676E-07	2.665E-08	1.111E+00	1.106E+01
266	PRBAV130LA	208	1.090E-03	2.643E-08	2.409E-07	2.673E-07	2.641E-08	1.110E+00	1.096E+01
267	PRBAV108LA	208	1.090E-03	2.643E-08	2.409E-07	2.673E-07	2.641E-08	1.110E+00	1.096E+01
268	EC1BS013TM	192	2.700E-03	2.534E-08	2.409E-07	2.662E-07	2.527E-08	1.105E+00	1.049E+01
269	EC1BS011TM	329	2.700E-03	2.448E-08	2.409E-07	2.653E-07	2.441E-08	1.101E+00	1.013E+01
270	ED3MOD01	102	5.040E-04	2.339E-08	2.409E-07	2.643E-07	2.338E-08	1.097E+00	9.703E+00
271	PRBAV130TM	109	5.000E-04	2.339E-08	2.409E-07	2.643E-07	2.337E-08	1.097E+00	9.702E+00
272	PRBAV108TM	109	5.000E-04	2.339E-08	2.409E-07	2.643E-07	2.337E-08	1.097E+00	9.702E+00
273	PRAAV130TM	109	5.000E-04	2.339E-08	2.409E-07	2.643E-07	2.337E-08	1.097E+00	9.702E+00
274	PRAAV108TM	109	5.000E-04	2.339E-08	2.409E-07	2.643E-07	2.337E-08	1.097E+00	9.702E+00
275	IRBEP123BSA	16	1.710E-04	2.333E-08	2.409E-07	2.642E-07	2.332E-08	1.097E+00	9.681E+00
276	IRBEP123ASA	16	1.710E-04	2.333E-08	2.409E-07	2.642E-07	2.332E-08	1.097E+00	9.681E+00
277	ED1MOD03	168	2.700E-03	2.142E-08	2.409E-07	2.623E-07	2.136E-08	1.089E+00	8.866E+00
278	CDNTK02AF	2	2.400E-06	2.083E-08	2.409E-07	2.618E-07	2.083E-08	1.086E+00	8.647E+00
279	MSHTP002RI	19	5.230E-03	2.054E-08	2.408E-07	2.614E-07	2.044E-08	1.085E+00	8.482E+00
280	MSHTP001RI	19	5.230E-03	2.054E-08	2.408E-07	2.614E-07	2.044E-08	1.085E+00	8.482E+00
281	IEV-LCAS	417	3.480E-02	1.932E-08	2.402E-07	2.596E-07	1.865E-08	1.077E+00	7.742E+00
282	EC2BS023TM	101	2.700E-03	1.795E-08	2.409E-07	2.588E-07	1.790E-08	1.074E+00	7.429E+00
283	ED3BSDS1TM	65	3.000E-04	1.742E-08	2.409E-07	2.583E-07	1.741E-08	1.072E+00	7.228E+00
284	ED2BSDS1TM	52	3.000E-04	1.633E-08	2.409E-07	2.572E-07	1.632E-08	1.068E+00	6.775E+00
285	ED2MOD11	48	3.170E-04	1.576E-08	2.409E-07	2.567E-07	1.576E-08	1.065E+00	6.542E+00
286	OTH-PRESU	15	2.000E-03	1.561E-08	2.409E-07	2.565E-07	1.557E-08	1.065E+00	6.464E+00
287	IEV-SLB-D	18	5.960E-04	1.535E-08	2.409E-07	2.563E-07	1.534E-08	1.064E+00	6.368E+00
288	OTH-SLSOV3	511	5.400E-03	1.519E-08	2.408E-07	2.560E-07	1.510E-08	1.063E+00	6.269E+00

Table 50-23 (Sheet 8 of 15)

RISK IMPORTANCES SORTED BY RISK INCREASE

289	ZOX-PD-ES	93	2.000E-03	1.404E-08	2.409E-07	2.549E-07	1.402E-08	1.058E+00	5.818E+00
290	OTH-SLSOV2	97	1.000E-02	1.399E-08	2.408E-07	2.548E-07	1.385E-08	1.057E+00	5.749E+00
291	ZANTR-2AHF	14	2.880E-05	1.233E-08	2.409E-07	2.532E-07	1.233E-08	1.051E+00	5.116E+00
292	ECX-CB-GC	48	7.300E-04	1.227E-08	2.409E-07	2.532E-07	1.226E-08	1.051E+00	5.089E+00
293	OTH-SGTR1	75	6.700E-03	1.196E-08	2.408E-07	2.528E-07	1.188E-08	1.049E+00	4.931E+00
294	CONDVACUUM	35	1.000E-03	1.132E-08	2.409E-07	2.522E-07	1.131E-08	1.047E+00	4.693E+00
295	ZOX-DG-DR	36	4.400E-04	1.115E-08	2.409E-07	2.521E-07	1.115E-08	1.046E+00	4.628E+00
296	ECX-CB-GO	34	4.200E-04	1.112E-08	2.409E-07	2.520E-07	1.111E-08	1.046E+00	4.612E+00
297	EC1BS131TM	62	2.700E-03	1.090E-08	2.409E-07	2.518E-07	1.087E-08	1.045E+00	4.511E+00
298	EC1BS112TM	62	2.700E-03	1.090E-08	2.409E-07	2.518E-07	1.087E-08	1.045E+00	4.511E+00
299	IDDMOD32	67	3.170E-04	1.081E-08	2.409E-07	2.517E-07	1.081E-08	1.045E+00	4.487E+00
300	EC2BS021TM	89	2.700E-03	1.033E-08	2.409E-07	2.512E-07	1.030E-08	1.043E+00	4.276E+00
301	IDAMOD04	53	3.170E-04	1.014E-08	2.409E-07	2.511E-07	1.014E-08	1.042E+00	4.209E+00
302	ED1MOD01	35	5.040E-04	1.000E-08	2.409E-07	2.509E-07	9.997E-09	1.041E+00	4.150E+00
303	IEV-LCOND	858	1.120E-01	1.111E-08	2.397E-07	2.508E-07	9.862E-09	1.041E+00	4.093E+00
304	VWBMOD05	158	2.190E-02	9.985E-09	2.407E-07	2.507E-07	9.766E-09	1.041E+00	4.054E+00
305	VWBMOD04	141	1.830E-02	9.910E-09	2.407E-07	2.506E-07	9.729E-09	1.040E+00	4.038E+00
306	SWAMOD03	44	6.340E-04	9.692E-09	2.409E-07	2.506E-07	9.686E-09	1.040E+00	4.020E+00
307	IDBMOD24	42	3.170E-04	9.625E-09	2.409E-07	2.505E-07	9.622E-09	1.040E+00	3.994E+00
308	IDCMOD28	42	3.170E-04	9.625E-09	2.409E-07	2.505E-07	9.622E-09	1.040E+00	3.994E+00
309	RNAMOD09	160	5.070E-02	9.436E-09	2.404E-07	2.499E-07	8.958E-09	1.037E+00	3.718E+00
310	RNBMOD10	160	5.070E-02	9.436E-09	2.404E-07	2.499E-07	8.958E-09	1.037E+00	3.718E+00
311	ED1MOD07	31	3.050E-04	8.922E-09	2.409E-07	2.498E-07	8.919E-09	1.037E+00	3.702E+00
312	ED1MOD13	31	3.170E-04	8.917E-09	2.409E-07	2.498E-07	8.914E-09	1.037E+00	3.700E+00
313	VWN-MAN01	33	5.160E-03	8.947E-09	2.409E-07	2.498E-07	8.901E-09	1.037E+00	3.695E+00
314	VWBMOD06	33	5.180E-03	8.939E-09	2.409E-07	2.498E-07	8.893E-09	1.037E+00	3.691E+00
315	EC2BS212TM	31	2.700E-03	8.884E-09	2.409E-07	2.498E-07	8.860E-09	1.037E+00	3.678E+00
316	EC2BS231TM	31	2.700E-03	8.884E-09	2.409E-07	2.498E-07	8.860E-09	1.037E+00	3.678E+00
317	CCX-IV-XR1	6	2.400E-05	8.821E-09	2.409E-07	2.497E-07	8.821E-09	1.037E+00	3.661E+00
318	PMDMOD11	186	2.090E-03	7.809E-09	2.409E-07	2.487E-07	7.793E-09	1.032E+00	3.235E+00
319	VWAMOD02	14	6.120E-04	7.732E-09	2.409E-07	2.486E-07	7.727E-09	1.032E+00	3.207E+00
320	CANAV014LA	88	8.760E-03	7.581E-09	2.409E-07	2.484E-07	7.514E-09	1.031E+00	3.119E+00
321	REC-MANDASC	723	5.060E-01	1.516E-08	2.333E-07	2.484E-07	7.487E-09	1.031E+00	3.108E+00
322	PMAMOD11	190	2.090E-03	7.405E-09	2.409E-07	2.483E-07	7.389E-09	1.031E+00	3.067E+00
323	IEV-ATW-S	55	1.480E-02	7.475E-09	2.408E-07	2.483E-07	7.364E-09	1.031E+00	3.057E+00
324	ZOX-DG-DS	20	2.800E-04	7.319E-09	2.409E-07	2.482E-07	7.317E-09	1.030E+00	3.037E+00
325	PLMMOD41	33	6.350E-04	7.247E-09	2.409E-07	2.482E-07	7.243E-09	1.030E+00	3.006E+00
326	RNAMOD06	312	3.400E-02	7.420E-09	2.407E-07	2.481E-07	7.167E-09	1.030E+00	2.975E+00
327	CDNTF01BRI	82	5.230E-03	7.195E-09	2.409E-07	2.481E-07	7.157E-09	1.030E+00	2.971E+00
328	CCAMOD03	26	6.140E-04	7.159E-09	2.409E-07	2.481E-07	7.155E-09	1.030E+00	2.970E+00
329	CIAEP014SA	8	1.710E-04	7.147E-09	2.409E-07	2.481E-07	7.146E-09	1.030E+00	2.966E+00
330	IEV-LOSP	530	1.200E-01	7.981E-09	2.400E-07	2.479E-07	7.023E-09	1.029E+00	2.915E+00

Table 50-23 (Sheet 9 of 15)

RISK IMPORTANCES SORTED BY RISK INCREASE

331	PMD0301ASA	113	1.160E-03	6.897E-09	2.409E-07	2.478E-07	6.889E-09	1.029E+00	2.860E+00
332	PMD0301BSA	103	1.160E-03	6.712E-09	2.409E-07	2.476E-07	6.704E-09	1.028E+00	2.783E+00
333	RNBMOD07	199	3.400E-02	6.901E-09	2.407E-07	2.476E-07	6.667E-09	1.028E+00	2.767E+00
334	PMA0301ASA	110	1.160E-03	6.475E-09	2.409E-07	2.474E-07	6.467E-09	1.027E+00	2.684E+00
335	PMA0301BSA	100	1.160E-03	6.289E-09	2.409E-07	2.472E-07	6.282E-09	1.026E+00	2.608E+00
336	PMBMOD11	112	2.090E-03	6.037E-09	2.409E-07	2.469E-07	6.024E-09	1.025E+00	2.501E+00
337	IDDMOD33	63	5.160E-04	5.936E-09	2.409E-07	2.469E-07	5.933E-09	1.025E+00	2.462E+00
338	RNAEP01ASA	19	1.710E-04	5.848E-09	2.409E-07	2.468E-07	5.847E-09	1.024E+00	2.427E+00
339	VWAMOD03	6	2.520E-04	5.758E-09	2.409E-07	2.467E-07	5.756E-09	1.024E+00	2.389E+00
340	VWAMOD01	6	2.520E-04	5.758E-09	2.409E-07	2.467E-07	5.756E-09	1.024E+00	2.389E+00
341	PMCMOD11	97	2.090E-03	5.729E-09	2.409E-07	2.466E-07	5.717E-09	1.024E+00	2.373E+00
342	RNAEP01BSA	17	1.710E-04	5.699E-09	2.409E-07	2.466E-07	5.698E-09	1.024E+00	2.365E+00
343	PMAMOD31	46	5.020E-03	5.707E-09	2.409E-07	2.466E-07	5.679E-09	1.024E+00	2.357E+00
344	PMBMOD32	46	5.020E-03	5.707E-09	2.409E-07	2.466E-07	5.679E-09	1.024E+00	2.357E+00
345	ZO1DG001TM	762	4.600E-02	5.727E-09	2.407E-07	2.464E-07	5.463E-09	1.023E+00	2.268E+00
346	PMAMOD21	98	4.070E-03	5.373E-09	2.409E-07	2.463E-07	5.351E-09	1.022E+00	2.221E+00
347	PMBMOD21	98	4.070E-03	5.373E-09	2.409E-07	2.463E-07	5.351E-09	1.022E+00	2.221E+00
348	PMCMOD21	98	4.070E-03	5.373E-09	2.409E-07	2.463E-07	5.351E-09	1.022E+00	2.221E+00
349	PMDMOD21	98	4.070E-03	5.373E-09	2.409E-07	2.463E-07	5.351E-09	1.022E+00	2.221E+00
350	CVBPM01BTM	68	2.190E-02	5.457E-09	2.408E-07	2.463E-07	5.338E-09	1.022E+00	2.216E+00
351	MSX-AV2-FA	44	2.310E-03	5.315E-09	2.409E-07	2.462E-07	5.303E-09	1.022E+00	2.201E+00
352	PL3MOD11	20	2.090E-03	5.297E-09	2.409E-07	2.462E-07	5.286E-09	1.022E+00	2.194E+00
353	CVMOD03	44	1.120E-02	5.308E-09	2.409E-07	2.462E-07	5.249E-09	1.022E+00	2.179E+00
354	IDAMOD05	47	5.160E-04	5.203E-09	2.409E-07	2.461E-07	5.200E-09	1.022E+00	2.159E+00
355	PMB0301ASA	60	1.160E-03	5.177E-09	2.409E-07	2.461E-07	5.171E-09	1.021E+00	2.146E+00
356	PMC0301ASA	60	1.160E-03	5.177E-09	2.409E-07	2.461E-07	5.171E-09	1.021E+00	2.146E+00
357	PMC0301BSA	58	1.160E-03	5.149E-09	2.409E-07	2.461E-07	5.143E-09	1.021E+00	2.135E+00
358	PMB0301BSA	58	1.160E-03	5.149E-09	2.409E-07	2.461E-07	5.143E-09	1.021E+00	2.135E+00
359	CVMOD02	13	1.410E-03	5.121E-09	2.409E-07	2.460E-07	5.113E-09	1.021E+00	2.122E+00
360	ZO1MOD01	439	2.020E-02	5.150E-09	2.408E-07	2.460E-07	5.046E-09	1.021E+00	2.094E+00
361	PMDMOD34	27	5.020E-03	5.057E-09	2.409E-07	2.460E-07	5.032E-09	1.021E+00	2.089E+00
362	PMCMOD33	27	5.020E-03	5.057E-09	2.409E-07	2.460E-07	5.032E-09	1.021E+00	2.089E+00
363	DUMP-MAN01	31	1.320E-03	4.945E-09	2.409E-07	2.459E-07	4.939E-09	1.020E+00	2.050E+00
364	CANCV015GC	415	2.450E-02	4.976E-09	2.408E-07	2.458E-07	4.854E-09	1.020E+00	2.015E+00
365	ZOX-PD-ER	6	1.300E-04	4.850E-09	2.409E-07	2.458E-07	4.849E-09	1.020E+00	2.013E+00
366	IDBMOD25	39	5.160E-04	4.837E-09	2.409E-07	2.458E-07	4.834E-09	1.020E+00	2.007E+00
367	IDCMOD29	39	5.160E-04	4.837E-09	2.409E-07	2.458E-07	4.834E-09	1.020E+00	2.007E+00
368	PL30301ASA	12	1.160E-03	4.756E-09	2.409E-07	2.457E-07	4.751E-09	1.020E+00	1.972E+00
369	EC1BS111TM	163	2.700E-03	4.704E-09	2.409E-07	2.456E-07	4.691E-09	1.019E+00	1.947E+00
370	REBCV119GO	79	1.750E-03	4.693E-09	2.409E-07	2.456E-07	4.685E-09	1.019E+00	1.945E+00
371	REACV119GO	79	1.750E-03	4.693E-09	2.409E-07	2.456E-07	4.685E-09	1.019E+00	1.945E+00
372	PL30301BSA	11	1.160E-03	4.670E-09	2.409E-07	2.456E-07	4.664E-09	1.019E+00	1.936E+00

Table 50-23 (Sheet 10 of 15)

RISK IMPORTANCES SORTED BY RISK INCREASE

373	IRWMOD12	71	1.460E-03	4.649E-09	2.409E-07	2.456E-07	4.643E-09	1.019E+00	1.927E+00
374	IRWMOD10	71	1.460E-03	4.649E-09	2.409E-07	2.456E-07	4.643E-09	1.019E+00	1.927E+00
375	EC2MOD23	8	4.800E-05	4.613E-09	2.409E-07	2.455E-07	4.612E-09	1.019E+00	1.914E+00
376	EC1MOD13	8	4.800E-05	4.613E-09	2.409E-07	2.455E-07	4.612E-09	1.019E+00	1.914E+00
377	CCX-BY-PN1	5	5.700E-05	4.589E-09	2.409E-07	2.455E-07	4.589E-09	1.019E+00	1.905E+00
378	FSMOD255A	14	5.800E-04	4.424E-09	2.409E-07	2.453E-07	4.422E-09	1.018E+00	1.835E+00
379	CASMOD01	63	2.410E-03	4.384E-09	2.409E-07	2.453E-07	4.374E-09	1.018E+00	1.815E+00
380	IWDRS120AFA	44	8.760E-04	4.127E-09	2.409E-07	2.450E-07	4.124E-09	1.017E+00	1.712E+00
381	IWCRS120BFA	44	8.760E-04	4.127E-09	2.409E-07	2.450E-07	4.124E-09	1.017E+00	1.712E+00
382	PL2MOD11	12	2.090E-03	4.127E-09	2.409E-07	2.450E-07	4.118E-09	1.017E+00	1.709E+00
383	CVN-MAN03	11	1.070E-03	4.064E-09	2.409E-07	2.450E-07	4.060E-09	1.017E+00	1.685E+00
384	PRAMOD9	51	1.410E-02	4.007E-09	2.409E-07	2.449E-07	3.951E-09	1.016E+00	1.640E+00
385	CV3EPCPASA	4	1.710E-04	3.901E-09	2.409E-07	2.448E-07	3.900E-09	1.016E+00	1.619E+00
386	IEV-ATWS	136	4.810E-01	7.495E-09	2.373E-07	2.448E-07	3.890E-09	1.016E+00	1.615E+00
387	PL20301BSA	8	1.160E-03	3.822E-09	2.409E-07	2.447E-07	3.817E-09	1.016E+00	1.584E+00
388	PL20301ASA	8	1.160E-03	3.822E-09	2.409E-07	2.447E-07	3.817E-09	1.016E+00	1.584E+00
389	PMAXS00ASA	12	8.000E-05	3.709E-09	2.409E-07	2.446E-07	3.708E-09	1.015E+00	1.539E+00
390	PMBXS00ASA	12	8.000E-05	3.709E-09	2.409E-07	2.446E-07	3.708E-09	1.015E+00	1.539E+00
391	PMCXS00ASA	12	8.000E-05	3.709E-09	2.409E-07	2.446E-07	3.708E-09	1.015E+00	1.539E+00
392	PMDXS00ASA	12	8.000E-05	3.709E-09	2.409E-07	2.446E-07	3.708E-09	1.015E+00	1.539E+00
393	CMAAV014LA	17	1.590E-03	3.653E-09	2.409E-07	2.446E-07	3.647E-09	1.015E+00	1.514E+00
394	CMAAV015LA	17	1.590E-03	3.653E-09	2.409E-07	2.446E-07	3.647E-09	1.015E+00	1.514E+00
395	EC1CB100VO	133	4.200E-03	3.638E-09	2.409E-07	2.445E-07	3.623E-09	1.015E+00	1.504E+00
396	VW2EPTRBSA	4	1.710E-04	3.556E-09	2.409E-07	2.445E-07	3.555E-09	1.015E+00	1.476E+00
397	CCX-PL2MOD1	4	1.410E-04	3.546E-09	2.409E-07	2.445E-07	3.546E-09	1.015E+00	1.472E+00
398	MSX-AV4-FA	3	2.000E-04	3.430E-09	2.409E-07	2.443E-07	3.429E-09	1.014E+00	1.423E+00
399	MSAEPSD1SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	1.014E+00	1.422E+00
400	MSAEPSD3SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	1.014E+00	1.422E+00
401	MSAEPSD5SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	1.014E+00	1.422E+00
402	MSAEPSD6SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	1.014E+00	1.422E+00
403	MSAEPSD8SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	1.014E+00	1.422E+00
404	MSAEPSD2SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	1.014E+00	1.422E+00
405	MSAEPSD7SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	1.014E+00	1.422E+00
406	MSAEPSD4SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	1.014E+00	1.422E+00
407	ED3MOD03	104	2.700E-03	3.426E-09	2.409E-07	2.443E-07	3.416E-09	1.014E+00	1.418E+00
408	PRAMOD10	19	2.110E-03	3.423E-09	2.409E-07	2.443E-07	3.416E-09	1.014E+00	1.418E+00
409	PRBMOD10	19	2.110E-03	3.423E-09	2.409E-07	2.443E-07	3.416E-09	1.014E+00	1.418E+00
410	ED2MOD03	71	2.700E-03	3.370E-09	2.409E-07	2.443E-07	3.361E-09	1.014E+00	1.395E+00
411	ATW-MAN04C	34	5.260E-01	6.695E-09	2.374E-07	2.441E-07	3.174E-09	1.013E+00	1.317E+00
412	CA9EPCMPASA	10	1.710E-04	3.138E-09	2.409E-07	2.441E-07	3.137E-09	1.013E+00	1.302E+00
413	CVMOD07	148	2.710E-02	3.195E-09	2.408E-07	2.440E-07	3.109E-09	1.013E+00	1.290E+00
414	CVMOD05	163	2.880E-02	3.197E-09	2.408E-07	2.440E-07	3.105E-09	1.013E+00	1.289E+00

Table 50-23 (Sheet 11 of 15)

RISK IMPORTANCES SORTED BY RISK INCREASE

415	WLIAV004LA	52	8.760E-03	2.682E-09	2.409E-07	2.436E-07	2.658E-09	1.011E+00	1.103E+00
416	WLIAV055LA	52	8.760E-03	2.682E-09	2.409E-07	2.436E-07	2.658E-09	1.011E+00	1.103E+00
417	WLOAV006LA	52	8.760E-03	2.682E-09	2.409E-07	2.436E-07	2.658E-09	1.011E+00	1.103E+00
418	WLOAV057LA	52	8.760E-03	2.682E-09	2.409E-07	2.436E-07	2.658E-09	1.011E+00	1.103E+00
419	ZO1MOD04	47	1.250E-03	2.652E-09	2.409E-07	2.436E-07	2.649E-09	1.011E+00	1.099E+00
420	EC1CB100RQ	2	1.440E-05	2.535E-09	2.409E-07	2.435E-07	2.535E-09	1.011E+00	1.052E+00
421	CCX-PLAMOD1	6	1.410E-04	2.527E-09	2.409E-07	2.434E-07	2.527E-09	1.010E+00	1.049E+00
422	EC1MOD11	4	4.800E-05	2.496E-09	2.409E-07	2.434E-07	2.496E-09	1.010E+00	1.036E+00
423	AD4MOD10D	42	8.760E-04	2.405E-09	2.409E-07	2.433E-07	2.402E-09	1.010E+00	9.972E-01
424	AD4MOD09C	42	8.760E-04	2.405E-09	2.409E-07	2.433E-07	2.402E-09	1.010E+00	9.972E-01
425	AD4MOD07C	42	8.760E-04	2.405E-09	2.409E-07	2.433E-07	2.402E-09	1.010E+00	9.972E-01
426	AD4MOD08D	42	8.760E-04	2.405E-09	2.409E-07	2.433E-07	2.402E-09	1.010E+00	9.972E-01
427	CCX-PLA03	4	9.690E-05	2.341E-09	2.409E-07	2.433E-07	2.340E-09	1.010E+00	9.714E-01
428	HPM-MAN01	6	5.020E-04	2.298E-09	2.409E-07	2.432E-07	2.296E-09	1.010E+00	9.532E-01
429	PRCEP101SA	2	1.710E-04	2.251E-09	2.409E-07	2.432E-07	2.251E-09	1.009E+00	9.344E-01
430	PRCEP108SA	2	1.710E-04	2.251E-09	2.409E-07	2.432E-07	2.251E-09	1.009E+00	9.344E-01
431	PRDEP108SA	2	1.710E-04	2.251E-09	2.409E-07	2.432E-07	2.251E-09	1.009E+00	9.344E-01
432	PRI-MAN01	2	4.960E-04	2.250E-09	2.409E-07	2.432E-07	2.249E-09	1.009E+00	9.335E-01
433	REG-MAN00	232	2.040E-01	2.560E-09	2.404E-07	2.430E-07	2.038E-09	1.008E+00	8.460E-01
434	ADN-MAN01C	13	5.000E-01	3.993E-09	2.389E-07	2.429E-07	1.996E-09	1.008E+00	8.287E-01
435	IEV-LRCS	143	1.800E-02	1.957E-09	2.409E-07	2.428E-07	1.921E-09	1.008E+00	7.975E-01
436	IEV-LCCW	690	1.440E-01	2.241E-09	2.406E-07	2.428E-07	1.919E-09	1.008E+00	7.964E-01
437	IEV-LMFW1	763	1.920E-01	2.359E-09	2.405E-07	2.428E-07	1.906E-09	1.008E+00	7.910E-01
438	ZOX-BL-ES	1	6.000E-05	1.867E-09	2.409E-07	2.428E-07	1.867E-09	1.008E+00	7.748E-01
439	CCX-PLDMOD1	1	1.410E-04	1.851E-09	2.409E-07	2.428E-07	1.851E-09	1.008E+00	7.682E-01
440	CCX-PLD03	1	9.690E-05	1.847E-09	2.409E-07	2.428E-07	1.847E-09	1.008E+00	7.667E-01
441	CV3EPCPBSA	2	1.710E-04	1.778E-09	2.409E-07	2.427E-07	1.777E-09	1.007E+00	7.378E-01
442	IEV-LMFW	1334	3.350E-01	2.596E-09	2.401E-07	2.426E-07	1.726E-09	1.007E+00	7.166E-01
443	PL4MOD11	71	2.090E-03	1.604E-09	2.409E-07	2.425E-07	1.601E-09	1.007E+00	6.646E-01
444	FWMOD03A	184	1.700E-02	1.626E-09	2.409E-07	2.425E-07	1.598E-09	1.007E+00	6.634E-01
445	FWMOD013A	155	1.410E-02	1.590E-09	2.409E-07	2.425E-07	1.568E-09	1.007E+00	6.507E-01
446	LPM-MAN01C	5	5.000E-01	3.044E-09	2.394E-07	2.424E-07	1.522E-09	1.006E+00	6.317E-01
447	ZO2DG002TM	230	4.600E-02	1.468E-09	2.409E-07	2.423E-07	1.401E-09	1.006E+00	5.815E-01
448	FWMOD03B	154	1.700E-02	1.407E-09	2.409E-07	2.423E-07	1.383E-09	1.006E+00	5.740E-01
449	FWMOD013B	135	1.410E-02	1.384E-09	2.409E-07	2.423E-07	1.365E-09	1.006E+00	5.665E-01
450	PL40301ASA	43	1.160E-03	1.319E-09	2.409E-07	2.422E-07	1.317E-09	1.005E+00	5.468E-01
451	PL9MOD11	46	2.090E-03	1.318E-09	2.409E-07	2.422E-07	1.315E-09	1.005E+00	5.457E-01
452	SWN-MAN03	55	4.000E-02	1.333E-09	2.409E-07	2.422E-07	1.280E-09	1.005E+00	5.313E-01
453	PL9MOD12	32	2.090E-03	1.220E-09	2.409E-07	2.421E-07	1.217E-09	1.005E+00	5.053E-01
454	ZO2MOD01	112	2.020E-02	1.236E-09	2.409E-07	2.421E-07	1.211E-09	1.005E+00	5.025E-01
455	PMDMOD41	29	6.350E-04	1.183E-09	2.409E-07	2.421E-07	1.182E-09	1.005E+00	4.906E-01
456	PL40301BSA	35	1.160E-03	1.161E-09	2.409E-07	2.421E-07	1.160E-09	1.005E+00	4.815E-01

Table 50-23 (Sheet 12 of 15)

RISK IMPORTANCES SORTED BY RISK INCREASE

457	PL90301ASA	32	1.160E-03	1.127E-09	2.409E-07	2.420E-07	1.126E-09	1.005E+00	4.673E-01
458	EC2BS222TM	29	2.700E-03	1.121E-09	2.409E-07	2.420E-07	1.118E-09	1.005E+00	4.639E-01
459	SG2TF50ARI	18	5.230E-03	1.120E-09	2.409E-07	2.420E-07	1.114E-09	1.005E+00	4.622E-01
460	SGBAV074LA	79	8.760E-03	1.089E-09	2.409E-07	2.420E-07	1.080E-09	1.004E+00	4.482E-01
461	SGBAV075LA	79	8.760E-03	1.089E-09	2.409E-07	2.420E-07	1.080E-09	1.004E+00	4.482E-01
462	PL3MOD51	24	8.740E-04	1.046E-09	2.409E-07	2.420E-07	1.045E-09	1.004E+00	4.336E-01
463	ADF-MAN01	374	5.000E-01	2.029E-09	2.399E-07	2.419E-07	1.015E-09	1.004E+00	4.212E-01
464	PL90301BSA	28	1.160E-03	1.002E-09	2.409E-07	2.419E-07	1.001E-09	1.004E+00	4.154E-01
465	PMAMOD12	56	2.090E-03	9.911E-10	2.409E-07	2.419E-07	9.890E-10	1.004E+00	4.105E-01
466	PL90302ASA	16	1.160E-03	9.731E-10	2.409E-07	2.419E-07	9.720E-10	1.004E+00	4.034E-01
467	PMDMOD12	53	2.090E-03	9.717E-10	2.409E-07	2.419E-07	9.697E-10	1.004E+00	4.025E-01
468	CASMOD02	101	2.310E-02	9.210E-10	2.409E-07	2.418E-07	8.997E-10	1.004E+00	3.735E-01
469	ED2MOD01	12	5.040E-04	8.750E-10	2.409E-07	2.418E-07	8.746E-10	1.004E+00	3.630E-01
470	FWACV012GO	8	2.190E-04	8.658E-10	2.409E-07	2.418E-07	8.656E-10	1.004E+00	3.593E-01
471	FWBCV012GO	8	2.190E-04	8.658E-10	2.409E-07	2.418E-07	8.656E-10	1.004E+00	3.593E-01
472	ED3MOD11	8	3.170E-04	8.656E-10	2.409E-07	2.418E-07	8.653E-10	1.004E+00	3.592E-01
473	ED3MOD111	8	3.170E-04	8.656E-10	2.409E-07	2.418E-07	8.653E-10	1.004E+00	3.592E-01
474	ED4MOD111	8	3.170E-04	8.656E-10	2.409E-07	2.418E-07	8.653E-10	1.004E+00	3.592E-01
475	PL90302BSA	12	1.160E-03	8.479E-10	2.409E-07	2.418E-07	8.469E-10	1.004E+00	3.515E-01
476	SFBEP013ASA	6	1.710E-04	7.661E-10	2.409E-07	2.417E-07	7.660E-10	1.003E+00	3.179E-01
477	SFBEP013BSA	6	1.710E-04	7.661E-10	2.409E-07	2.417E-07	7.660E-10	1.003E+00	3.179E-01
478	SFBEPSFPASA	6	1.710E-04	7.661E-10	2.409E-07	2.417E-07	7.660E-10	1.003E+00	3.179E-01
479	SFBEPSFPBSA	6	1.710E-04	7.661E-10	2.409E-07	2.417E-07	7.660E-10	1.003E+00	3.179E-01
480	AD4MOD07A	16	8.760E-04	7.664E-10	2.409E-07	2.417E-07	7.658E-10	1.003E+00	3.179E-01
481	AD4MOD08B	16	8.760E-04	7.664E-10	2.409E-07	2.417E-07	7.658E-10	1.003E+00	3.179E-01
482	AD4MOD10B	16	8.760E-04	7.664E-10	2.409E-07	2.417E-07	7.658E-10	1.003E+00	3.179E-01
483	AD4MOD09A	16	8.760E-04	7.664E-10	2.409E-07	2.417E-07	7.658E-10	1.003E+00	3.179E-01
484	EC2CB200VO	21	4.200E-03	7.334E-10	2.409E-07	2.417E-07	7.303E-10	1.003E+00	3.031E-01
485	PL4MOD12	41	2.090E-03	7.288E-10	2.409E-07	2.416E-07	7.272E-10	1.003E+00	3.019E-01
486	PLSMOD61	26	3.460E-03	7.103E-10	2.409E-07	2.416E-07	7.078E-10	1.003E+00	2.938E-01
487	PL2MOD51	16	8.740E-04	6.970E-10	2.409E-07	2.416E-07	6.964E-10	1.003E+00	2.891E-01
488	ATW-MAN06C	1	5.000E-01	1.390E-09	2.402E-07	2.416E-07	6.950E-10	1.003E+00	2.885E-01
489	PMD0302ASA	28	1.160E-03	6.935E-10	2.409E-07	2.416E-07	6.927E-10	1.003E+00	2.875E-01
490	PMA0302ASA	28	1.160E-03	6.935E-10	2.409E-07	2.416E-07	6.927E-10	1.003E+00	2.875E-01
491	CABCM00BTM	20	1.500E-03	6.929E-10	2.409E-07	2.416E-07	6.919E-10	1.003E+00	2.872E-01
492	PLSMOD62	20	3.460E-03	6.649E-10	2.409E-07	2.416E-07	6.626E-10	1.003E+00	2.750E-01
493	FWA-CV-EO	4	1.000E-04	5.930E-10	2.409E-07	2.415E-07	5.929E-10	1.002E+00	2.461E-01
494	PL2MOD52	3	8.740E-04	5.684E-10	2.409E-07	2.415E-07	5.679E-10	1.002E+00	2.357E-01
495	ED3MOD04	73	2.190E-02	5.306E-10	2.409E-07	2.414E-07	5.190E-10	1.002E+00	2.154E-01
496	PMA0302BSA	18	1.160E-03	5.082E-10	2.409E-07	2.414E-07	5.076E-10	1.002E+00	2.107E-01
497	PMD0302BSA	18	1.160E-03	5.082E-10	2.409E-07	2.414E-07	5.076E-10	1.002E+00	2.107E-01
498	PL70302ASA	2	1.160E-03	5.026E-10	2.409E-07	2.414E-07	5.020E-10	1.002E+00	2.084E-01

Table 50-23 (Sheet 13 of 15)

RISK IMPORTANCES SORTED BY RISK INCREASE

499	PL70302BSA	2	1.160E-03	5.026E-10	2.409E-07	2.414E-07	5.020E-10	1.002E+00	2.084E-01
500	PL7MOD12	2	2.090E-03	5.029E-10	2.409E-07	2.414E-07	5.018E-10	1.002E+00	2.083E-01
501	AD2MOD01	75	5.640E-02	5.307E-10	2.409E-07	2.414E-07	5.008E-10	1.002E+00	2.079E-01
502	AD2MOD02	75	5.640E-02	5.307E-10	2.409E-07	2.414E-07	5.008E-10	1.002E+00	2.079E-01
503	AD3MOD04	75	5.640E-02	5.307E-10	2.409E-07	2.414E-07	5.008E-10	1.002E+00	2.079E-01
504	AD3MOD03	75	5.640E-02	5.307E-10	2.409E-07	2.414E-07	5.008E-10	1.002E+00	2.079E-01
505	PL40302ASA	21	1.160E-03	4.944E-10	2.409E-07	2.414E-07	4.938E-10	1.002E+00	2.050E-01
506	PMAMOD41	11	6.350E-04	4.176E-10	2.409E-07	2.413E-07	4.174E-10	1.002E+00	1.732E-01
507	OTH-R05	530	7.000E-01	1.368E-09	2.400E-07	2.413E-07	4.105E-10	1.002E+00	1.704E-01
508	ZO2MOD04	7	1.250E-03	4.053E-10	2.409E-07	2.413E-07	4.048E-10	1.002E+00	1.680E-01
509	PL3MOD12	4	2.090E-03	3.895E-10	2.409E-07	2.413E-07	3.887E-10	1.002E+00	1.613E-01
510	EC2BS211TM	28	2.700E-03	3.860E-10	2.409E-07	2.413E-07	3.850E-10	1.002E+00	1.598E-01
511	PL40302BSA	13	1.160E-03	3.369E-10	2.409E-07	2.413E-07	3.365E-10	1.001E+00	1.397E-01
512	PLBMOD11	20	2.090E-03	3.319E-10	2.409E-07	2.413E-07	3.312E-10	1.001E+00	1.375E-01
513	PMBMOD12	17	2.090E-03	3.157E-10	2.409E-07	2.412E-07	3.151E-10	1.001E+00	1.308E-01
514	ED1MOD06	8	3.480E-04	3.063E-10	2.409E-07	2.412E-07	3.062E-10	1.001E+00	1.271E-01
515	VFOAV009	8	8.760E-03	3.066E-10	2.409E-07	2.412E-07	3.039E-10	1.001E+00	1.261E-01
516	VFOAV003	8	8.760E-03	3.066E-10	2.409E-07	2.412E-07	3.039E-10	1.001E+00	1.261E-01
517	VFIAV010	8	8.760E-03	3.066E-10	2.409E-07	2.412E-07	3.039E-10	1.001E+00	1.261E-01
518	VFIAV004	8	8.760E-03	3.066E-10	2.409E-07	2.412E-07	3.039E-10	1.001E+00	1.261E-01
519	PLB0301ASA	16	1.160E-03	2.928E-10	2.409E-07	2.412E-07	2.924E-10	1.001E+00	1.214E-01
520	IDDMOD38	6	3.170E-04	2.845E-10	2.409E-07	2.412E-07	2.845E-10	1.001E+00	1.181E-01
521	IDAMOD08	6	3.170E-04	2.845E-10	2.409E-07	2.412E-07	2.845E-10	1.001E+00	1.181E-01
522	ATW-MAN04	26	5.200E-02	2.974E-10	2.409E-07	2.412E-07	2.819E-10	1.001E+00	1.170E-01
523	ED3MOD06	1	3.480E-04	2.819E-10	2.409E-07	2.412E-07	2.818E-10	1.001E+00	1.170E-01
524	ZO1MOD03	2	1.000E-04	2.810E-10	2.409E-07	2.412E-07	2.810E-10	1.001E+00	1.166E-01
525	PLB0301BSA	14	1.160E-03	2.686E-10	2.409E-07	2.412E-07	2.683E-10	1.001E+00	1.114E-01
526	PMAMOD22	17	4.070E-03	2.693E-10	2.409E-07	2.412E-07	2.682E-10	1.001E+00	1.113E-01
527	PMBMOD22	17	4.070E-03	2.693E-10	2.409E-07	2.412E-07	2.682E-10	1.001E+00	1.113E-01
528	PMDMOD22	17	4.070E-03	2.693E-10	2.409E-07	2.412E-07	2.682E-10	1.001E+00	1.113E-01
529	PMCMOD22	17	4.070E-03	2.693E-10	2.409E-07	2.412E-07	2.682E-10	1.001E+00	1.113E-01
530	PMCMOD12	14	2.090E-03	2.598E-10	2.409E-07	2.412E-07	2.593E-10	1.001E+00	1.076E-01
531	CVAEP084SA	3	1.710E-04	2.462E-10	2.409E-07	2.412E-07	2.462E-10	1.001E+00	1.022E-01
532	CVBEP081SA	3	1.710E-04	2.462E-10	2.409E-07	2.412E-07	2.462E-10	1.001E+00	1.022E-01
533	PL30302ASA	2	1.160E-03	2.414E-10	2.409E-07	2.412E-07	2.411E-10	1.001E+00	1.001E-01
534	SGBOR--DAS-SP	7	7.220E-03	2.203E-10	2.409E-07	2.411E-07	2.187E-10	1.001E+00	9.077E-02
535	SGAOR--DAS-SP	7	7.220E-03	2.203E-10	2.409E-07	2.411E-07	2.187E-10	1.001E+00	9.077E-02
536	CCBMOD01	48	4.800E-02	2.259E-10	2.409E-07	2.411E-07	2.150E-10	1.001E+00	8.925E-02
537	PMC0302ASA	8	1.160E-03	2.081E-10	2.409E-07	2.411E-07	2.079E-10	1.001E+00	8.628E-02
538	PMB0302ASA	8	1.160E-03	2.081E-10	2.409E-07	2.411E-07	2.079E-10	1.001E+00	8.628E-02
539	SWB-001TM	34	3.800E-02	2.149E-10	2.409E-07	2.411E-07	2.068E-10	1.001E+00	8.582E-02
540	SWBMOD02	31	2.440E-02	2.109E-10	2.409E-07	2.411E-07	2.057E-10	1.001E+00	8.539E-02

Table 50-23 (Sheet 14 of 15)

RISK IMPORTANCES SORTED BY RISK INCREASE

541	SGBTL--DAS-UF	5	5.230E-03	2.038E-10	2.409E-07	2.411E-07	2.027E-10	1.001E+00	8.414E-02
542	SGATL--DAS-UF	5	5.230E-03	2.038E-10	2.409E-07	2.411E-07	2.027E-10	1.001E+00	8.414E-02
543	IWBCV124AO	9	1.750E-03	2.011E-10	2.409E-07	2.411E-07	2.007E-10	1.001E+00	8.332E-02
544	IRWMOD08	7	1.460E-03	1.877E-10	2.409E-07	2.411E-07	1.875E-10	1.001E+00	7.781E-02
545	PMC0302BSA	6	1.160E-03	1.803E-10	2.409E-07	2.411E-07	1.800E-10	1.001E+00	7.473E-02
546	PMB0302BSA	6	1.160E-03	1.803E-10	2.409E-07	2.411E-07	1.800E-10	1.001E+00	7.473E-02
547	PL30302BSA	1	1.160E-03	1.552E-10	2.409E-07	2.411E-07	1.550E-10	1.001E+00	6.433E-02
548	EC1MOD01	1	6.910E-05	1.505E-10	2.409E-07	2.411E-07	1.505E-10	1.001E+00	6.247E-02
549	ED1MOD02	2	1.920E-04	1.490E-10	2.409E-07	2.411E-07	1.489E-10	1.001E+00	6.182E-02
550	PLAMOD12	4	2.090E-03	1.336E-10	2.409E-07	2.411E-07	1.333E-10	1.001E+00	5.533E-02
551	MSMODV001	14	2.710E-02	1.201E-10	2.409E-07	2.410E-07	1.169E-10	1.000E+00	4.851E-02
552	MSMODV003	14	2.710E-02	1.201E-10	2.409E-07	2.410E-07	1.169E-10	1.000E+00	4.851E-02
553	PLBMOD12	8	2.090E-03	1.065E-10	2.409E-07	2.410E-07	1.063E-10	1.000E+00	4.412E-02
554	IDBMOD36	2	3.170E-04	1.013E-10	2.409E-07	2.410E-07	1.012E-10	1.000E+00	4.202E-02
555	IDCMOD37	2	3.170E-04	1.013E-10	2.409E-07	2.410E-07	1.012E-10	1.000E+00	4.202E-02
556	ED4MOD03	2	2.700E-03	9.111E-11	2.409E-07	2.410E-07	9.087E-11	1.000E+00	3.772E-02
557	OTH-BL	23	1.900E-01	9.931E-11	2.409E-07	2.410E-07	8.044E-11	1.000E+00	3.339E-02
558	PLA0302ASA	2	1.160E-03	7.517E-11	2.409E-07	2.410E-07	7.509E-11	1.000E+00	3.117E-02
559	PLA0302BSA	2	1.160E-03	7.517E-11	2.409E-07	2.410E-07	7.509E-11	1.000E+00	3.117E-02
560	ED2MOD07	2	3.050E-04	7.213E-11	2.409E-07	2.410E-07	7.211E-11	1.000E+00	2.993E-02
561	ED2MOD13	2	3.170E-04	7.192E-11	2.409E-07	2.410E-07	7.190E-11	1.000E+00	2.984E-02
562	ED2MOD06	2	3.480E-04	7.184E-11	2.409E-07	2.410E-07	7.181E-11	1.000E+00	2.981E-02
563	PLB0302ASA	4	1.160E-03	6.776E-11	2.409E-07	2.410E-07	6.768E-11	1.000E+00	2.809E-02
564	SWBMOD11P	6	1.410E-02	6.383E-11	2.409E-07	2.410E-07	6.293E-11	1.000E+00	2.612E-02
565	CMBAV015LA	1	1.590E-03	6.239E-11	2.409E-07	2.410E-07	6.229E-11	1.000E+00	2.586E-02
566	CMBAV014LA	1	1.590E-03	6.239E-11	2.409E-07	2.410E-07	6.229E-11	1.000E+00	2.586E-02
567	CASMOD03	10	2.310E-02	6.295E-11	2.409E-07	2.410E-07	6.150E-11	1.000E+00	2.553E-02
568	IWBCV122AO	3	1.750E-03	5.297E-11	2.409E-07	2.410E-07	5.288E-11	1.000E+00	2.195E-02
569	IRWMOD07	3	1.460E-03	5.295E-11	2.409E-07	2.410E-07	5.287E-11	1.000E+00	2.194E-02
570	EC3BS003TM	1	2.700E-03	4.667E-11	2.409E-07	2.410E-07	4.654E-11	1.000E+00	1.932E-02
571	PLB0302BSA	2	1.160E-03	4.362E-11	2.409E-07	2.410E-07	4.357E-11	1.000E+00	1.808E-02
572	IWARS123BFA	2	8.760E-04	4.167E-11	2.409E-07	2.410E-07	4.163E-11	1.000E+00	1.728E-02
573	IWCRS125BFA	2	8.760E-04	4.167E-11	2.409E-07	2.410E-07	4.163E-11	1.000E+00	1.728E-02
574	VFSFRAC	16	1.200E-01	4.476E-11	2.409E-07	2.410E-07	3.939E-11	1.000E+00	1.635E-02
575	SGAAV040LA	2	1.090E-03	3.706E-11	2.409E-07	2.410E-07	3.702E-11	1.000E+00	1.537E-02
576	PMDMOD42	2	6.350E-04	3.512E-11	2.409E-07	2.410E-07	3.510E-11	1.000E+00	1.457E-02
577	PMAMOD42	2	6.350E-04	3.512E-11	2.409E-07	2.410E-07	3.510E-11	1.000E+00	1.457E-02
578	PLMMOD42	2	6.350E-04	3.512E-11	2.409E-07	2.410E-07	3.510E-11	1.000E+00	1.457E-02
579	SFNMV067GC	14	1.100E-02	3.182E-11	2.409E-07	2.410E-07	3.147E-11	1.000E+00	1.306E-02
580	ATW-MAN01C	9	5.170E-01	5.922E-11	2.409E-07	2.409E-07	2.860E-11	1.000E+00	1.187E-02
581	ATW-MAN01	6	3.300E-02	1.802E-11	2.409E-07	2.409E-07	1.743E-11	1.000E+00	7.233E-03
582	CVX-MV-GC2	4	4.400E-03	1.684E-11	2.409E-07	2.409E-07	1.677E-11	1.000E+00	6.959E-03

Table 50-23 (Sheet 15 of 15)

RISK IMPORTANCES SORTED BY RISK INCREASE

583	CVN-MAN02	2	1.580E-03	1.570E-11	2.409E-07	2.409E-07	1.567E-11	1.000E+00	6.505E-03
584	CCAMOD02	1	7.100E-03	1.352E-11	2.409E-07	2.409E-07	1.343E-11	1.000E+00	5.572E-03
585	AD1MOD06	11	5.640E-02	1.251E-11	2.409E-07	2.409E-07	1.181E-11	1.000E+00	4.901E-03
586	SGBAV057LA	1	1.090E-03	1.000E-11	2.409E-07	2.409E-07	9.989E-12	1.000E+00	4.146E-03
587	TCBMOD01B	1	2.520E-02	5.000E-12	2.409E-07	2.409E-07	4.874E-12	1.000E+00	2.023E-03
588	IDBMOD27	6	2.190E-02	3.973E-12	2.409E-07	2.409E-07	3.886E-12	1.000E+00	1.613E-03
589	IDCMOD31	6	2.190E-02	3.973E-12	2.409E-07	2.409E-07	3.886E-12	1.000E+00	1.613E-03
590	IDDMOD35	6	2.190E-02	3.973E-12	2.409E-07	2.409E-07	3.886E-12	1.000E+00	1.613E-03
591	IDAMOD07	6	2.190E-02	3.973E-12	2.409E-07	2.409E-07	3.886E-12	1.000E+00	1.613E-03
592	CVNMV091GC	11	8.760E-02	2.499E-12	2.409E-07	2.409E-07	2.280E-12	1.000E+00	9.464E-04
593	CVNMV090GC	11	8.760E-02	2.499E-12	2.409E-07	2.409E-07	2.280E-12	1.000E+00	9.464E-04
594	ATW-MAN06	1	5.200E-03	2.173E-12	2.409E-07	2.409E-07	2.162E-12	1.000E+00	8.973E-04
595	AD1MOD05	6	5.640E-02	1.555E-12	2.409E-07	2.409E-07	1.467E-12	1.000E+00	6.090E-04
596	SGBAV250LA	1	8.760E-03	1.244E-12	2.409E-07	2.409E-07	1.233E-12	1.000E+00	5.119E-04
597	SGBCV058GC	1	2.450E-02	4.449E-13	2.409E-07	2.409E-07	4.340E-13	1.000E+00	1.801E-04
598	IEV-ATW-T	13	1.170E+00	6.086E-10	2.402E-07	2.408E-07	-1.035E-10	9.996E-01	-4.294E-02
599	IEV-TRANS	1500	1.400E+00	2.203E-09	2.378E-07	2.400E-07	-8.814E-10	9.963E-01	-3.658E-01

Table 50-24 (Sheet 1 of 15)

RISK IMPORTANCES SORTED BY RISK DECREASE

SORTED BY RISK DECREASE IMPORTANCE

	BASIC EVENT ID	CUTSETS	BEV PROB. Q	BIRN A	CMF0 B	CMF1	RDEC	RRW	FV	WRDEC %
1	IEV-SI-LB	1160	2.120E-04	4.480E-04	1.459E-07	4.482E-04	9.499E-08	1.651E+00	3.943E-01	39.43
2	IWA-PLUG	68	2.400E-04	2.121E-04	1.900E-07	2.123E-04	5.091E-08	1.268E+00	2.113E-01	21.13
3	IEV-LLOCA	286	5.000E-06	8.958E-03	1.960E-07	8.958E-03	4.496E-08	1.229E+00	1.866E-01	18.66
4	IEV-SPADS	1078	5.400E-05	5.476E-04	2.113E-07	5.478E-04	2.958E-08	1.140E+00	1.228E-01	12.28
5	ADX-EV-SA2	1607	5.900E-05	3.898E-04	2.179E-07	3.900E-04	2.300E-08	1.106E+00	9.547E-02	9.55
6	IEV-SLOCA	1638	5.000E-04	3.616E-05	2.228E-07	3.638E-05	1.808E-08	1.081E+00	7.504E-02	7.50
7	REX-FL-GP	849	1.200E-05	1.474E-03	2.232E-07	1.474E-03	1.770E-08	1.079E+00	7.346E-02	7.35
8	IEV-MLOCA	1681	4.360E-04	3.696E-05	2.248E-07	3.718E-05	1.611E-08	1.072E+00	6.688E-02	6.69
9	ADX-EV-SA	1678	3.000E-05	3.949E-04	2.291E-07	3.952E-04	1.185E-08	1.052E+00	4.918E-02	4.92
10	IWX-CV-AO	1617	3.000E-05	3.929E-04	2.291E-07	3.931E-04	1.179E-08	1.051E+00	4.893E-02	4.89
11	IWX-EV-SA	1686	2.600E-05	3.993E-04	2.305E-07	3.996E-04	1.038E-08	1.045E+00	4.310E-02	4.31
12	IEV-RV-RP	1	1.000E-08	1.000E+00	2.309E-07	1.000E+00	1.000E-08	1.043E+00	4.151E-02	4.15
13	ACACV028GO	141	1.750E-03	5.536E-06	2.312E-07	5.767E-06	9.688E-09	1.042E+00	4.021E-02	4.02
14	ACACV029GO	141	1.750E-03	5.536E-06	2.312E-07	5.767E-06	9.688E-09	1.042E+00	4.021E-02	4.02
15	ACBCV029GO	73	1.750E-03	5.230E-06	2.318E-07	5.462E-06	9.153E-09	1.039E+00	3.799E-02	3.80
16	ACBCV028GO	73	1.750E-03	5.230E-06	2.318E-07	5.462E-06	9.153E-09	1.039E+00	3.799E-02	3.80
17	REC-MANDASC	723	5.060E-01	1.516E-08	2.333E-07	2.484E-07	7.669E-09	1.033E+00	3.183E-02	3.18
18	IWX-XMTR	560	4.780E-04	1.495E-05	2.338E-07	1.518E-05	7.146E-09	1.031E+00	2.966E-02	2.97
19	REN-MAN04	495	1.000E-02	7.033E-07	2.339E-07	9.372E-07	7.033E-09	1.030E+00	2.919E-02	2.92
20	CCX-INPUT-LOGIC	43	1.030E-04	6.635E-05	2.341E-07	6.659E-05	6.834E-09	1.029E+00	2.837E-02	2.84
21	IEV-SGTR	3076	3.880E-03	1.751E-06	2.341E-07	1.985E-06	6.792E-09	1.029E+00	2.819E-02	2.82
22	RPX-CB-GO	426	4.200E-04	1.223E-05	2.358E-07	1.246E-05	5.135E-09	1.022E+00	2.131E-02	2.13
23	CCX-AV-LA	133	6.200E-05	6.786E-05	2.367E-07	6.810E-05	4.207E-09	1.018E+00	1.746E-02	1.75
24	CCX-XMTR	579	4.780E-04	8.755E-06	2.367E-07	8.992E-06	4.185E-09	1.018E+00	1.737E-02	1.74
25	CCX-XMTR195	280	4.780E-04	8.449E-06	2.369E-07	8.686E-06	4.039E-09	1.017E+00	1.676E-02	1.68
26	ACAOR001SP	95	7.270E-04	5.542E-06	2.369E-07	5.779E-06	4.029E-09	1.017E+00	1.672E-02	1.67
27	ACBOR001SP	35	7.270E-04	5.237E-06	2.371E-07	5.474E-06	3.807E-09	1.016E+00	1.580E-02	1.58
28	IEV-CMTLB	987	9.310E-05	3.954E-05	2.372E-07	3.978E-05	3.682E-09	1.016E+00	1.528E-02	1.53
29	ATW-MAN03	104	5.200E-02	7.075E-08	2.372E-07	3.080E-07	3.679E-09	1.016E+00	1.527E-02	1.53
30	IEV-ATWS	136	4.810E-01	7.495E-09	2.373E-07	2.448E-07	3.605E-09	1.015E+00	1.496E-02	1.50
31	ATW-MAN04C	34	5.260E-01	6.695E-09	2.374E-07	2.441E-07	3.522E-09	1.015E+00	1.462E-02	1.46
32	ADX-MV3-GO	2324	3.240E-04	1.033E-05	2.376E-07	1.056E-05	3.346E-09	1.014E+00	1.389E-02	1.39
33	CMX-CV-GO	93	5.100E-05	6.542E-05	2.376E-07	6.565E-05	3.336E-09	1.014E+00	1.385E-02	1.38
34	IEV-TRANS	1500	1.400E+00	2.203E-09	2.378E-07	2.400E-07	3.085E-09	1.013E+00	1.280E-02	1.28
35	ACX-CV-GO	179	5.100E-05	5.958E-05	2.379E-07	5.982E-05	3.038E-09	1.013E+00	1.261E-02	1.26
36	RN11MOD3	362	1.410E-02	1.879E-07	2.383E-07	4.262E-07	2.649E-09	1.011E+00	1.100E-02	1.10
37	RN22MOD4	362	1.410E-02	1.879E-07	2.383E-07	4.262E-07	2.649E-09	1.011E+00	1.100E-02	1.10

Table 50-24 (Sheet 2 of 15)

RISK IMPORTANCES SORTED BY RISK DECREASE

38	RN23MOD5	362	1.410E-02	1.879E-07	2.383E-07	4.262E-07	2.649E-09	1.011E+00	1.100E-02	1.10
39	RN55MOD1	362	1.410E-02	1.879E-07	2.383E-07	4.262E-07	2.649E-09	1.011E+00	1.100E-02	1.10
40	OTH-SGTR	989	1.000E-02	2.599E-07	2.383E-07	4.982E-07	2.599E-09	1.011E+00	1.079E-02	1.08
41	CMX-VS-FA	75	3.840E-05	6.542E-05	2.384E-07	6.566E-05	2.512E-09	1.011E+00	1.043E-02	1.04
42	CIB-MAN00	320	1.840E-03	1.288E-06	2.386E-07	1.527E-06	2.370E-09	1.010E+00	9.838E-03	0.98
43	ADN-MAN01	680	3.020E-03	7.843E-07	2.386E-07	1.023E-06	2.369E-09	1.010E+00	9.832E-03	0.98
44	CCX-SFTW	262	1.200E-06	1.904E-03	2.386E-07	1.905E-03	2.287E-09	1.010E+00	9.494E-03	0.95
45	IWX-FL-GP	993	1.200E-05	1.797E-04	2.388E-07	1.799E-04	2.156E-09	1.009E+00	8.951E-03	0.90
46	CCX-PMXMOD1-SW	347	1.100E-05	1.926E-04	2.388E-07	1.929E-04	2.119E-09	1.009E+00	8.795E-03	0.88
47	EC1BS001TM	1288	2.700E-03	7.530E-07	2.389E-07	9.918E-07	2.033E-09	1.009E+00	8.438E-03	0.84
48	ADN-MAN01C	13	5.000E-01	3.993E-09	2.389E-07	2.429E-07	1.996E-09	1.008E+00	8.287E-03	0.83
49	OTH-SLSOV1	557	2.100E-02	9.277E-08	2.390E-07	3.317E-07	1.948E-09	1.008E+00	8.086E-03	0.81
50	CLP-UNAVAILABLE	299	1.000E-02	1.876E-07	2.390E-07	4.267E-07	1.876E-09	1.008E+00	7.787E-03	0.78
51	EC1BS012TM	1041	2.700E-03	6.818E-07	2.391E-07	9.209E-07	1.841E-09	1.008E+00	7.641E-03	0.76
52	REC-MANDAS	381	1.160E-02	1.574E-07	2.391E-07	3.965E-07	1.825E-09	1.008E+00	7.577E-03	0.76
53	MDAS	799	1.000E-02	1.800E-07	2.391E-07	4.191E-07	1.800E-09	1.008E+00	7.471E-03	0.75
54	PXX-AV-LA1	1975	9.600E-05	1.860E-05	2.391E-07	1.884E-05	1.785E-09	1.007E+00	7.410E-03	0.74
55	PXX-AV-LA	1975	9.600E-05	1.860E-05	2.391E-07	1.884E-05	1.785E-09	1.007E+00	7.410E-03	0.74
56	CCX-BY-PN	968	4.700E-05	3.777E-05	2.391E-07	3.801E-05	1.775E-09	1.007E+00	7.368E-03	0.74
57	IWACV124AO	26	1.750E-03	9.998E-07	2.392E-07	1.239E-06	1.750E-09	1.007E+00	7.263E-03	0.73
58	IWACV122AO	20	1.750E-03	9.997E-07	2.392E-07	1.239E-06	1.749E-09	1.007E+00	7.262E-03	0.73
59	IEV-RCSLK	1526	6.200E-03	2.750E-07	2.392E-07	5.142E-07	1.705E-09	1.007E+00	7.078E-03	0.71
60	CMA-PLUG	65	7.270E-04	2.319E-06	2.392E-07	2.559E-06	1.686E-09	1.007E+00	6.999E-03	0.70
61	IEV-POWEX	701	4.500E-03	3.687E-07	2.393E-07	6.080E-07	1.659E-09	1.007E+00	6.887E-03	0.69
62	CCX-EP-SAM	298	8.620E-06	1.921E-04	2.393E-07	1.923E-04	1.656E-09	1.007E+00	6.873E-03	0.69
63	OTH-PRSOV	664	1.000E-02	1.653E-07	2.393E-07	4.046E-07	1.653E-09	1.007E+00	6.861E-03	0.69
64	LPM-MAN01C	5	5.000E-01	3.044E-09	2.394E-07	2.424E-07	1.522E-09	1.006E+00	6.317E-03	0.63
65	LPM-MAN02	282	3.300E-03	4.557E-07	2.394E-07	6.951E-07	1.504E-09	1.006E+00	6.242E-03	0.62
66	IRWMOD06	21	1.460E-03	1.000E-06	2.395E-07	1.240E-06	1.460E-09	1.006E+00	6.062E-03	0.61
67	IRWMOD05	17	1.460E-03	1.000E-06	2.395E-07	1.240E-06	1.460E-09	1.006E+00	6.061E-03	0.61
68	IEV-LCOND	858	1.120E-01	1.111E-08	2.397E-07	2.508E-07	1.244E-09	1.005E+00	5.163E-03	0.52
69	IWX-EV1-SA	1	5.800E-06	2.121E-04	2.397E-07	2.123E-04	1.230E-09	1.005E+00	5.105E-03	0.51
70	ED3MOD07	387	3.050E-04	3.840E-06	2.397E-07	4.080E-06	1.171E-09	1.005E+00	4.861E-03	0.49
71	ADF-MAN01	374	5.000E-01	2.029E-09	2.399E-07	2.419E-07	1.015E-09	1.004E+00	4.212E-03	0.42
72	DAS	322	1.000E-02	1.007E-07	2.399E-07	3.406E-07	1.007E-09	1.004E+00	4.179E-03	0.42
73	IEV-LOSP	530	1.200E-01	7.981E-09	2.400E-07	2.479E-07	9.577E-10	1.004E+00	3.975E-03	0.40
74	OTH-R05	530	7.000E-01	1.368E-09	2.400E-07	2.413E-07	9.577E-10	1.004E+00	3.975E-03	0.40
75	CANTP011RI	705	5.230E-03	1.770E-07	2.400E-07	4.170E-07	9.255E-10	1.004E+00	3.841E-03	0.38
76	RNX-KV1-GO	207	4.900E-03	1.869E-07	2.400E-07	4.269E-07	9.160E-10	1.004E+00	3.802E-03	0.38
77	IWBRS123AFA	16	8.760E-04	1.000E-06	2.400E-07	1.240E-06	8.761E-10	1.004E+00	3.636E-03	0.36
78	IWDRS125AFA	16	8.760E-04	1.000E-06	2.400E-07	1.240E-06	8.761E-10	1.004E+00	3.636E-03	0.36
79	IEV-LMFW	1334	3.350E-01	2.596E-09	2.401E-07	2.426E-07	8.697E-10	1.004E+00	3.610E-03	0.36

Table 50-24 (Sheet 3 of 15)

RISK IMPORTANCES SORTED BY RISK DECREASE

80	CVN-MAN00	33	3.100E-03	2.673E-07	2.401E-07	5.074E-07	8.285E-10	1.003E+00	3.439E-03	0.34
81	IDBBSDS1TM	606	3.000E-04	2.566E-06	2.402E-07	2.806E-06	7.697E-10	1.003E+00	3.195E-03	0.32
82	IDBBSDD1TM	581	3.000E-04	2.561E-06	2.402E-07	2.801E-06	7.683E-10	1.003E+00	3.189E-03	0.32
83	CIB-MAN01	280	1.340E-03	5.540E-07	2.402E-07	7.941E-07	7.423E-10	1.003E+00	3.081E-03	0.31
84	IEV-ATW-T	13	1.170E+00	6.086E-10	2.402E-07	2.408E-07	7.120E-10	1.003E+00	2.955E-03	0.30
85	ATW-MAN05	5	5.200E-03	1.369E-07	2.402E-07	3.771E-07	7.118E-10	1.003E+00	2.954E-03	0.30
86	ATW-MAN06C	1	5.000E-01	1.390E-09	2.402E-07	2.416E-07	6.950E-10	1.003E+00	2.885E-03	0.29
87	CCX-IN-LOGIC-SW	22	1.100E-05	6.269E-05	2.402E-07	6.293E-05	6.896E-10	1.003E+00	2.862E-03	0.29
88	CCX-PMXMOD2-SW	22	1.100E-05	6.269E-05	2.402E-07	6.293E-05	6.896E-10	1.003E+00	2.862E-03	0.29
89	IEV-LCAS	417	3.480E-02	1.932E-08	2.402E-07	2.596E-07	6.725E-10	1.003E+00	2.791E-03	0.28
90	IDDBSDS1TM	253	3.000E-04	2.058E-06	2.403E-07	2.299E-06	6.175E-10	1.003E+00	2.563E-03	0.26
91	IDDBSDD1TM	207	3.000E-04	2.053E-06	2.403E-07	2.293E-06	6.159E-10	1.003E+00	2.557E-03	0.26
92	IEV-SLB-V	305	1.210E-03	5.010E-07	2.403E-07	7.414E-07	6.063E-10	1.003E+00	2.516E-03	0.25
93	RHN-MAN01	168	2.900E-03	1.864E-07	2.404E-07	4.268E-07	5.405E-10	1.002E+00	2.244E-03	0.22
94	REG-MAN00	232	2.040E-01	2.560E-09	2.404E-07	2.430E-07	5.223E-10	1.002E+00	2.168E-03	0.22
95	EC1BS122TM	235	2.700E-03	1.879E-07	2.404E-07	4.283E-07	5.073E-10	1.002E+00	2.106E-03	0.21
96	IEV-PRSTR	317	1.340E-04	3.743E-06	2.404E-07	3.983E-06	5.015E-10	1.002E+00	2.082E-03	0.21
97	RNAMOD09	160	5.070E-02	9.436E-09	2.404E-07	2.499E-07	4.784E-10	1.002E+00	1.986E-03	0.20
98	RNBMOD10	160	5.070E-02	9.436E-09	2.404E-07	2.499E-07	4.784E-10	1.002E+00	1.986E-03	0.20
99	EC0MOD01	1460	5.080E-03	9.180E-08	2.405E-07	3.323E-07	4.663E-10	1.002E+00	1.936E-03	0.19
100	OTH-SLSOV	321	1.100E-02	4.159E-08	2.405E-07	2.821E-07	4.575E-10	1.002E+00	1.899E-03	0.19
101	IEV-LMFW1	763	1.920E-01	2.359E-09	2.405E-07	2.428E-07	4.528E-10	1.002E+00	1.880E-03	0.19
102	LPM-MAN01	227	1.340E-03	3.085E-07	2.405E-07	5.490E-07	4.134E-10	1.002E+00	1.716E-03	0.17
103	CCX-TRNSM	556	4.780E-04	8.126E-07	2.405E-07	1.053E-06	3.884E-10	1.002E+00	1.612E-03	0.16
104	AD4MOD08	510	5.800E-04	6.610E-07	2.405E-07	9.015E-07	3.834E-10	1.002E+00	1.591E-03	0.16
105	AD4MOD07	510	5.800E-04	6.610E-07	2.405E-07	9.015E-07	3.834E-10	1.002E+00	1.591E-03	0.16
106	AD4MOD09	510	5.800E-04	6.610E-07	2.405E-07	9.015E-07	3.834E-10	1.002E+00	1.591E-03	0.16
107	AD4MOD10	510	5.800E-04	6.610E-07	2.405E-07	9.015E-07	3.834E-10	1.002E+00	1.591E-03	0.16
108	IDABSDS1TM	264	3.000E-04	1.197E-06	2.406E-07	1.437E-06	3.590E-10	1.001E+00	1.490E-03	0.15
109	IDABSDD1TM	239	3.000E-04	1.192E-06	2.406E-07	1.433E-06	3.577E-10	1.001E+00	1.485E-03	0.15
110	IDCBSDS1TM	333	3.000E-04	1.094E-06	2.406E-07	1.334E-06	3.281E-10	1.001E+00	1.362E-03	0.14
111	IDCBSDD1TM	308	3.000E-04	1.089E-06	2.406E-07	1.330E-06	3.268E-10	1.001E+00	1.356E-03	0.14
112	RNNCV013GO	142	1.750E-03	1.857E-07	2.406E-07	4.263E-07	3.249E-10	1.001E+00	1.349E-03	0.13
113	IEV-LCCW	690	1.440E-01	2.241E-09	2.406E-07	2.428E-07	3.228E-10	1.001E+00	1.340E-03	0.13
114	EC2BS002TM	501	2.700E-03	1.173E-07	2.406E-07	3.579E-07	3.166E-10	1.001E+00	1.314E-03	0.13
115	EC2BS022TM	337	2.700E-03	1.048E-07	2.406E-07	3.454E-07	2.829E-10	1.001E+00	1.174E-03	0.12
116	ZO1DG001TM	762	4.600E-02	5.727E-09	2.407E-07	2.464E-07	2.634E-10	1.001E+00	1.093E-03	0.11
117	RNAMOD06	312	3.400E-02	7.420E-09	2.407E-07	2.481E-07	2.523E-10	1.001E+00	1.047E-03	0.10
118	EC2BS221TM	260	2.700E-03	9.117E-08	2.407E-07	3.318E-07	2.462E-10	1.001E+00	1.022E-03	0.10
119	CIX-AV-LA	194	7.700E-04	3.134E-07	2.407E-07	5.541E-07	2.413E-10	1.001E+00	1.002E-03	0.10
120	RNBMOD07	199	3.400E-02	6.901E-09	2.407E-07	2.476E-07	2.346E-10	1.001E+00	9.739E-04	0.10
121	EC1BS121TM	258	2.700E-03	8.138E-08	2.407E-07	3.221E-07	2.197E-10	1.001E+00	9.120E-04	0.09

Table 50-24 (Sheet 4 of 15)

RISK IMPORTANCES SORTED BY RISK DECREASE

122	VWBMOD05	158	2.190E-02	9.985E-09	2.407E-07	2.507E-07	2.187E-10	1.001E+00	9.076E-04	0.09
123	CMX-AV-LA	36	9.600E-05	2.273E-06	2.407E-07	2.514E-06	2.182E-10	1.001E+00	9.058E-04	0.09
124	VWBMOD04	141	1.830E-02	9.910E-09	2.407E-07	2.506E-07	1.814E-10	1.001E+00	7.527E-04	0.08
125	RC1CB063GO	186	4.200E-03	3.819E-08	2.408E-07	2.790E-07	1.604E-10	1.001E+00	6.658E-04	0.07
126	RC1CB061GO	186	4.200E-03	3.819E-08	2.408E-07	2.790E-07	1.604E-10	1.001E+00	6.658E-04	0.07
127	RC1CB053GO	186	4.200E-03	3.819E-08	2.408E-07	2.790E-07	1.604E-10	1.001E+00	6.658E-04	0.07
128	RC1CB051GO	186	4.200E-03	3.819E-08	2.408E-07	2.790E-07	1.604E-10	1.001E+00	6.658E-04	0.07
129	OTH-SDMAN	96	7.700E-04	2.036E-07	2.408E-07	4.444E-07	1.568E-10	1.001E+00	6.508E-04	0.07
130	CVMOD04	111	7.370E-04	2.101E-07	2.408E-07	4.509E-07	1.548E-10	1.001E+00	6.427E-04	0.06
131	CCX-XMTR1	153	4.780E-04	3.124E-07	2.408E-07	5.531E-07	1.493E-10	1.001E+00	6.198E-04	0.06
132	SGBAV040LA	276	1.090E-03	1.346E-07	2.408E-07	3.754E-07	1.467E-10	1.001E+00	6.091E-04	0.06
133	RNX-PM-FS	102	7.700E-04	1.838E-07	2.408E-07	4.246E-07	1.415E-10	1.001E+00	5.875E-04	0.06
134	OTH-SLSOV2	97	1.000E-02	1.399E-08	2.408E-07	2.548E-07	1.399E-10	1.001E+00	5.807E-04	0.06
135	IEV-SLB-U	160	3.720E-04	3.513E-07	2.408E-07	5.921E-07	1.307E-10	1.001E+00	5.425E-04	0.05
136	RC1CB052GO	174	4.200E-03	3.092E-08	2.408E-07	2.717E-07	1.299E-10	1.001E+00	5.391E-04	0.05
137	RC1CB054GO	174	4.200E-03	3.092E-08	2.408E-07	2.717E-07	1.299E-10	1.001E+00	5.391E-04	0.05
138	RC1CB064GO	146	4.200E-03	3.072E-08	2.408E-07	2.715E-07	1.290E-10	1.001E+00	5.355E-04	0.05
139	RC1CB062GO	146	4.200E-03	3.072E-08	2.408E-07	2.715E-07	1.290E-10	1.001E+00	5.355E-04	0.05
140	CANCV015GC	415	2.450E-02	4.976E-09	2.408E-07	2.458E-07	1.219E-10	1.001E+00	5.060E-04	0.05
141	CVBPM01BTM	68	2.190E-02	5.457E-09	2.408E-07	2.463E-07	1.195E-10	1.000E+00	4.961E-04	0.05
142	IWX-CV1-AO	1	5.400E-07	2.111E-04	2.408E-07	2.114E-04	1.140E-10	1.000E+00	4.732E-04	0.05
143	RNX-KV-GO	92	6.100E-04	1.833E-07	2.408E-07	4.241E-07	1.118E-10	1.000E+00	4.640E-04	0.05
144	IEV-ATW-S	55	1.480E-02	7.475E-09	2.408E-07	2.483E-07	1.106E-10	1.000E+00	4.592E-04	0.05
145	CCX-TT-UF	139	1.170E-04	9.364E-07	2.408E-07	1.177E-06	1.096E-10	1.000E+00	4.547E-04	0.05
146	MSHTP002RI	19	5.230E-03	2.054E-08	2.408E-07	2.614E-07	1.074E-10	1.000E+00	4.460E-04	0.04
147	MSHTP001RI	19	5.230E-03	2.054E-08	2.408E-07	2.614E-07	1.074E-10	1.000E+00	4.460E-04	0.04
148	ZO1MOD01	439	2.020E-02	5.150E-09	2.408E-07	2.460E-07	1.040E-10	1.000E+00	4.318E-04	0.04
149	REA-PLUG	232	2.400E-04	4.173E-07	2.408E-07	6.581E-07	1.002E-10	1.000E+00	4.157E-04	0.04
150	REB-PLUG	212	2.400E-04	4.090E-07	2.408E-07	6.498E-07	9.816E-11	1.000E+00	4.074E-04	0.04
151	CCX-PMS-HARDWARE	52	7.890E-05	1.179E-06	2.408E-07	1.420E-06	9.302E-11	1.000E+00	3.861E-04	0.04
152	OTH-MGSET	29	1.750E-03	5.281E-08	2.408E-07	2.936E-07	9.242E-11	1.000E+00	3.836E-04	0.04
153	CVMOD05	163	2.880E-02	3.197E-09	2.408E-07	2.440E-07	9.207E-11	1.000E+00	3.821E-04	0.04
154	CVMOD07	148	2.710E-02	3.195E-09	2.408E-07	2.440E-07	8.660E-11	1.000E+00	3.594E-04	0.04
155	OTH-PRES	52	2.000E-03	4.121E-08	2.408E-07	2.821E-07	8.243E-11	1.000E+00	3.421E-04	0.03
156	OTH-SLSOV3	511	5.400E-03	1.519E-08	2.408E-07	2.560E-07	8.201E-11	1.000E+00	3.404E-04	0.03
157	OTH-SGTR1	75	6.700E-03	1.196E-08	2.408E-07	2.528E-07	8.014E-11	1.000E+00	3.326E-04	0.03
158	ED1MOD113	119	3.170E-04	2.510E-07	2.408E-07	4.919E-07	7.958E-11	1.000E+00	3.303E-04	0.03
159	ED1MOD11	119	3.170E-04	2.510E-07	2.408E-07	4.919E-07	7.958E-11	1.000E+00	3.303E-04	0.03
160	ED1BSDS1TM	137	3.000E-04	2.641E-07	2.408E-07	5.050E-07	7.924E-11	1.000E+00	3.289E-04	0.03
161	EC1BS013TM	192	2.700E-03	2.534E-08	2.409E-07	2.662E-07	6.842E-11	1.000E+00	2.840E-04	0.03
162	ZO2DG002TM	230	4.600E-02	1.468E-09	2.409E-07	2.423E-07	6.755E-11	1.000E+00	2.804E-04	0.03
163	CANAV014LA	88	8.760E-03	7.581E-09	2.409E-07	2.484E-07	6.641E-11	1.000E+00	2.756E-04	0.03

Table 50-24 (Sheet 5 of 15)

RISK IMPORTANCES SORTED BY RISK DECREASE

164	EC1BS011TM	329	2.700E-03	2.448E-08	2.409E-07	2.653E-07	6.608E-11	1.000E+00	2.743E-04	0.03
165	IDABSDK1TM	71	3.000E-04	2.037E-07	2.409E-07	4.445E-07	6.110E-11	1.000E+00	2.536E-04	0.03
166	CVMOD03	44	1.120E-02	5.308E-09	2.409E-07	2.462E-07	5.945E-11	1.000E+00	2.468E-04	0.02
167	ED1MOD03	168	2.700E-03	2.142E-08	2.409E-07	2.623E-07	5.783E-11	1.000E+00	2.400E-04	0.02
168	PRAMOD9	51	1.410E-02	4.007E-09	2.409E-07	2.449E-07	5.650E-11	1.000E+00	2.345E-04	0.02
169	IDBBSDK1TM	64	3.000E-04	1.803E-07	2.409E-07	4.212E-07	5.410E-11	1.000E+00	2.246E-04	0.02
170	SWN-MAN03	55	4.000E-02	1.333E-09	2.409E-07	2.422E-07	5.333E-11	1.000E+00	2.214E-04	0.02
171	ADX-MV-GO	75	7.480E-04	6.857E-08	2.409E-07	3.094E-07	5.129E-11	1.000E+00	2.129E-04	0.02
172	IEV-ISLOC	1	5.000E-11	1.000E+00	2.409E-07	1.000E+00	5.000E-11	1.000E+00	2.075E-04	0.02
173	EC2BS023TM	101	2.700E-03	1.795E-08	2.409E-07	2.588E-07	4.846E-11	1.000E+00	2.011E-04	0.02
174	IRWMOD09	67	1.460E-03	3.239E-08	2.409E-07	2.733E-07	4.728E-11	1.000E+00	1.963E-04	0.02
175	IRWMOD11	67	1.460E-03	3.239E-08	2.409E-07	2.733E-07	4.728E-11	1.000E+00	1.963E-04	0.02
176	VWBMOD06	33	5.180E-03	8.939E-09	2.409E-07	2.498E-07	4.630E-11	1.000E+00	1.922E-04	0.02
177	VWN-MAN01	33	5.160E-03	8.947E-09	2.409E-07	2.498E-07	4.617E-11	1.000E+00	1.916E-04	0.02
178	CVMOD01	75	2.210E-04	2.013E-07	2.409E-07	4.421E-07	4.448E-11	1.000E+00	1.846E-04	0.02
179	CCX-PLSMOD6	84	2.530E-04	1.636E-07	2.409E-07	4.045E-07	4.140E-11	1.000E+00	1.718E-04	0.02
180	SWAMOD09T	82	2.520E-04	1.624E-07	2.409E-07	4.032E-07	4.091E-11	1.000E+00	1.698E-04	0.02
181	PCNHR001ML	194	2.400E-06	1.677E-05	2.409E-07	1.701E-05	4.024E-11	1.000E+00	1.670E-04	0.02
182	IWNTK001AF	194	2.400E-06	1.677E-05	2.409E-07	1.701E-05	4.024E-11	1.000E+00	1.670E-04	0.02
183	CCX-IV-XR	160	2.400E-05	1.666E-06	2.409E-07	1.907E-06	3.999E-11	1.000E+00	1.660E-04	0.02
184	RNNCV056GO	61	2.190E-04	1.788E-07	2.409E-07	4.197E-07	3.916E-11	1.000E+00	1.625E-04	0.02
185	CCX-PMXMOD4-SW	54	1.100E-05	3.462E-06	2.409E-07	3.703E-06	3.808E-11	1.000E+00	1.581E-04	0.02
186	CDNTF01BRI	82	5.230E-03	7.195E-09	2.409E-07	2.481E-07	3.763E-11	1.000E+00	1.562E-04	0.02
187	CCX-PMDMOD1	119	1.410E-04	2.666E-07	2.409E-07	5.075E-07	3.759E-11	1.000E+00	1.560E-04	0.02
188	RCX-RB-FA	95	8.100E-06	4.578E-06	2.409E-07	4.819E-06	3.708E-11	1.000E+00	1.539E-04	0.02
189	OTH-PO	63	1.200E-04	3.078E-07	2.409E-07	5.487E-07	3.694E-11	1.000E+00	1.533E-04	0.02
190	IEV-LRCS	143	1.800E-02	1.957E-09	2.409E-07	2.428E-07	3.522E-11	1.000E+00	1.462E-04	0.01
191	CCX-PMAMOD1	124	1.410E-04	2.388E-07	2.409E-07	4.797E-07	3.367E-11	1.000E+00	1.397E-04	0.01
192	CMB-PLUG	11	7.270E-04	4.508E-08	2.409E-07	2.860E-07	3.277E-11	1.000E+00	1.360E-04	0.01
193	RPTMOD01	107	8.760E-04	3.585E-08	2.409E-07	2.767E-07	3.141E-11	1.000E+00	1.304E-04	0.01
194	RPTMOD03	107	8.760E-04	3.585E-08	2.409E-07	2.767E-07	3.141E-11	1.000E+00	1.304E-04	0.01
195	RPTMOD05	107	8.760E-04	3.585E-08	2.409E-07	2.767E-07	3.141E-11	1.000E+00	1.304E-04	0.01
196	RPTMOD07	107	8.760E-04	3.585E-08	2.409E-07	2.767E-07	3.141E-11	1.000E+00	1.304E-04	0.01
197	OTH-PRESU	15	2.000E-03	1.561E-08	2.409E-07	2.565E-07	3.121E-11	1.000E+00	1.295E-04	0.01
198	ATW-MAN01C	9	5.170E-01	5.922E-11	2.409E-07	2.409E-07	3.062E-11	1.000E+00	1.271E-04	0.01
199	RNBEP011SA	50	1.710E-04	1.758E-07	2.409E-07	4.167E-07	3.007E-11	1.000E+00	1.248E-04	0.01
200	RNDEP023SA	50	1.710E-04	1.758E-07	2.409E-07	4.167E-07	3.007E-11	1.000E+00	1.248E-04	0.01
201	RNAEP022SA	50	1.710E-04	1.758E-07	2.409E-07	4.167E-07	3.007E-11	1.000E+00	1.248E-04	0.01
202	AD2MOD01	75	5.640E-02	5.307E-10	2.409E-07	2.414E-07	2.993E-11	1.000E+00	1.242E-04	0.01
203	AD2MOD02	75	5.640E-02	5.307E-10	2.409E-07	2.414E-07	2.993E-11	1.000E+00	1.242E-04	0.01
204	AD3MOD04	75	5.640E-02	5.307E-10	2.409E-07	2.414E-07	2.993E-11	1.000E+00	1.242E-04	0.01
205	AD3MOD03	75	5.640E-02	5.307E-10	2.409E-07	2.414E-07	2.993E-11	1.000E+00	1.242E-04	0.01

Table 50-24 (Sheet 6 of 15)

RISK IMPORTANCES SORTED BY RISK DECREASE

206	EC1BS131TM	62	2.700E-03	1.090E-08	2.409E-07	2.518E-07	2.942E-11	1.000E+00	1.221E-04	0.01
207	EC1BS112TM	62	2.700E-03	1.090E-08	2.409E-07	2.518E-07	2.942E-11	1.000E+00	1.221E-04	0.01
208	PRAAV108LA	208	1.090E-03	2.668E-08	2.409E-07	2.676E-07	2.908E-11	1.000E+00	1.207E-04	0.01
209	PRAAV130LA	208	1.090E-03	2.668E-08	2.409E-07	2.676E-07	2.908E-11	1.000E+00	1.207E-04	0.01
210	PRBAV130LA	208	1.090E-03	2.643E-08	2.409E-07	2.673E-07	2.881E-11	1.000E+00	1.196E-04	0.01
211	PRBAV108LA	208	1.090E-03	2.643E-08	2.409E-07	2.673E-07	2.881E-11	1.000E+00	1.196E-04	0.01
212	PMAMOD31	46	5.020E-03	5.707E-09	2.409E-07	2.466E-07	2.865E-11	1.000E+00	1.189E-04	0.01
213	PMBMOD32	46	5.020E-03	5.707E-09	2.409E-07	2.466E-07	2.865E-11	1.000E+00	1.189E-04	0.01
214	ZOX-PD-ES	93	2.000E-03	1.404E-08	2.409E-07	2.549E-07	2.809E-11	1.000E+00	1.166E-04	0.01
215	IWARS118BFA	43	8.760E-04	3.185E-08	2.409E-07	2.727E-07	2.790E-11	1.000E+00	1.158E-04	0.01
216	IWBRS118AFA	43	8.760E-04	3.185E-08	2.409E-07	2.727E-07	2.790E-11	1.000E+00	1.158E-04	0.01
217	EC2BS021TM	89	2.700E-03	1.033E-08	2.409E-07	2.512E-07	2.789E-11	1.000E+00	1.158E-04	0.01
218	FWMOD03A	184	1.700E-02	1.626E-09	2.409E-07	2.425E-07	2.764E-11	1.000E+00	1.147E-04	0.01
219	EC1MOD12	142	4.800E-05	5.589E-07	2.409E-07	7.998E-07	2.683E-11	1.000E+00	1.114E-04	0.01
220	CCX-PL3MOD1	59	1.410E-04	1.888E-07	2.409E-07	4.297E-07	2.662E-11	1.000E+00	1.105E-04	0.01
221	CCX-VS-FA	17	3.840E-05	6.787E-07	2.409E-07	9.196E-07	2.606E-11	1.000E+00	1.082E-04	0.01
222	IDBFD013RQ	83	1.200E-05	2.140E-06	2.409E-07	2.381E-06	2.568E-11	1.000E+00	1.066E-04	0.01
223	CCX-PMD030	107	9.690E-05	2.639E-07	2.409E-07	5.048E-07	2.557E-11	1.000E+00	1.061E-04	0.01
224	PMDMOD34	27	5.020E-03	5.057E-09	2.409E-07	2.460E-07	2.539E-11	1.000E+00	1.054E-04	0.01
225	PMCMOD33	27	5.020E-03	5.057E-09	2.409E-07	2.460E-07	2.539E-11	1.000E+00	1.054E-04	0.01
226	ZO2MOD01	112	2.020E-02	1.236E-09	2.409E-07	2.421E-07	2.496E-11	1.000E+00	1.036E-04	0.01
227	RPTMOD08	77	8.760E-04	2.839E-08	2.409E-07	2.693E-07	2.487E-11	1.000E+00	1.032E-04	0.01
228	RPTMOD06	77	8.760E-04	2.839E-08	2.409E-07	2.693E-07	2.487E-11	1.000E+00	1.032E-04	0.01
229	RPTMOD04	77	8.760E-04	2.839E-08	2.409E-07	2.693E-07	2.487E-11	1.000E+00	1.032E-04	0.01
230	RPTMOD02	77	8.760E-04	2.839E-08	2.409E-07	2.693E-07	2.487E-11	1.000E+00	1.032E-04	0.01
231	CCX-PL4MOD1	49	1.410E-04	1.757E-07	2.409E-07	4.166E-07	2.477E-11	1.000E+00	1.028E-04	0.01
232	EC2BS212TM	31	2.700E-03	8.884E-09	2.409E-07	2.498E-07	2.399E-11	1.000E+00	9.956E-05	0.01
233	EC2BS231TM	31	2.700E-03	8.884E-09	2.409E-07	2.498E-07	2.399E-11	1.000E+00	9.956E-05	0.01
234	FWMOD03B	154	1.700E-02	1.407E-09	2.409E-07	2.423E-07	2.392E-11	1.000E+00	9.927E-05	0.01
235	WLIAV004LA	52	8.760E-03	2.682E-09	2.409E-07	2.436E-07	2.349E-11	1.000E+00	9.750E-05	0.01
236	WLIAV055LA	52	8.760E-03	2.682E-09	2.409E-07	2.436E-07	2.349E-11	1.000E+00	9.750E-05	0.01
237	WLOAV006LA	52	8.760E-03	2.682E-09	2.409E-07	2.436E-07	2.349E-11	1.000E+00	9.750E-05	0.01
238	WLOAV057LA	52	8.760E-03	2.682E-09	2.409E-07	2.436E-07	2.349E-11	1.000E+00	9.750E-05	0.01
239	IDDFD019RQ	52	1.200E-05	1.955E-06	2.409E-07	2.196E-06	2.346E-11	1.000E+00	9.739E-05	0.01
240	CCX-PMA030	105	9.690E-05	2.354E-07	2.409E-07	4.763E-07	2.281E-11	1.000E+00	9.467E-05	0.01
241	FWMOD013A	155	1.410E-02	1.590E-09	2.409E-07	2.425E-07	2.242E-11	1.000E+00	9.307E-05	0.01
242	CCX-PL9MOD1	61	1.410E-04	1.557E-07	2.409E-07	3.966E-07	2.196E-11	1.000E+00	9.115E-05	0.01
243	PMAMOD21	98	4.070E-03	5.373E-09	2.409E-07	2.463E-07	2.187E-11	1.000E+00	9.077E-05	0.01
244	PMBMOD21	98	4.070E-03	5.373E-09	2.409E-07	2.463E-07	2.187E-11	1.000E+00	9.077E-05	0.01
245	PMCMOD21	98	4.070E-03	5.373E-09	2.409E-07	2.463E-07	2.187E-11	1.000E+00	9.077E-05	0.01
246	PMDMOD21	98	4.070E-03	5.373E-09	2.409E-07	2.463E-07	2.187E-11	1.000E+00	9.077E-05	0.01
247	FWX-MV2-GO	62	5.500E-04	3.900E-08	2.409E-07	2.799E-07	2.145E-11	1.000E+00	8.903E-05	0.01

Table 50-24 (Sheet 7 of 15)

RISK IMPORTANCES SORTED BY RISK DECREASE

248	CASMOD02	101	2.310E-02	9.210E-10	2.409E-07	2.418E-07	2.128E-11	1.000E+00	8.831E-05	0.01
249	FWX-PM2-FS	62	5.400E-04	3.900E-08	2.409E-07	2.799E-07	2.106E-11	1.000E+00	8.741E-05	0.01
250	FWMOD013B	135	1.410E-02	1.384E-09	2.409E-07	2.423E-07	1.952E-11	1.000E+00	8.101E-05	0.01
251	OTH-BL	23	1.900E-01	9.931E-11	2.409E-07	2.410E-07	1.887E-11	1.000E+00	7.832E-05	0.01
252	CAX-CM-ER	58	1.200E-04	1.556E-07	2.409E-07	3.965E-07	1.867E-11	1.000E+00	7.749E-05	0.01
253	ED4MOD11	194	3.170E-04	5.482E-08	2.409E-07	2.957E-07	1.738E-11	1.000E+00	7.214E-05	0.01
254	CCX-PL303	41	9.690E-05	1.757E-07	2.409E-07	4.166E-07	1.702E-11	1.000E+00	7.066E-05	0.01
255	CCX-PL403	47	9.690E-05	1.745E-07	2.409E-07	4.154E-07	1.691E-11	1.000E+00	7.019E-05	0.01
256	PMDMOD11	186	2.090E-03	7.809E-09	2.409E-07	2.487E-07	1.632E-11	1.000E+00	6.775E-05	0.01
257	ED4BSDS1TM	190	3.000E-04	5.431E-08	2.409E-07	2.952E-07	1.629E-11	1.000E+00	6.762E-05	0.01
258	ED4MOD112	172	3.170E-04	5.050E-08	2.409E-07	2.914E-07	1.601E-11	1.000E+00	6.644E-05	0.01
259	CCX-PLMOD3	54	1.030E-04	1.552E-07	2.409E-07	3.961E-07	1.598E-11	1.000E+00	6.634E-05	0.01
260	PMAMOD11	190	2.090E-03	7.405E-09	2.409E-07	2.483E-07	1.548E-11	1.000E+00	6.424E-05	0.01
261	ATW-MAN04	26	5.200E-02	2.974E-10	2.409E-07	2.412E-07	1.547E-11	1.000E+00	6.419E-05	0.01
262	EC1CB100VO	133	4.200E-03	3.638E-09	2.409E-07	2.445E-07	1.528E-11	1.000E+00	6.342E-05	0.01
263	CCX-PL903	53	9.690E-05	1.551E-07	2.409E-07	3.960E-07	1.502E-11	1.000E+00	6.236E-05	0.01
264	CCX-PMBMOD1	75	1.410E-04	9.720E-08	2.409E-07	3.381E-07	1.371E-11	1.000E+00	5.689E-05	0.01
265	ACATK001AF	8	2.400E-06	5.505E-06	2.409E-07	5.746E-06	1.321E-11	1.000E+00	5.484E-05	0.01
266	IDAFD003RQ	45	1.200E-05	1.080E-06	2.409E-07	1.321E-06	1.296E-11	1.000E+00	5.381E-05	0.01
267	EC1BS111TM	163	2.700E-03	4.704E-09	2.409E-07	2.456E-07	1.270E-11	1.000E+00	5.272E-05	0.01
268	PMBMOD11	112	2.090E-03	6.037E-09	2.409E-07	2.469E-07	1.262E-11	1.000E+00	5.237E-05	0.01
269	ACBTK001AF	4	2.400E-06	5.228E-06	2.409E-07	5.469E-06	1.255E-11	1.000E+00	5.208E-05	0.01
270	CCX-PMDMOD2	51	3.040E-04	4.041E-08	2.409E-07	2.813E-07	1.229E-11	1.000E+00	5.099E-05	0.01
271	MSX-AV2-FA	44	2.310E-03	5.315E-09	2.409E-07	2.462E-07	1.228E-11	1.000E+00	5.096E-05	0.01
272	CCX-PMCMOD2	51	3.040E-04	4.041E-08	2.409E-07	2.813E-07	1.229E-11	1.000E+00	5.099E-05	0.01
273	CCX-PMBMOD2	51	3.040E-04	4.041E-08	2.409E-07	2.813E-07	1.229E-11	1.000E+00	5.099E-05	0.01
274	CCX-PMAMOD2	51	3.040E-04	4.041E-08	2.409E-07	2.813E-07	1.229E-11	1.000E+00	5.099E-05	0.01
275	CCX-EP-SA	46	8.620E-06	1.410E-06	2.409E-07	1.651E-06	1.215E-11	1.000E+00	5.045E-05	0.01
276	PMCMOD11	97	2.090E-03	5.729E-09	2.409E-07	2.466E-07	1.197E-11	1.000E+00	4.970E-05	0.00
277	ED3MOD01	102	5.040E-04	2.339E-08	2.409E-07	2.643E-07	1.179E-11	1.000E+00	4.893E-05	0.00
278	PRBAV130TM	109	5.000E-04	2.339E-08	2.409E-07	2.643E-07	1.169E-11	1.000E+00	4.853E-05	0.00
279	PRBAV108TM	109	5.000E-04	2.339E-08	2.409E-07	2.643E-07	1.169E-11	1.000E+00	4.853E-05	0.00
280	PRAAV130TM	109	5.000E-04	2.339E-08	2.409E-07	2.643E-07	1.169E-11	1.000E+00	4.853E-05	0.00
281	PRAAV108TM	109	5.000E-04	2.339E-08	2.409E-07	2.643E-07	1.169E-11	1.000E+00	4.853E-05	0.00
282	ED3MOD04	73	2.190E-02	5.306E-10	2.409E-07	2.414E-07	1.162E-11	1.000E+00	4.824E-05	0.00
283	CONDVACUUM	35	1.000E-03	1.132E-08	2.409E-07	2.522E-07	1.132E-11	1.000E+00	4.698E-05	0.00
284	IDCFD007RQ	35	1.200E-05	9.257E-07	2.409E-07	1.167E-06	1.111E-11	1.000E+00	4.611E-05	0.00
285	PL3MOD11	20	2.090E-03	5.297E-09	2.409E-07	2.462E-07	1.107E-11	1.000E+00	4.595E-05	0.00
286	CCBMOD01	48	4.800E-02	2.259E-10	2.409E-07	2.411E-07	1.084E-11	1.000E+00	4.500E-05	0.00
287	CCX-PL2MOD5	41	6.980E-05	1.527E-07	2.409E-07	3.936E-07	1.066E-11	1.000E+00	4.425E-05	0.00
288	CASMOD01	63	2.410E-03	4.384E-09	2.409E-07	2.453E-07	1.057E-11	1.000E+00	4.386E-05	0.00
289	CCX-PL3MOD5	40	6.980E-05	1.511E-07	2.409E-07	3.920E-07	1.055E-11	1.000E+00	4.378E-05	0.00

Table 50-24 (Sheet 8 of 15)

RISK IMPORTANCES SORTED BY RISK DECREASE

290	IDBBSDS1LF	46	4.800E-06	2.063E-06	2.409E-07	2.304E-06	9.902E-12	1.000E+00	4.110E-05	0.00
291	IDBBSDD1LF	46	4.800E-06	2.063E-06	2.409E-07	2.304E-06	9.902E-12	1.000E+00	4.110E-05	0.00
292	SGBAV074LA	79	8.760E-03	1.089E-09	2.409E-07	2.420E-07	9.542E-12	1.000E+00	3.961E-05	0.00
293	SGBAV075LA	79	8.760E-03	1.089E-09	2.409E-07	2.420E-07	9.542E-12	1.000E+00	3.961E-05	0.00
294	IWB-PLUG	67	2.400E-04	3.961E-08	2.409E-07	2.805E-07	9.506E-12	1.000E+00	3.946E-05	0.00
295	CCX-PMDMOD4	29	4.980E-05	1.895E-07	2.409E-07	4.304E-07	9.435E-12	1.000E+00	3.916E-05	0.00
296	CCX-PMB030	63	9.690E-05	9.547E-08	2.409E-07	3.364E-07	9.251E-12	1.000E+00	3.840E-05	0.00
297	ED3MOD03	104	2.700E-03	3.426E-09	2.409E-07	2.443E-07	9.249E-12	1.000E+00	3.839E-05	0.00
298	IEV-SLB-D	18	5.960E-04	1.535E-08	2.409E-07	2.563E-07	9.150E-12	1.000E+00	3.798E-05	0.00
299	IDDBSDS1LF	31	4.800E-06	1.900E-06	2.409E-07	2.141E-06	9.119E-12	1.000E+00	3.785E-05	0.00
300	IDDBSDD1LF	31	4.800E-06	1.900E-06	2.409E-07	2.141E-06	9.119E-12	1.000E+00	3.785E-05	0.00
301	ED2MOD03	71	2.700E-03	3.370E-09	2.409E-07	2.443E-07	9.100E-12	1.000E+00	3.777E-05	0.00
302	ECX-CB-GC	48	7.300E-04	1.227E-08	2.409E-07	2.532E-07	8.957E-12	1.000E+00	3.718E-05	0.00
303	RNX-CV-GO	25	5.100E-05	1.699E-07	2.409E-07	4.108E-07	8.664E-12	1.000E+00	3.596E-05	0.00
304	CCX-PLMMOD4	31	4.980E-05	1.736E-07	2.409E-07	4.145E-07	8.645E-12	1.000E+00	3.588E-05	0.00
305	PL2MOD11	12	2.090E-03	4.127E-09	2.409E-07	2.450E-07	8.625E-12	1.000E+00	3.580E-05	0.00
306	CCX-PMAMOD4	29	4.980E-05	1.716E-07	2.409E-07	4.125E-07	8.544E-12	1.000E+00	3.546E-05	0.00
307	REBCV119GO	79	1.750E-03	4.693E-09	2.409E-07	2.456E-07	8.213E-12	1.000E+00	3.409E-05	0.00
308	REACV119GO	79	1.750E-03	4.693E-09	2.409E-07	2.456E-07	8.213E-12	1.000E+00	3.409E-05	0.00
309	SWB-001TM	34	3.800E-02	2.149E-10	2.409E-07	2.411E-07	8.168E-12	1.000E+00	3.390E-05	0.00
310	PMD0301ASA	113	1.160E-03	6.897E-09	2.409E-07	2.478E-07	8.001E-12	1.000E+00	3.321E-05	0.00
311	PMD0301BSA	103	1.160E-03	6.712E-09	2.409E-07	2.476E-07	7.786E-12	1.000E+00	3.232E-05	0.00
312	PMA0301ASA	110	1.160E-03	6.475E-09	2.409E-07	2.474E-07	7.511E-12	1.000E+00	3.117E-05	0.00
313	ALL-IND-FAIL	63	1.000E-06	7.487E-06	2.409E-07	7.728E-06	7.487E-12	1.000E+00	3.108E-05	0.00
314	CMX-TK-AF	5	1.200E-07	6.115E-05	2.409E-07	6.140E-05	7.339E-12	1.000E+00	3.046E-05	0.00
315	PMA0301BSA	100	1.160E-03	6.289E-09	2.409E-07	2.472E-07	7.296E-12	1.000E+00	3.028E-05	0.00
316	CVMOD02	13	1.410E-03	5.121E-09	2.409E-07	2.460E-07	7.220E-12	1.000E+00	2.997E-05	0.00
317	PRAMOD10	19	2.110E-03	3.423E-09	2.409E-07	2.443E-07	7.223E-12	1.000E+00	2.998E-05	0.00
318	PRBMOD10	19	2.110E-03	3.423E-09	2.409E-07	2.443E-07	7.223E-12	1.000E+00	2.998E-05	0.00
319	ACX-TK-AF	3	1.200E-07	5.918E-05	2.409E-07	5.942E-05	7.102E-12	1.000E+00	2.948E-05	0.00
320	IRWMOD12	71	1.460E-03	4.649E-09	2.409E-07	2.456E-07	6.788E-12	1.000E+00	2.818E-05	0.00
321	IRWMOD10	71	1.460E-03	4.649E-09	2.409E-07	2.456E-07	6.788E-12	1.000E+00	2.818E-05	0.00
322	CCX-PMCMOD1	53	1.410E-04	4.766E-08	2.409E-07	2.886E-07	6.720E-12	1.000E+00	2.789E-05	0.00
323	DUMP-MAN01	31	1.320E-03	4.945E-09	2.409E-07	2.459E-07	6.528E-12	1.000E+00	2.709E-05	0.00
324	SWAMOD03	44	6.340E-04	9.692E-09	2.409E-07	2.506E-07	6.145E-12	1.000E+00	2.550E-05	0.00
325	PMB0301ASA	60	1.160E-03	5.177E-09	2.409E-07	2.461E-07	6.005E-12	1.000E+00	2.492E-05	0.00
326	PMC0301ASA	60	1.160E-03	5.177E-09	2.409E-07	2.461E-07	6.005E-12	1.000E+00	2.492E-05	0.00
327	PMC0301BSA	58	1.160E-03	5.149E-09	2.409E-07	2.461E-07	5.973E-12	1.000E+00	2.479E-05	0.00
328	PMB0301BSA	58	1.160E-03	5.149E-09	2.409E-07	2.461E-07	5.973E-12	1.000E+00	2.479E-05	0.00
329	SG2TF50ARI	18	5.230E-03	1.120E-09	2.409E-07	2.420E-07	5.855E-12	1.000E+00	2.430E-05	0.00
330	CMAAV014LA	17	1.590E-03	3.653E-09	2.409E-07	2.446E-07	5.809E-12	1.000E+00	2.411E-05	0.00
331	CMAAV015LA	17	1.590E-03	3.653E-09	2.409E-07	2.446E-07	5.809E-12	1.000E+00	2.411E-05	0.00

Table 50-24 (Sheet 9 of 15)

RISK IMPORTANCES SORTED BY RISK DECREASE

332	PL30301ASA	12	1.160E-03	4.756E-09	2.409E-07	2.457E-07	5.517E-12	1.000E+00	2.290E-05	0.00
333	CMATK002AF	17	2.400E-06	2.297E-06	2.409E-07	2.538E-06	5.513E-12	1.000E+00	2.288E-05	0.00
334	PL30301BSA	11	1.160E-03	4.670E-09	2.409E-07	2.456E-07	5.417E-12	1.000E+00	2.248E-05	0.00
335	VFSFRAC	16	1.200E-01	4.476E-11	2.409E-07	2.410E-07	5.371E-12	1.000E+00	2.229E-05	0.00
336	ED3BSDS1TM	65	3.000E-04	1.742E-08	2.409E-07	2.583E-07	5.226E-12	1.000E+00	2.169E-05	0.00
337	SWBMOD02	31	2.440E-02	2.109E-10	2.409E-07	2.411E-07	5.145E-12	1.000E+00	2.136E-05	0.00
338	IDABSDD1LF	31	4.800E-06	1.052E-06	2.409E-07	1.293E-06	5.049E-12	1.000E+00	2.096E-05	0.00
339	IDABSDS1LF	31	4.800E-06	1.052E-06	2.409E-07	1.293E-06	5.049E-12	1.000E+00	2.096E-05	0.00
340	ED1MOD01	35	5.040E-04	1.000E-08	2.409E-07	2.509E-07	5.041E-12	1.000E+00	2.092E-05	0.00
341	ED2MOD11	48	3.170E-04	1.576E-08	2.409E-07	2.567E-07	4.997E-12	1.000E+00	2.074E-05	0.00
342	ZOX-DG-DR	36	4.400E-04	1.115E-08	2.409E-07	2.521E-07	4.908E-12	1.000E+00	2.037E-05	0.00
343	ED2BSDS1TM	52	3.000E-04	1.633E-08	2.409E-07	2.572E-07	4.898E-12	1.000E+00	2.033E-05	0.00
344	IRCEP118ASA	9	1.710E-04	2.852E-08	2.409E-07	2.694E-07	4.877E-12	1.000E+00	2.024E-05	0.00
345	IRDEP118BSA	9	1.710E-04	2.852E-08	2.409E-07	2.694E-07	4.877E-12	1.000E+00	2.024E-05	0.00
346	CVX-PM-ER	7	3.700E-05	1.284E-07	2.409E-07	3.693E-07	4.749E-12	1.000E+00	1.971E-05	0.00
347	VWAMOD02	14	6.120E-04	7.732E-09	2.409E-07	2.486E-07	4.732E-12	1.000E+00	1.964E-05	0.00
348	ECX-CB-GO	34	4.200E-04	1.112E-08	2.409E-07	2.520E-07	4.669E-12	1.000E+00	1.938E-05	0.00
349	CCX-PLBMOD1	23	1.410E-04	3.295E-08	2.409E-07	2.739E-07	4.646E-12	1.000E+00	1.929E-05	0.00
350	PLMMOD41	33	6.350E-04	7.247E-09	2.409E-07	2.482E-07	4.602E-12	1.000E+00	1.910E-05	0.00
351	CMA-CV	16	2.000E-06	2.293E-06	2.409E-07	2.534E-06	4.585E-12	1.000E+00	1.903E-05	0.00
352	CCX-PMC030	43	9.690E-05	4.605E-08	2.409E-07	2.870E-07	4.462E-12	1.000E+00	1.852E-05	0.00
353	PL20301BSA	8	1.160E-03	3.822E-09	2.409E-07	2.447E-07	4.433E-12	1.000E+00	1.840E-05	0.00
354	PL20301ASA	8	1.160E-03	3.822E-09	2.409E-07	2.447E-07	4.433E-12	1.000E+00	1.840E-05	0.00
355	CCAMOD03	26	6.140E-04	7.159E-09	2.409E-07	2.481E-07	4.396E-12	1.000E+00	1.825E-05	0.00
356	CVN-MAN03	11	1.070E-03	4.064E-09	2.409E-07	2.450E-07	4.349E-12	1.000E+00	1.805E-05	0.00
357	IDCBSDS1LF	16	4.800E-06	8.887E-07	2.409E-07	1.130E-06	4.266E-12	1.000E+00	1.771E-05	0.00
358	IDCBSDD1LF	16	4.800E-06	8.887E-07	2.409E-07	1.130E-06	4.266E-12	1.000E+00	1.771E-05	0.00
359	IRBEP123ASA	16	1.710E-04	2.333E-08	2.409E-07	2.642E-07	3.989E-12	1.000E+00	1.656E-05	0.00
360	IRBEP123BSA	16	1.710E-04	2.333E-08	2.409E-07	2.642E-07	3.989E-12	1.000E+00	1.656E-05	0.00
361	ACAOR001EB	7	7.200E-07	5.492E-06	2.409E-07	5.733E-06	3.954E-12	1.000E+00	1.641E-05	0.00
362	ACBOR001EB	4	7.200E-07	5.228E-06	2.409E-07	5.469E-06	3.764E-12	1.000E+00	1.562E-05	0.00
363	IWDRS120AFA	44	8.760E-04	4.127E-09	2.409E-07	2.450E-07	3.616E-12	1.000E+00	1.501E-05	0.00
364	IWCRS120BFA	44	8.760E-04	4.127E-09	2.409E-07	2.450E-07	3.616E-12	1.000E+00	1.501E-05	0.00
365	IWX-EV4-SA	59	5.800E-05	5.999E-08	2.409E-07	3.009E-07	3.479E-12	1.000E+00	1.444E-05	0.00
366	IDDMOD32	67	3.170E-04	1.081E-08	2.409E-07	2.517E-07	3.428E-12	1.000E+00	1.423E-05	0.00
367	CCX-PM-ER	14	1.400E-05	2.430E-07	2.409E-07	4.839E-07	3.402E-12	1.000E+00	1.412E-05	0.00
368	PL4MOD11	71	2.090E-03	1.604E-09	2.409E-07	2.425E-07	3.353E-12	1.000E+00	1.392E-05	0.00
369	ZO1MOD04	47	1.250E-03	2.652E-09	2.409E-07	2.436E-07	3.315E-12	1.000E+00	1.376E-05	0.00
370	EC2MOD22	18	4.800E-05	6.821E-08	2.409E-07	3.091E-07	3.274E-12	1.000E+00	1.359E-05	0.00
371	MSMODV001	14	2.710E-02	1.201E-10	2.409E-07	2.410E-07	3.255E-12	1.000E+00	1.351E-05	0.00
372	MSMODV003	14	2.710E-02	1.201E-10	2.409E-07	2.410E-07	3.255E-12	1.000E+00	1.351E-05	0.00
373	IDAMOD04	53	3.170E-04	1.014E-08	2.409E-07	2.511E-07	3.215E-12	1.000E+00	1.335E-05	0.00

Table 50-24 (Sheet 10 of 15)

RISK IMPORTANCES SORTED BY RISK DECREASE

374	CCX-PLB03	19	9.690E-05	3.260E-08	2.409E-07	2.735E-07	3.159E-12	1.000E+00	1.311E-05	0.00
375	EC2CB200VO	21	4.200E-03	7.334E-10	2.409E-07	2.417E-07	3.080E-12	1.000E+00	1.279E-05	0.00
376	IDDMOD33	63	5.160E-04	5.936E-09	2.409E-07	2.469E-07	3.063E-12	1.000E+00	1.271E-05	0.00
377	IDBMOD24	42	3.170E-04	9.625E-09	2.409E-07	2.505E-07	3.051E-12	1.000E+00	1.266E-05	0.00
378	IDCMOD28	42	3.170E-04	9.625E-09	2.409E-07	2.505E-07	3.051E-12	1.000E+00	1.266E-05	0.00
379	EC2BS222TM	29	2.700E-03	1.121E-09	2.409E-07	2.420E-07	3.026E-12	1.000E+00	1.256E-05	0.00
380	EC1MOD122	19	1.680E-05	1.681E-07	2.409E-07	4.090E-07	2.824E-12	1.000E+00	1.172E-05	0.00
381	ED1MOD13	31	3.170E-04	8.917E-09	2.409E-07	2.498E-07	2.827E-12	1.000E+00	1.173E-05	0.00
382	PL9MOD11	46	2.090E-03	1.318E-09	2.409E-07	2.422E-07	2.754E-12	1.000E+00	1.143E-05	0.00
383	ED1MOD07	31	3.050E-04	8.922E-09	2.409E-07	2.498E-07	2.721E-12	1.000E+00	1.130E-05	0.00
384	IDAMOD05	47	5.160E-04	5.203E-09	2.409E-07	2.461E-07	2.685E-12	1.000E+00	1.114E-05	0.00
385	RNX-PM-ER	19	1.600E-05	1.681E-07	2.409E-07	4.090E-07	2.689E-12	1.000E+00	1.116E-05	0.00
386	VFOAV009	8	8.760E-03	3.066E-10	2.409E-07	2.412E-07	2.686E-12	1.000E+00	1.115E-05	0.00
387	VFOAV003	8	8.760E-03	3.066E-10	2.409E-07	2.412E-07	2.686E-12	1.000E+00	1.115E-05	0.00
388	VFIAV010	8	8.760E-03	3.066E-10	2.409E-07	2.412E-07	2.686E-12	1.000E+00	1.115E-05	0.00
389	VFIAV004	8	8.760E-03	3.066E-10	2.409E-07	2.412E-07	2.686E-12	1.000E+00	1.115E-05	0.00
390	PL9MOD12	32	2.090E-03	1.220E-09	2.409E-07	2.421E-07	2.550E-12	1.000E+00	1.058E-05	0.00
391	FSMOD255A	14	5.800E-04	4.424E-09	2.409E-07	2.453E-07	2.566E-12	1.000E+00	1.065E-05	0.00
392	IDCMOD29	39	5.160E-04	4.837E-09	2.409E-07	2.458E-07	2.496E-12	1.000E+00	1.036E-05	0.00
393	IDBMOD25	39	5.160E-04	4.837E-09	2.409E-07	2.458E-07	2.496E-12	1.000E+00	1.036E-05	0.00
394	PLSMOD61	26	3.460E-03	7.103E-10	2.409E-07	2.416E-07	2.458E-12	1.000E+00	1.020E-05	0.00
395	PLSMOD62	20	3.460E-03	6.649E-10	2.409E-07	2.416E-07	2.300E-12	1.000E+00	9.548E-06	0.00
396	ZANMOD01	54	8.400E-05	2.733E-08	2.409E-07	2.682E-07	2.296E-12	1.000E+00	9.528E-06	0.00
397	AD4MOD10D	42	8.760E-04	2.405E-09	2.409E-07	2.433E-07	2.106E-12	1.000E+00	8.743E-06	0.00
398	AD4MOD09C	42	8.760E-04	2.405E-09	2.409E-07	2.433E-07	2.106E-12	1.000E+00	8.743E-06	0.00
399	AD4MOD07C	42	8.760E-04	2.405E-09	2.409E-07	2.433E-07	2.106E-12	1.000E+00	8.743E-06	0.00
400	AD4MOD08D	42	8.760E-04	2.405E-09	2.409E-07	2.433E-07	2.106E-12	1.000E+00	8.743E-06	0.00
401	PMAMOD12	56	2.090E-03	9.911E-10	2.409E-07	2.419E-07	2.071E-12	1.000E+00	8.598E-06	0.00
402	CCX-BC-SA	7	8.400E-06	2.451E-07	2.409E-07	4.860E-07	2.059E-12	1.000E+00	8.545E-06	0.00
403	ZOX-DG-DS	20	2.800E-04	7.319E-09	2.409E-07	2.482E-07	2.049E-12	1.000E+00	8.507E-06	0.00
404	IDAFD004RQ	19	1.200E-05	1.681E-07	2.409E-07	4.090E-07	2.017E-12	1.000E+00	8.374E-06	0.00
405	PMDMOD12	53	2.090E-03	9.717E-10	2.409E-07	2.419E-07	2.031E-12	1.000E+00	8.430E-06	0.00
406	IDBFD014RQ	19	1.200E-05	1.681E-07	2.409E-07	4.090E-07	2.017E-12	1.000E+00	8.374E-06	0.00
407	SWX-PM-ER	12	1.400E-05	1.391E-07	2.409E-07	3.800E-07	1.947E-12	1.000E+00	8.083E-06	0.00
408	CCX-PLMMOD4-SW	20	1.100E-05	1.694E-07	2.409E-07	4.104E-07	1.864E-12	1.000E+00	7.736E-06	0.00
409	CCX-PL4MOD1-SW	19	1.100E-05	1.682E-07	2.409E-07	4.091E-07	1.850E-12	1.000E+00	7.680E-06	0.00
410	EC1BS001LF	33	4.800E-06	3.745E-07	2.409E-07	6.155E-07	1.798E-12	1.000E+00	7.462E-06	0.00
411	CCX-EAI	10	1.270E-05	1.357E-07	2.409E-07	3.767E-07	1.724E-12	1.000E+00	7.155E-06	0.00
412	CMAOR001EB	14	7.200E-07	2.280E-06	2.409E-07	2.521E-06	1.642E-12	1.000E+00	6.815E-06	0.00
413	SGBOR--DAS-SP	7	7.220E-03	2.203E-10	2.409E-07	2.411E-07	1.590E-12	1.000E+00	6.601E-06	0.00
414	SGAOR--DAS-SP	7	7.220E-03	2.203E-10	2.409E-07	2.411E-07	1.590E-12	1.000E+00	6.601E-06	0.00
415	PL40301ASA	43	1.160E-03	1.319E-09	2.409E-07	2.422E-07	1.530E-12	1.000E+00	6.350E-06	0.00

Table 50-24 (Sheet 11 of 15)

RISK IMPORTANCES SORTED BY RISK DECREASE

416	PL4MOD12	41	2.090E-03	7.288E-10	2.409E-07	2.416E-07	1.523E-12	1.000E+00	6.322E-06	0.00
417	CCX-PLSMOD6-SW	10	1.100E-05	1.359E-07	2.409E-07	3.768E-07	1.495E-12	1.000E+00	6.204E-06	0.00
418	CCX-PLMOD3-SW	10	1.100E-05	1.359E-07	2.409E-07	3.768E-07	1.495E-12	1.000E+00	6.204E-06	0.00
419	CCX-PL3MOD5-SW	10	1.100E-05	1.359E-07	2.409E-07	3.768E-07	1.495E-12	1.000E+00	6.204E-06	0.00
420	CCX-PL9MOD1-SW	10	1.100E-05	1.359E-07	2.409E-07	3.768E-07	1.495E-12	1.000E+00	6.204E-06	0.00
421	CCX-PL2MOD5-SW	10	1.100E-05	1.359E-07	2.409E-07	3.768E-07	1.495E-12	1.000E+00	6.204E-06	0.00
422	VWAMOD01	6	2.520E-04	5.758E-09	2.409E-07	2.467E-07	1.451E-12	1.000E+00	6.023E-06	0.00
423	VWAMOD03	6	2.520E-04	5.758E-09	2.409E-07	2.467E-07	1.451E-12	1.000E+00	6.023E-06	0.00
424	CASMOD03	10	2.310E-02	6.295E-11	2.409E-07	2.410E-07	1.454E-12	1.000E+00	6.036E-06	0.00
425	PL40301BSA	35	1.160E-03	1.161E-09	2.409E-07	2.421E-07	1.347E-12	1.000E+00	5.591E-06	0.00
426	PL90301ASA	32	1.160E-03	1.127E-09	2.409E-07	2.420E-07	1.307E-12	1.000E+00	5.427E-06	0.00
427	CCX-BL-ER	2	1.200E-05	1.041E-07	2.409E-07	3.450E-07	1.249E-12	1.000E+00	5.184E-06	0.00
428	VWX-RF-ER	2	1.200E-05	1.041E-07	2.409E-07	3.450E-07	1.249E-12	1.000E+00	5.184E-06	0.00
429	CIAEP014SA	8	1.710E-04	7.147E-09	2.409E-07	2.481E-07	1.222E-12	1.000E+00	5.073E-06	0.00
430	PL90301BSA	28	1.160E-03	1.002E-09	2.409E-07	2.419E-07	1.162E-12	1.000E+00	4.824E-06	0.00
431	HPM-MAN01	6	5.020E-04	2.298E-09	2.409E-07	2.432E-07	1.153E-12	1.000E+00	4.787E-06	0.00
432	PL90302ASA	16	1.160E-03	9.731E-10	2.409E-07	2.419E-07	1.129E-12	1.000E+00	4.685E-06	0.00
433	CCX-PL3MOD1-SW	2	1.100E-05	1.040E-07	2.409E-07	3.449E-07	1.144E-12	1.000E+00	4.748E-06	0.00
434	PRI-MAN01	2	4.960E-04	2.250E-09	2.409E-07	2.432E-07	1.116E-12	1.000E+00	4.632E-06	0.00
435	EC2MOD221	8	1.680E-05	6.514E-08	2.409E-07	3.061E-07	1.094E-12	1.000E+00	4.543E-06	0.00
436	EC1MOD121	8	1.680E-05	6.514E-08	2.409E-07	3.061E-07	1.094E-12	1.000E+00	4.543E-06	0.00
437	PMAMOD22	17	4.070E-03	2.693E-10	2.409E-07	2.412E-07	1.096E-12	1.000E+00	4.549E-06	0.00
438	PMBMOD22	17	4.070E-03	2.693E-10	2.409E-07	2.412E-07	1.096E-12	1.000E+00	4.549E-06	0.00
439	PMDMOD22	17	4.070E-03	2.693E-10	2.409E-07	2.412E-07	1.096E-12	1.000E+00	4.549E-06	0.00
440	PMCMOD22	17	4.070E-03	2.693E-10	2.409E-07	2.412E-07	1.096E-12	1.000E+00	4.549E-06	0.00
441	PL7MOD12	2	2.090E-03	5.029E-10	2.409E-07	2.414E-07	1.051E-12	1.000E+00	4.362E-06	0.00
442	EC2BS211TM	28	2.700E-03	3.860E-10	2.409E-07	2.413E-07	1.042E-12	1.000E+00	4.326E-06	0.00
443	SGBTL--DAS-UF	5	5.230E-03	2.038E-10	2.409E-07	2.411E-07	1.066E-12	1.000E+00	4.423E-06	0.00
444	SGATL--DAS-UF	5	5.230E-03	2.038E-10	2.409E-07	2.411E-07	1.066E-12	1.000E+00	4.423E-06	0.00
445	CABCM00BTM	20	1.500E-03	6.929E-10	2.409E-07	2.416E-07	1.039E-12	1.000E+00	4.314E-06	0.00
446	RNAEP01ASA	19	1.710E-04	5.848E-09	2.409E-07	2.468E-07	1.000E-12	1.000E+00	4.151E-06	0.00
447	PL90302BSA	12	1.160E-03	8.479E-10	2.409E-07	2.418E-07	9.836E-13	1.000E+00	4.083E-06	0.00
448	RNAEP01BSA	17	1.710E-04	5.699E-09	2.409E-07	2.466E-07	9.745E-13	1.000E+00	4.045E-06	0.00
449	PL3MOD51	24	8.740E-04	1.046E-09	2.409E-07	2.420E-07	9.138E-13	1.000E+00	3.793E-06	0.00
450	SWBMOD11P	6	1.410E-02	6.383E-11	2.409E-07	2.410E-07	9.000E-13	1.000E+00	3.736E-06	0.00
451	PMD0302ASA	28	1.160E-03	6.935E-10	2.409E-07	2.416E-07	8.045E-13	1.000E+00	3.339E-06	0.00
452	PMA0302ASA	28	1.160E-03	6.935E-10	2.409E-07	2.416E-07	8.045E-13	1.000E+00	3.339E-06	0.00
453	PL3MOD12	4	2.090E-03	3.895E-10	2.409E-07	2.413E-07	8.140E-13	1.000E+00	3.379E-06	0.00
454	IDABSDK1LF	15	4.800E-06	1.631E-07	2.409E-07	4.040E-07	7.828E-13	1.000E+00	3.249E-06	0.00
455	ED1BSDS1LF	15	4.800E-06	1.631E-07	2.409E-07	4.040E-07	7.828E-13	1.000E+00	3.249E-06	0.00
456	IDBBSDK1LF	15	4.800E-06	1.631E-07	2.409E-07	4.040E-07	7.828E-13	1.000E+00	3.249E-06	0.00
457	PMDMOD41	29	6.350E-04	1.183E-09	2.409E-07	2.421E-07	7.510E-13	1.000E+00	3.117E-06	0.00

Table 50-24 (Sheet 12 of 15)

RISK IMPORTANCES SORTED BY RISK DECREASE

458	AD1MOD06	11	5.640E-02	1.251E-11	2.409E-07	2.409E-07	7.057E-13	1.000E+00	2.929E-06	0.00
459	PLBMOD11	20	2.090E-03	3.319E-10	2.409E-07	2.413E-07	6.936E-13	1.000E+00	2.879E-06	0.00
460	MSX-AV4-FA	3	2.000E-04	3.430E-09	2.409E-07	2.443E-07	6.860E-13	1.000E+00	2.847E-06	0.00
461	CV3EPCPASA	4	1.710E-04	3.901E-09	2.409E-07	2.448E-07	6.670E-13	1.000E+00	2.769E-06	0.00
462	AD4MOD07A	16	8.760E-04	7.664E-10	2.409E-07	2.417E-07	6.714E-13	1.000E+00	2.787E-06	0.00
463	AD4MOD08B	16	8.760E-04	7.664E-10	2.409E-07	2.417E-07	6.714E-13	1.000E+00	2.787E-06	0.00
464	AD4MOD10B	16	8.760E-04	7.664E-10	2.409E-07	2.417E-07	6.714E-13	1.000E+00	2.787E-06	0.00
465	AD4MOD09A	16	8.760E-04	7.664E-10	2.409E-07	2.417E-07	6.714E-13	1.000E+00	2.787E-06	0.00
466	CCX-PL4EH0	14	4.030E-06	1.608E-07	2.409E-07	4.017E-07	6.480E-13	1.000E+00	2.690E-06	0.00
467	PMBMOD12	17	2.090E-03	3.157E-10	2.409E-07	2.412E-07	6.599E-13	1.000E+00	2.739E-06	0.00
468	CCX-PMAEH0	14	4.030E-06	1.608E-07	2.409E-07	4.017E-07	6.480E-13	1.000E+00	2.690E-06	0.00
469	CCX-PMDEH0	14	4.030E-06	1.608E-07	2.409E-07	4.017E-07	6.480E-13	1.000E+00	2.690E-06	0.00
470	ZOX-PD-ER	6	1.300E-04	4.850E-09	2.409E-07	2.458E-07	6.305E-13	1.000E+00	2.617E-06	0.00
471	PL2MOD51	16	8.740E-04	6.970E-10	2.409E-07	2.416E-07	6.092E-13	1.000E+00	2.529E-06	0.00
472	PMA0302BSA	18	1.160E-03	5.082E-10	2.409E-07	2.414E-07	5.895E-13	1.000E+00	2.447E-06	0.00
473	PMD0302BSA	18	1.160E-03	5.082E-10	2.409E-07	2.414E-07	5.895E-13	1.000E+00	2.447E-06	0.00
474	VW2EPTRBSA	4	1.710E-04	3.556E-09	2.409E-07	2.445E-07	6.080E-13	1.000E+00	2.524E-06	0.00
475	ATW-MAN01	6	3.300E-02	1.802E-11	2.409E-07	2.409E-07	5.947E-13	1.000E+00	2.468E-06	0.00
476	MSAEPSD5SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	5.860E-13	1.000E+00	2.432E-06	0.00
477	MSAEPSD6SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	5.860E-13	1.000E+00	2.432E-06	0.00
478	PL70302ASA	2	1.160E-03	5.026E-10	2.409E-07	2.414E-07	5.830E-13	1.000E+00	2.420E-06	0.00
479	PL70302BSA	2	1.160E-03	5.026E-10	2.409E-07	2.414E-07	5.830E-13	1.000E+00	2.420E-06	0.00
480	MSAEPSD4SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	5.860E-13	1.000E+00	2.432E-06	0.00
481	PL40302ASA	21	1.160E-03	4.944E-10	2.409E-07	2.414E-07	5.735E-13	1.000E+00	2.380E-06	0.00
482	MSAEPSD7SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	5.860E-13	1.000E+00	2.432E-06	0.00
483	MSAEPSD2SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	5.860E-13	1.000E+00	2.432E-06	0.00
484	MSAEPSD8SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	5.860E-13	1.000E+00	2.432E-06	0.00
485	MSAEPSD3SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	5.860E-13	1.000E+00	2.432E-06	0.00
486	MSAEPSD1SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	5.860E-13	1.000E+00	2.432E-06	0.00
487	CA9EPCMPASA	10	1.710E-04	3.138E-09	2.409E-07	2.441E-07	5.366E-13	1.000E+00	2.227E-06	0.00
488	PMCMOD12	14	2.090E-03	2.598E-10	2.409E-07	2.412E-07	5.430E-13	1.000E+00	2.254E-06	0.00
489	ZO2MOD04	7	1.250E-03	4.053E-10	2.409E-07	2.413E-07	5.066E-13	1.000E+00	2.103E-06	0.00
490	PL2MOD52	3	8.740E-04	5.684E-10	2.409E-07	2.415E-07	4.968E-13	1.000E+00	2.062E-06	0.00
491	CCX-PL2MOD1	4	1.410E-04	3.546E-09	2.409E-07	2.445E-07	5.000E-13	1.000E+00	2.075E-06	0.00
492	IWX-EV2-SA	7	5.800E-06	7.947E-08	2.409E-07	3.204E-07	4.609E-13	1.000E+00	1.913E-06	0.00
493	ED2MOD01	12	5.040E-04	8.750E-10	2.409E-07	2.418E-07	4.410E-13	1.000E+00	1.830E-06	0.00
494	CCX-PL3EH0	2	4.030E-06	1.040E-07	2.409E-07	3.449E-07	4.190E-13	1.000E+00	1.739E-06	0.00
495	CCX-EAO	10	3.230E-06	1.361E-07	2.409E-07	3.770E-07	4.396E-13	1.000E+00	1.825E-06	0.00
496	PL40302BSA	13	1.160E-03	3.369E-10	2.409E-07	2.413E-07	3.908E-13	1.000E+00	1.622E-06	0.00
497	PRDEP108SA	2	1.710E-04	2.251E-09	2.409E-07	2.432E-07	3.850E-13	1.000E+00	1.598E-06	0.00
498	PRCEP101SA	2	1.710E-04	2.251E-09	2.409E-07	2.432E-07	3.850E-13	1.000E+00	1.598E-06	0.00
499	PRCEP108SA	2	1.710E-04	2.251E-09	2.409E-07	2.432E-07	3.850E-13	1.000E+00	1.598E-06	0.00

Table 50-24 (Sheet 13 of 15)

RISK IMPORTANCES SORTED BY RISK DECREASE

500	PLB0301ASA	16	1.160E-03	2.928E-10	2.409E-07	2.412E-07	3.396E-13	1.000E+00	1.410E-06	0.00
501	ZANTR-2AHF	14	2.880E-05	1.233E-08	2.409E-07	2.532E-07	3.550E-13	1.000E+00	1.474E-06	0.00
502	IWBCV124AO	9	1.750E-03	2.011E-10	2.409E-07	2.411E-07	3.519E-13	1.000E+00	1.461E-06	0.00
503	SFNMV067GC	14	1.100E-02	3.182E-11	2.409E-07	2.410E-07	3.500E-13	1.000E+00	1.453E-06	0.00
504	CCX-PLAMOD1	6	1.410E-04	2.527E-09	2.409E-07	2.434E-07	3.563E-13	1.000E+00	1.479E-06	0.00
505	CV3EPCPBSA	2	1.710E-04	1.778E-09	2.409E-07	2.427E-07	3.040E-13	1.000E+00	1.262E-06	0.00
506	PLB0301BSA	14	1.160E-03	2.686E-10	2.409E-07	2.412E-07	3.116E-13	1.000E+00	1.293E-06	0.00
507	CCX-PLBMOD1-SW	6	1.100E-05	3.004E-08	2.409E-07	2.710E-07	3.304E-13	1.000E+00	1.371E-06	0.00
508	EC2BS002LF	6	4.800E-06	6.304E-08	2.409E-07	3.040E-07	3.026E-13	1.000E+00	1.256E-06	0.00
509	PMBXS00ASA	12	8.000E-05	3.709E-09	2.409E-07	2.446E-07	2.967E-13	1.000E+00	1.232E-06	0.00
510	ED3MOD11	8	3.170E-04	8.656E-10	2.409E-07	2.418E-07	2.744E-13	1.000E+00	1.139E-06	0.00
511	PMAXS00ASA	12	8.000E-05	3.709E-09	2.409E-07	2.446E-07	2.967E-13	1.000E+00	1.232E-06	0.00
512	ED3MOD111	8	3.170E-04	8.656E-10	2.409E-07	2.418E-07	2.744E-13	1.000E+00	1.139E-06	0.00
513	PL30302ASA	2	1.160E-03	2.414E-10	2.409E-07	2.412E-07	2.800E-13	1.000E+00	1.162E-06	0.00
514	PMDXS00ASA	12	8.000E-05	3.709E-09	2.409E-07	2.446E-07	2.967E-13	1.000E+00	1.232E-06	0.00
515	PLAMOD12	4	2.090E-03	1.336E-10	2.409E-07	2.411E-07	2.792E-13	1.000E+00	1.159E-06	0.00
516	PMCXS00ASA	12	8.000E-05	3.709E-09	2.409E-07	2.446E-07	2.967E-13	1.000E+00	1.232E-06	0.00
517	ED4MOD111	8	3.170E-04	8.656E-10	2.409E-07	2.418E-07	2.744E-13	1.000E+00	1.139E-06	0.00
518	PMAMOD41	11	6.350E-04	4.176E-10	2.409E-07	2.413E-07	2.652E-13	1.000E+00	1.101E-06	0.00
519	CCX-PLDMOD1	1	1.410E-04	1.851E-09	2.409E-07	2.428E-07	2.610E-13	1.000E+00	1.083E-06	0.00
520	IRWMOD08	7	1.460E-03	1.877E-10	2.409E-07	2.411E-07	2.741E-13	1.000E+00	1.138E-06	0.00
521	CCX-BY-PN1	5	5.700E-05	4.589E-09	2.409E-07	2.455E-07	2.616E-13	1.000E+00	1.086E-06	0.00
522	ED4MOD03	2	2.700E-03	9.111E-11	2.409E-07	2.410E-07	2.460E-13	1.000E+00	1.021E-06	0.00
523	CASPPRUPT	6	2.000E-06	1.198E-07	2.409E-07	3.607E-07	2.396E-13	1.000E+00	9.945E-07	0.00
524	PMC0302ASA	8	1.160E-03	2.081E-10	2.409E-07	2.411E-07	2.414E-13	1.000E+00	1.002E-06	0.00
525	PMB0302ASA	8	1.160E-03	2.081E-10	2.409E-07	2.411E-07	2.414E-13	1.000E+00	1.002E-06	0.00
526	EC2MOD23	8	4.800E-05	4.613E-09	2.409E-07	2.455E-07	2.214E-13	1.000E+00	9.190E-07	0.00
527	EC1MOD13	8	4.800E-05	4.613E-09	2.409E-07	2.455E-07	2.214E-13	1.000E+00	9.190E-07	0.00
528	PLBMOD12	8	2.090E-03	1.065E-10	2.409E-07	2.410E-07	2.226E-13	1.000E+00	9.240E-07	0.00
529	CCX-PLA03	4	9.690E-05	2.341E-09	2.409E-07	2.433E-07	2.268E-13	1.000E+00	9.414E-07	0.00
530	CVNMV091GC	11	8.760E-02	2.499E-12	2.409E-07	2.409E-07	2.189E-13	1.000E+00	9.086E-07	0.00
531	CVNMV090GC	11	8.760E-02	2.499E-12	2.409E-07	2.409E-07	2.189E-13	1.000E+00	9.086E-07	0.00
532	FWACV012GO	8	2.190E-04	8.658E-10	2.409E-07	2.418E-07	1.896E-13	1.000E+00	7.870E-07	0.00
533	PMC0302BSA	6	1.160E-03	1.803E-10	2.409E-07	2.411E-07	2.091E-13	1.000E+00	8.679E-07	0.00
534	PMB0302BSA	6	1.160E-03	1.803E-10	2.409E-07	2.411E-07	2.091E-13	1.000E+00	8.679E-07	0.00
535	CCX-IV-XR1	6	2.400E-05	8.821E-09	2.409E-07	2.497E-07	2.117E-13	1.000E+00	8.787E-07	0.00
536	SGX-MV-RP	4	7.670E-06	2.780E-08	2.409E-07	2.687E-07	2.132E-13	1.000E+00	8.849E-07	0.00
537	FWBCV012GO	8	2.190E-04	8.658E-10	2.409E-07	2.418E-07	1.896E-13	1.000E+00	7.870E-07	0.00
538	PL30302BSA	1	1.160E-03	1.552E-10	2.409E-07	2.411E-07	1.800E-13	1.000E+00	7.471E-07	0.00
539	CCX-PLD03	1	9.690E-05	1.847E-09	2.409E-07	2.428E-07	1.790E-13	1.000E+00	7.430E-07	0.00
540	SGX-CV-GO	4	6.400E-06	2.781E-08	2.409E-07	2.687E-07	1.780E-13	1.000E+00	7.388E-07	0.00
541	FWX-PM2-ER	4	5.900E-06	2.783E-08	2.409E-07	2.688E-07	1.642E-13	1.000E+00	6.816E-07	0.00

Table 50-24 (Sheet 14 of 15)

RISK IMPORTANCES SORTED BY RISK DECREASE

542	FWX-CV2-GO	4	6.400E-06	2.781E-08	2.409E-07	2.687E-07	1.780E-13	1.000E+00	7.388E-07	0.00
543	SGX-AV-FA	4	6.300E-06	2.778E-08	2.409E-07	2.687E-07	1.750E-13	1.000E+00	7.264E-07	0.00
544	SFBEPSFPBSA	6	1.710E-04	7.661E-10	2.409E-07	2.417E-07	1.310E-13	1.000E+00	5.437E-07	0.00
545	SFBEP013ASA	6	1.710E-04	7.661E-10	2.409E-07	2.417E-07	1.310E-13	1.000E+00	5.437E-07	0.00
546	CCX-HE-AF	4	1.200E-06	1.080E-07	2.409E-07	3.489E-07	1.296E-13	1.000E+00	5.379E-07	0.00
547	SFBEPSFPASA	6	1.710E-04	7.661E-10	2.409E-07	2.417E-07	1.310E-13	1.000E+00	5.437E-07	0.00
548	CCX-PLBEH0	4	4.030E-06	2.779E-08	2.409E-07	2.687E-07	1.120E-13	1.000E+00	4.649E-07	0.00
549	EC1MOD11	4	4.800E-05	2.496E-09	2.409E-07	2.434E-07	1.198E-13	1.000E+00	4.973E-07	0.00
550	EC3BS003TM	1	2.700E-03	4.667E-11	2.409E-07	2.410E-07	1.260E-13	1.000E+00	5.230E-07	0.00
551	ZOX-BL-ES	1	6.000E-05	1.867E-09	2.409E-07	2.428E-07	1.120E-13	1.000E+00	4.649E-07	0.00
552	SFBEP013BSA	6	1.710E-04	7.661E-10	2.409E-07	2.417E-07	1.310E-13	1.000E+00	5.437E-07	0.00
553	TCBMOD01B	1	2.520E-02	5.000E-12	2.409E-07	2.409E-07	1.260E-13	1.000E+00	5.230E-07	0.00
554	ED1MOD06	8	3.480E-04	3.063E-10	2.409E-07	2.412E-07	1.066E-13	1.000E+00	4.425E-07	0.00
555	CMBAV015LA	1	1.590E-03	6.239E-11	2.409E-07	2.410E-07	9.920E-14	1.000E+00	4.118E-07	0.00
556	PLA0302ASA	2	1.160E-03	7.517E-11	2.409E-07	2.410E-07	8.720E-14	1.000E+00	3.619E-07	0.00
557	PLA0302BSA	2	1.160E-03	7.517E-11	2.409E-07	2.410E-07	8.720E-14	1.000E+00	3.619E-07	0.00
558	PLB0302ASA	4	1.160E-03	6.776E-11	2.409E-07	2.410E-07	7.860E-14	1.000E+00	3.262E-07	0.00
559	CMBAV014LA	1	1.590E-03	6.239E-11	2.409E-07	2.410E-07	9.920E-14	1.000E+00	4.118E-07	0.00
560	IWBCV122AO	3	1.750E-03	5.297E-11	2.409E-07	2.410E-07	9.270E-14	1.000E+00	3.848E-07	0.00
561	IRWMOD07	3	1.460E-03	5.295E-11	2.409E-07	2.410E-07	7.730E-14	1.000E+00	3.209E-07	0.00
562	IDDMOD38	6	3.170E-04	2.845E-10	2.409E-07	2.412E-07	9.020E-14	1.000E+00	3.744E-07	0.00
563	IDAMOD08	6	3.170E-04	2.845E-10	2.409E-07	2.412E-07	9.020E-14	1.000E+00	3.744E-07	0.00
564	CMB-CV	1	2.000E-06	3.925E-08	2.409E-07	2.802E-07	7.850E-14	1.000E+00	3.258E-07	0.00
565	CMBTK002AF	1	2.400E-06	3.925E-08	2.409E-07	2.802E-07	9.420E-14	1.000E+00	3.910E-07	0.00
566	CCAMOD02	1	7.100E-03	1.352E-11	2.409E-07	2.409E-07	9.600E-14	1.000E+00	3.985E-07	0.00
567	ED3MOD06	1	3.480E-04	2.819E-10	2.409E-07	2.412E-07	9.810E-14	1.000E+00	4.072E-07	0.00
568	IDBMOD27	6	2.190E-02	3.973E-12	2.409E-07	2.409E-07	8.700E-14	1.000E+00	3.611E-07	0.00
569	IDCMOD31	6	2.190E-02	3.973E-12	2.409E-07	2.409E-07	8.700E-14	1.000E+00	3.611E-07	0.00
570	IDDMOD35	6	2.190E-02	3.973E-12	2.409E-07	2.409E-07	8.700E-14	1.000E+00	3.611E-07	0.00
571	IDAMOD07	6	2.190E-02	3.973E-12	2.409E-07	2.409E-07	8.700E-14	1.000E+00	3.611E-07	0.00
572	AD1MOD05	6	5.640E-02	1.555E-12	2.409E-07	2.409E-07	8.770E-14	1.000E+00	3.640E-07	0.00
573	CDNTK02AF	2	2.400E-06	2.083E-08	2.409E-07	2.618E-07	5.000E-14	1.000E+00	2.075E-07	0.00
574	CVX-MV-GC2	4	4.400E-03	1.684E-11	2.409E-07	2.409E-07	7.410E-14	1.000E+00	3.076E-07	0.00
575	FWA-CV-EO	4	1.000E-04	5.930E-10	2.409E-07	2.415E-07	5.930E-14	1.000E+00	2.461E-07	0.00
576	PLB0302BSA	2	1.160E-03	4.362E-11	2.409E-07	2.410E-07	5.060E-14	1.000E+00	2.100E-07	0.00
577	PMAMOD42	2	6.350E-04	3.512E-11	2.409E-07	2.410E-07	2.230E-14	1.000E+00	9.256E-08	0.00
578	PLMMOD42	2	6.350E-04	3.512E-11	2.409E-07	2.410E-07	2.230E-14	1.000E+00	9.256E-08	0.00
579	CMBOR001EB	1	7.200E-07	3.931E-08	2.409E-07	2.802E-07	2.830E-14	1.000E+00	1.175E-07	0.00
580	IWCRS125BFA	2	8.760E-04	4.167E-11	2.409E-07	2.410E-07	3.650E-14	1.000E+00	1.515E-07	0.00
581	IDCMOD37	2	3.170E-04	1.013E-10	2.409E-07	2.410E-07	3.210E-14	1.000E+00	1.332E-07	0.00
582	CVN-MAN02	2	1.580E-03	1.570E-11	2.409E-07	2.409E-07	2.480E-14	1.000E+00	1.029E-07	0.00
583	CVBEP081SA	3	1.710E-04	2.462E-10	2.409E-07	2.412E-07	4.210E-14	1.000E+00	1.747E-07	0.00

Table 50-24 (Sheet 15 of 15)

RISK IMPORTANCES SORTED BY RISK DECREASE

584	SGAAV040LA	2	1.090E-03	3.706E-11	2.409E-07	2.410E-07	4.040E-14	1.000E+00	1.677E-07	0.00
585	ED1MOD02	2	1.920E-04	1.490E-10	2.409E-07	2.411E-07	2.860E-14	1.000E+00	1.187E-07	0.00
586	ED2MOD07	2	3.050E-04	7.213E-11	2.409E-07	2.410E-07	2.200E-14	1.000E+00	9.132E-08	0.00
587	ED2MOD13	2	3.170E-04	7.192E-11	2.409E-07	2.410E-07	2.280E-14	1.000E+00	9.464E-08	0.00
588	ED2MOD06	2	3.480E-04	7.184E-11	2.409E-07	2.410E-07	2.500E-14	1.000E+00	1.038E-07	0.00
589	PMDMOD42	2	6.350E-04	3.512E-11	2.409E-07	2.410E-07	2.230E-14	1.000E+00	9.256E-08	0.00
590	ZO1MOD03	2	1.000E-04	2.810E-10	2.409E-07	2.412E-07	2.810E-14	1.000E+00	1.166E-07	0.00
591	CVAEP084SA	3	1.710E-04	2.462E-10	2.409E-07	2.412E-07	4.210E-14	1.000E+00	1.747E-07	0.00
592	IWARS123BFA	2	8.760E-04	4.167E-11	2.409E-07	2.410E-07	3.650E-14	1.000E+00	1.515E-07	0.00
593	EC1CB100RQ	2	1.440E-05	2.535E-09	2.409E-07	2.435E-07	3.650E-14	1.000E+00	1.515E-07	0.00
594	IDBMOD36	2	3.170E-04	1.013E-10	2.409E-07	2.410E-07	3.210E-14	1.000E+00	1.332E-07	0.00
595	SGBAV057LA	1	1.090E-03	1.000E-11	2.409E-07	2.409E-07	1.090E-14	1.000E+00	4.524E-08	0.00
596	SGBAV250LA	1	8.760E-03	1.244E-12	2.409E-07	2.409E-07	1.090E-14	1.000E+00	4.524E-08	0.00
597	SGBCV058GC	1	2.450E-02	4.449E-13	2.409E-07	2.409E-07	1.090E-14	1.000E+00	4.524E-08	0.00
598	EC1MOD01	1	6.910E-05	1.505E-10	2.409E-07	2.411E-07	1.040E-14	1.000E+00	4.317E-08	0.00
599	ATW-MAN06	1	5.200E-03	2.173E-12	2.409E-07	2.409E-07	1.130E-14	1.000E+00	4.690E-08	0.00

Table 50-25 (Sheet 1 of 13)

RISK INCREASES SORTED BY SLOPE (BIRNBAUM) IMPORTANCE

SORTED BY BIRNBAUM (SLOPE) IMPORTANCE

	BASIC EVENT ID	CUTSETS	BEV PROB. Q	BIRN A	CMF0 B	CMF1	RINC	RDEC	RAW	RRW	FV
1	IEV-RV-RP	1	1.000E-08	1.000E+00	2.309E-07	1.000E+00	1.000E+00	1.000E-08	4.151E+06	1.043E+00	4.151E-02
2	IEV-ISLOC	1	5.000E-11	1.000E+00	2.409E-07	1.000E+00	1.000E+00	5.000E-11	4.151E+06	1.000E+00	2.075E-04
3	IEV-LLOCA	286	5.000E-06	8.958E-03	1.960E-07	8.958E-03	8.958E-03	4.496E-08	3.718E+04	1.229E+00	1.866E-01
4	CCX-SFTW	262	1.200E-06	1.904E-03	2.386E-07	1.905E-03	1.904E-03	2.287E-09	7.906E+03	1.010E+00	9.494E-03
5	REX-FL-GP	849	1.200E-05	1.474E-03	2.232E-07	1.474E-03	1.474E-03	1.770E-08	6.119E+03	1.079E+00	7.346E-02
6	IEV-SPADS	1078	5.400E-05	5.476E-04	2.113E-07	5.478E-04	5.475E-04	2.958E-08	2.274E+03	1.140E+00	1.228E-01
7	IEV-SI-LB	1160	2.120E-04	4.480E-04	1.459E-07	4.482E-04	4.479E-04	9.499E-08	1.860E+03	1.651E+00	3.943E-01
8	IWX-EV-SA	1686	2.600E-05	3.993E-04	2.305E-07	3.996E-04	3.993E-04	1.038E-08	1.658E+03	1.045E+00	4.310E-02
9	ADX-EV-SA	1678	3.000E-05	3.949E-04	2.291E-07	3.952E-04	3.949E-04	1.185E-08	1.640E+03	1.052E+00	4.918E-02
10	IWX-CV-AO	1617	3.000E-05	3.929E-04	2.291E-07	3.931E-04	3.929E-04	1.179E-08	1.632E+03	1.051E+00	4.893E-02
11	ADX-EV-SA2	1607	5.900E-05	3.898E-04	2.179E-07	3.900E-04	3.898E-04	2.300E-08	1.619E+03	1.106E+00	9.547E-02
12	IWA-PLUG	68	2.400E-04	2.121E-04	1.900E-07	2.123E-04	2.121E-04	5.091E-08	8.813E+02	1.268E+00	2.113E-01
13	IWX-EV1-SA	1	5.800E-06	2.121E-04	2.397E-07	2.123E-04	2.121E-04	1.230E-09	8.812E+02	1.005E+00	5.105E-03
14	IWX-CV1-AO	1	5.400E-07	2.111E-04	2.408E-07	2.114E-04	2.111E-04	1.140E-10	8.773E+02	1.000E+00	4.732E-04
15	CCX-PMXMOD1-SW	347	1.100E-05	1.926E-04	2.388E-07	1.929E-04	1.926E-04	2.119E-09	8.005E+02	1.009E+00	8.795E-03
16	CCX-EP-SAM	298	8.620E-06	1.921E-04	2.393E-07	1.923E-04	1.921E-04	1.656E-09	7.983E+02	1.007E+00	6.873E-03
17	IWX-FL-GP	993	1.200E-05	1.797E-04	2.388E-07	1.799E-04	1.797E-04	2.156E-09	7.468E+02	1.009E+00	8.951E-03
18	CCX-AV-LA	133	6.200E-05	6.786E-05	2.367E-07	6.810E-05	6.786E-05	4.207E-09	2.827E+02	1.018E+00	1.746E-02
19	CCX-INPUT-LOGIC	43	1.030E-04	6.635E-05	2.341E-07	6.659E-05	6.635E-05	6.834E-09	2.764E+02	1.029E+00	2.837E-02
20	CMX-VS-FA	75	3.840E-05	6.542E-05	2.384E-07	6.566E-05	6.542E-05	2.512E-09	2.725E+02	1.011E+00	1.043E-02
21	CMX-CV-GO	93	5.100E-05	6.542E-05	2.376E-07	6.565E-05	6.541E-05	3.336E-09	2.725E+02	1.014E+00	1.385E-02
22	CCX-IN-LOGIC-SW	22	1.100E-05	6.269E-05	2.402E-07	6.293E-05	6.269E-05	6.896E-10	2.612E+02	1.003E+00	2.862E-03
23	CCX-PMXMOD2-SW	22	1.100E-05	6.269E-05	2.402E-07	6.293E-05	6.269E-05	6.896E-10	2.612E+02	1.003E+00	2.862E-03
24	CMX-TK-AF	5	1.200E-07	6.115E-05	2.409E-07	6.140E-05	6.115E-05	7.339E-12	2.548E+02	1.000E+00	3.046E-05
25	ACX-CV-GO	179	5.100E-05	5.958E-05	2.379E-07	5.982E-05	5.957E-05	3.038E-09	2.483E+02	1.013E+00	1.261E-02
26	ACX-TK-AF	3	1.200E-07	5.918E-05	2.409E-07	5.942E-05	5.918E-05	7.102E-12	2.467E+02	1.000E+00	2.948E-05
27	IEV-CMTLB	987	9.310E-05	3.954E-05	2.372E-07	3.978E-05	3.954E-05	3.682E-09	1.651E+02	1.016E+00	1.528E-02
28	CCX-BY-PN	968	4.700E-05	3.777E-05	2.391E-07	3.801E-05	3.777E-05	1.775E-09	1.578E+02	1.007E+00	7.368E-03
29	IEV-MLOCA	1681	4.360E-04	3.696E-05	2.248E-07	3.718E-05	3.694E-05	1.611E-08	1.543E+02	1.072E+00	6.688E-02
30	IEV-SLOCA	1638	5.000E-04	3.616E-05	2.228E-07	3.638E-05	3.614E-05	1.808E-08	1.510E+02	1.081E+00	7.504E-02
31	PXX-AV-LA1	1975	9.600E-05	1.860E-05	2.391E-07	1.884E-05	1.860E-05	1.785E-09	7.818E+01	1.007E+00	7.410E-03
32	PXX-AV-LA	1975	9.600E-05	1.860E-05	2.391E-07	1.884E-05	1.860E-05	1.785E-09	7.818E+01	1.007E+00	7.410E-03
33	PCNHR001ML	194	2.400E-06	1.677E-05	2.409E-07	1.701E-05	1.677E-05	4.024E-11	7.060E+01	1.000E+00	1.670E-04
34	IWNTK001AF	194	2.400E-06	1.677E-05	2.409E-07	1.701E-05	1.677E-05	4.024E-11	7.060E+01	1.000E+00	1.670E-04
35	IWX-XMTR	560	4.780E-04	1.495E-05	2.338E-07	1.518E-05	1.494E-05	7.146E-09	6.302E+01	1.031E+00	2.966E-02
36	RPX-CB-GO	426	4.200E-04	1.223E-05	2.358E-07	1.246E-05	1.222E-05	5.135E-09	5.172E+01	1.022E+00	2.131E-02
37	ADX-MV3-GO	2324	3.240E-04	1.033E-05	2.376E-07	1.056E-05	1.032E-05	3.346E-09	4.385E+01	1.014E+00	1.389E-02
38	CCX-XMTR	579	4.780E-04	8.755E-06	2.367E-07	8.992E-06	8.751E-06	4.185E-09	3.732E+01	1.018E+00	1.737E-02
39	CCX-XMTR195	280	4.780E-04	8.449E-06	2.369E-07	8.686E-06	8.445E-06	4.039E-09	3.605E+01	1.017E+00	1.676E-02
40	ALL-IND-FAIL	63	1.000E-06	7.487E-06	2.409E-07	7.728E-06	7.487E-06	7.487E-12	3.208E+01	1.000E+00	3.108E-05
41	ACAOR001SP	95	7.270E-04	5.542E-06	2.369E-07	5.779E-06	5.538E-06	4.029E-09	2.399E+01	1.017E+00	1.672E-02
42	ACACV028GO	141	1.750E-03	5.536E-06	2.312E-07	5.767E-06	5.526E-06	9.688E-09	2.394E+01	1.042E+00	4.021E-02
43	ACACV029GO	141	1.750E-03	5.536E-06	2.312E-07	5.767E-06	5.526E-06	9.688E-09	2.394E+01	1.042E+00	4.021E-02

Table 50-25 (Sheet 2 of 13)

RISK INCREASES SORTED BY SLOPE (BIRNBAUM) IMPORTANCE

44	ACATK001AF	8	2.400E-06	5.505E-06	2.409E-07	5.746E-06	5.505E-06	1.321E-11	2.385E+01	1.000E+00	5.484E-05
45	ACAOR001EB	7	7.200E-07	5.492E-06	2.409E-07	5.733E-06	5.492E-06	3.954E-12	2.380E+01	1.000E+00	1.641E-05
46	ACBOR001SP	35	7.270E-04	5.237E-06	2.371E-07	5.474E-06	5.233E-06	3.807E-09	2.272E+01	1.016E+00	1.580E-02
47	ACBCV029GO	73	1.750E-03	5.230E-06	2.318E-07	5.462E-06	5.221E-06	9.153E-09	2.267E+01	1.039E+00	3.799E-02
48	ACBCV028GO	73	1.750E-03	5.230E-06	2.318E-07	5.462E-06	5.221E-06	9.153E-09	2.267E+01	1.039E+00	3.799E-02
49	ACBTK001AF	4	2.400E-06	5.228E-06	2.409E-07	5.469E-06	5.228E-06	1.255E-11	2.270E+01	1.000E+00	5.208E-05
50	ACBOR001EB	4	7.200E-07	5.228E-06	2.409E-07	5.469E-06	5.228E-06	3.764E-12	2.270E+01	1.000E+00	1.562E-05
51	RCX-RB-FA	95	8.100E-06	4.578E-06	2.409E-07	4.819E-06	4.578E-06	3.708E-11	2.000E+01	1.000E+00	1.539E-04
52	ED3MOD07	387	3.050E-04	3.840E-06	2.397E-07	4.080E-06	3.839E-06	1.171E-09	1.693E+01	1.005E+00	4.861E-03
53	IEV-PRSTR	317	1.340E-04	3.743E-06	2.404E-07	3.983E-06	3.742E-06	5.015E-10	1.653E+01	1.002E+00	2.082E-03
54	CCX-PMXMOD4-SW	54	1.100E-05	3.462E-06	2.409E-07	3.703E-06	3.462E-06	3.808E-11	1.537E+01	1.000E+00	1.581E-04
55	IDBBSDS1TM	606	3.000E-04	2.566E-06	2.402E-07	2.806E-06	2.565E-06	7.697E-10	1.165E+01	1.003E+00	3.195E-03
56	IDBBSDD1TM	581	3.000E-04	2.561E-06	2.402E-07	2.801E-06	2.560E-06	7.683E-10	1.163E+01	1.003E+00	3.189E-03
57	CMA-PLUG	65	7.270E-04	2.319E-06	2.392E-07	2.559E-06	2.318E-06	1.686E-09	1.062E+01	1.007E+00	6.999E-03
58	CMATK002AF	17	2.400E-06	2.297E-06	2.409E-07	2.538E-06	2.297E-06	5.513E-12	1.053E+01	1.000E+00	2.288E-05
59	CMA-CV	16	2.000E-06	2.293E-06	2.409E-07	2.534E-06	2.293E-06	4.585E-12	1.052E+01	1.000E+00	1.903E-05
60	CMAOR001EB	14	7.200E-07	2.280E-06	2.409E-07	2.521E-06	2.280E-06	1.642E-12	1.046E+01	1.000E+00	6.815E-06
61	CMX-AV-LA	36	9.600E-05	2.273E-06	2.407E-07	2.514E-06	2.273E-06	2.182E-10	1.043E+01	1.001E+00	9.058E-04
62	IDBFD013RQ	83	1.200E-05	2.140E-06	2.409E-07	2.381E-06	2.140E-06	2.568E-11	9.882E+00	1.000E+00	1.066E-04
63	IDBBSDS1LF	46	4.800E-06	2.063E-06	2.409E-07	2.304E-06	2.063E-06	9.902E-12	9.563E+00	1.000E+00	4.110E-05
64	IDBBSDD1LF	46	4.800E-06	2.063E-06	2.409E-07	2.304E-06	2.063E-06	9.902E-12	9.563E+00	1.000E+00	4.110E-05
65	IDDBSDS1TM	253	3.000E-04	2.058E-06	2.403E-07	2.299E-06	2.058E-06	6.175E-10	9.542E+00	1.003E+00	2.563E-03
66	IDDBSDD1TM	207	3.000E-04	2.053E-06	2.403E-07	2.293E-06	2.052E-06	6.159E-10	9.519E+00	1.003E+00	2.557E-03
67	IDDFD019RQ	52	1.200E-05	1.955E-06	2.409E-07	2.196E-06	1.955E-06	2.346E-11	9.116E+00	1.000E+00	9.739E-05
68	IDDBSDS1LF	31	4.800E-06	1.900E-06	2.409E-07	2.141E-06	1.900E-06	9.119E-12	8.886E+00	1.000E+00	3.785E-05
69	IDDBSDD1LF	31	4.800E-06	1.900E-06	2.409E-07	2.141E-06	1.900E-06	9.119E-12	8.886E+00	1.000E+00	3.785E-05
70	IEV-SGTR	3076	3.880E-03	1.751E-06	2.341E-07	1.985E-06	1.744E-06	6.792E-09	8.238E+00	1.029E+00	2.819E-02
71	CCX-IV-XR	160	2.400E-05	1.666E-06	2.409E-07	1.907E-06	1.666E-06	3.999E-11	7.915E+00	1.000E+00	1.660E-04
72	CCX-EP-SA	46	8.620E-06	1.410E-06	2.409E-07	1.651E-06	1.410E-06	1.215E-11	6.853E+00	1.000E+00	5.045E-05
73	CIB-MAN00	320	1.840E-03	1.288E-06	2.386E-07	1.527E-06	1.286E-06	2.370E-09	6.337E+00	1.010E+00	9.838E-03
74	IDABSDS1TM	264	3.000E-04	1.197E-06	2.406E-07	1.437E-06	1.196E-06	3.590E-10	5.965E+00	1.001E+00	1.490E-03
75	IDABSDD1TM	239	3.000E-04	1.192E-06	2.406E-07	1.433E-06	1.192E-06	3.577E-10	5.947E+00	1.001E+00	1.485E-03
76	CCX-PMS-HARDWARE	52	7.890E-05	1.179E-06	2.408E-07	1.420E-06	1.179E-06	9.302E-11	5.893E+00	1.000E+00	3.861E-04
77	IDCBSDS1TM	333	3.000E-04	1.094E-06	2.406E-07	1.334E-06	1.093E-06	3.281E-10	5.538E+00	1.001E+00	1.362E-03
78	IDCBSDD1TM	308	3.000E-04	1.089E-06	2.406E-07	1.330E-06	1.089E-06	3.268E-10	5.520E+00	1.001E+00	1.356E-03
79	IDAFD003RQ	45	1.200E-05	1.080E-06	2.409E-07	1.321E-06	1.080E-06	1.296E-11	5.484E+00	1.000E+00	5.381E-05
80	IDABSDD1LF	31	4.800E-06	1.052E-06	2.409E-07	1.293E-06	1.052E-06	5.049E-12	5.366E+00	1.000E+00	2.096E-05
81	IDABSDS1LF	31	4.800E-06	1.052E-06	2.409E-07	1.293E-06	1.052E-06	5.049E-12	5.366E+00	1.000E+00	2.096E-05
82	IRWMOD06	21	1.460E-03	1.000E-06	2.395E-07	1.240E-06	9.989E-07	1.460E-09	5.146E+00	1.006E+00	6.062E-03
83	IRWMOD05	17	1.460E-03	1.000E-06	2.395E-07	1.240E-06	9.987E-07	1.460E-09	5.146E+00	1.006E+00	6.061E-03
84	IWBRS123AFA	16	8.760E-04	1.000E-06	2.400E-07	1.240E-06	9.992E-07	8.761E-10	5.148E+00	1.004E+00	3.636E-03
85	IWDRS125AFA	16	8.760E-04	1.000E-06	2.400E-07	1.240E-06	9.992E-07	8.761E-10	5.148E+00	1.004E+00	3.636E-03
86	IWACV124AO	26	1.750E-03	9.998E-07	2.392E-07	1.239E-06	9.981E-07	1.750E-09	5.143E+00	1.007E+00	7.263E-03
87	IWACV122AO	20	1.750E-03	9.997E-07	2.392E-07	1.239E-06	9.979E-07	1.749E-09	5.142E+00	1.007E+00	7.262E-03
88	CCX-TT-UF	139	1.170E-04	9.364E-07	2.408E-07	1.177E-06	9.363E-07	1.096E-10	4.886E+00	1.000E+00	4.547E-04
89	IDCFD007RQ	35	1.200E-05	9.257E-07	2.409E-07	1.167E-06	9.257E-07	1.111E-11	4.842E+00	1.000E+00	4.611E-05
90	IDCBSDS1LF	16	4.800E-06	8.887E-07	2.409E-07	1.130E-06	8.887E-07	4.266E-12	4.689E+00	1.000E+00	1.771E-05
91	IDCBSDD1LF	16	4.800E-06	8.887E-07	2.409E-07	1.130E-06	8.887E-07	4.266E-12	4.689E+00	1.000E+00	1.771E-05

Table 50-25 (Sheet 3 of 13)

RISK INCREASES SORTED BY SLOPE (BIRNBAUM) IMPORTANCE

92	CCX-TRNSM	556	4.780E-04	8.126E-07	2.405E-07	1.053E-06	8.122E-07	3.884E-10	4.371E+00	1.002E+00	1.612E-03
93	ADN-MAN01	680	3.020E-03	7.843E-07	2.386E-07	1.023E-06	7.820E-07	2.369E-09	4.246E+00	1.010E+00	9.832E-03
94	EC1BS001TM	1288	2.700E-03	7.530E-07	2.389E-07	9.918E-07	7.509E-07	2.033E-09	4.117E+00	1.009E+00	8.438E-03
95	REN-MAN04	495	1.000E-02	7.033E-07	2.339E-07	9.372E-07	6.962E-07	7.033E-09	3.890E+00	1.030E+00	2.919E-02
96	EC1BS012TM	1041	2.700E-03	6.818E-07	2.391E-07	9.209E-07	6.800E-07	1.841E-09	3.822E+00	1.008E+00	7.641E-03
97	CCX-VS-FA	17	3.840E-05	6.787E-07	2.409E-07	9.196E-07	6.787E-07	2.606E-11	3.817E+00	1.000E+00	1.082E-04
98	AD4MOD08	510	5.800E-04	6.610E-07	2.405E-07	9.015E-07	6.606E-07	3.834E-10	3.742E+00	1.002E+00	1.591E-03
99	AD4MOD07	510	5.800E-04	6.610E-07	2.405E-07	9.015E-07	6.606E-07	3.834E-10	3.742E+00	1.002E+00	1.591E-03
100	AD4MOD09	510	5.800E-04	6.610E-07	2.405E-07	9.015E-07	6.606E-07	3.834E-10	3.742E+00	1.002E+00	1.591E-03
101	AD4MOD10	510	5.800E-04	6.610E-07	2.405E-07	9.015E-07	6.606E-07	3.834E-10	3.742E+00	1.002E+00	1.591E-03
102	EC1MOD12	142	4.800E-05	5.589E-07	2.409E-07	7.998E-07	5.589E-07	2.683E-11	3.320E+00	1.000E+00	1.114E-04
103	CIB-MAN01	280	1.340E-03	5.540E-07	2.402E-07	7.941E-07	5.532E-07	7.423E-10	3.296E+00	1.003E+00	3.081E-03
104	IEV-SLB-V	305	1.210E-03	5.010E-07	2.403E-07	7.414E-07	5.004E-07	6.063E-10	3.077E+00	1.003E+00	2.516E-03
105	LPM-MAN02	282	3.300E-03	4.557E-07	2.394E-07	6.951E-07	4.542E-07	1.504E-09	2.885E+00	1.006E+00	6.242E-03
106	REA-PLUG	232	2.400E-04	4.173E-07	2.408E-07	6.581E-07	4.172E-07	1.002E-10	2.732E+00	1.000E+00	4.157E-04
107	REB-PLUG	212	2.400E-04	4.090E-07	2.408E-07	6.498E-07	4.089E-07	9.816E-11	2.697E+00	1.000E+00	4.074E-04
108	EC1BS001LF	33	4.800E-06	3.745E-07	2.409E-07	6.155E-07	3.745E-07	1.798E-12	2.555E+00	1.000E+00	7.462E-06
109	IEV-POWEX	701	4.500E-03	3.687E-07	2.393E-07	6.080E-07	3.671E-07	1.659E-09	2.524E+00	1.007E+00	6.887E-03
110	IEV-SLB-U	160	3.720E-04	3.513E-07	2.408E-07	5.921E-07	3.512E-07	1.307E-10	2.458E+00	1.001E+00	5.425E-04
111	CIX-AV-LA	194	7.700E-04	3.134E-07	2.407E-07	5.541E-07	3.132E-07	2.413E-10	2.300E+00	1.001E+00	1.002E-03
112	CCX-XMTR1	153	4.780E-04	3.124E-07	2.408E-07	5.531E-07	3.122E-07	1.493E-10	2.296E+00	1.001E+00	6.198E-04
113	LPM-MAN01	227	1.340E-03	3.085E-07	2.405E-07	5.490E-07	3.081E-07	4.134E-10	2.279E+00	1.002E+00	1.716E-03
114	OTH-PO	63	1.200E-04	3.078E-07	2.409E-07	5.487E-07	3.078E-07	3.694E-11	2.278E+00	1.000E+00	1.533E-04
115	IEV-RCSLK	1526	6.200E-03	2.750E-07	2.392E-07	5.142E-07	2.733E-07	1.705E-09	2.134E+00	1.007E+00	7.078E-03
116	CVN-MAN00	33	3.100E-03	2.673E-07	2.401E-07	5.074E-07	2.664E-07	8.285E-10	2.106E+00	1.003E+00	3.439E-03
117	CCX-PMDMOD1	119	1.410E-04	2.666E-07	2.409E-07	5.075E-07	2.665E-07	3.759E-11	2.106E+00	1.000E+00	1.560E-04
118	ED1BSDS1TM	137	3.000E-04	2.641E-07	2.408E-07	5.050E-07	2.640E-07	7.924E-11	2.096E+00	1.000E+00	3.289E-04
119	CCX-PMD030	107	9.690E-05	2.639E-07	2.409E-07	5.048E-07	2.638E-07	2.557E-11	2.095E+00	1.000E+00	1.061E-04
120	OTH-SGTR	989	1.000E-02	2.599E-07	2.383E-07	4.982E-07	2.573E-07	2.599E-09	2.068E+00	1.011E+00	1.079E-02
121	ED1MOD113	119	3.170E-04	2.510E-07	2.408E-07	4.919E-07	2.510E-07	7.958E-11	2.042E+00	1.000E+00	3.303E-04
122	ED1MOD11	119	3.170E-04	2.510E-07	2.408E-07	4.919E-07	2.510E-07	7.958E-11	2.042E+00	1.000E+00	3.303E-04
123	CCX-BC-SA	7	8.400E-06	2.451E-07	2.409E-07	4.860E-07	2.451E-07	2.059E-12	2.017E+00	1.000E+00	8.545E-06
124	CCX-PM-ER	14	1.400E-05	2.430E-07	2.409E-07	4.839E-07	2.430E-07	3.402E-12	2.009E+00	1.000E+00	1.412E-05
125	CCX-PMAMOD1	124	1.410E-04	2.388E-07	2.409E-07	4.797E-07	2.387E-07	3.367E-11	1.991E+00	1.000E+00	1.397E-04
126	CCX-PMA030	105	9.690E-05	2.354E-07	2.409E-07	4.763E-07	2.354E-07	2.281E-11	1.977E+00	1.000E+00	9.467E-05
127	CVMOD04	111	7.370E-04	2.101E-07	2.408E-07	4.509E-07	2.099E-07	1.548E-10	1.871E+00	1.001E+00	6.427E-04
128	IDABSDK1TM	71	3.000E-04	2.037E-07	2.409E-07	4.445E-07	2.036E-07	6.110E-11	1.845E+00	1.000E+00	2.536E-04
129	OTH-SDMAN	96	7.700E-04	2.036E-07	2.408E-07	4.444E-07	2.035E-07	1.568E-10	1.845E+00	1.001E+00	6.508E-04
130	CVMOD01	75	2.210E-04	2.013E-07	2.409E-07	4.421E-07	2.012E-07	4.448E-11	1.835E+00	1.000E+00	1.846E-04
131	CCX-PMDMOD4	29	4.980E-05	1.895E-07	2.409E-07	4.304E-07	1.895E-07	9.435E-12	1.786E+00	1.000E+00	3.916E-05
132	CCX-PL3MOD1	59	1.410E-04	1.888E-07	2.409E-07	4.297E-07	1.888E-07	2.662E-11	1.784E+00	1.000E+00	1.105E-04
133	EC1BS122TM	235	2.700E-03	1.879E-07	2.404E-07	4.283E-07	1.874E-07	5.073E-10	1.778E+00	1.002E+00	2.106E-03
134	RN55MOD1	362	1.410E-02	1.879E-07	2.383E-07	4.262E-07	1.852E-07	2.649E-09	1.769E+00	1.011E+00	1.100E-02
135	RN23MOD5	362	1.410E-02	1.879E-07	2.383E-07	4.262E-07	1.852E-07	2.649E-09	1.769E+00	1.011E+00	1.100E-02
136	RN11MOD3	362	1.410E-02	1.879E-07	2.383E-07	4.262E-07	1.852E-07	2.649E-09	1.769E+00	1.011E+00	1.100E-02
137	RN22MOD4	362	1.410E-02	1.879E-07	2.383E-07	4.262E-07	1.852E-07	2.649E-09	1.769E+00	1.011E+00	1.100E-02
138	CLP-UNAVAILABLE	299	1.000E-02	1.876E-07	2.390E-07	4.267E-07	1.857E-07	1.876E-09	1.771E+00	1.008E+00	7.787E-03
139	RNX-KV1-GO	207	4.900E-03	1.869E-07	2.400E-07	4.269E-07	1.860E-07	9.160E-10	1.772E+00	1.004E+00	3.802E-03

Table 50-25 (Sheet 4 of 13)

RISK INCREASES SORTED BY SLOPE (BIRNBAUM) IMPORTANCE

140	RHN-MAN01	168	2.900E-03	1.864E-07	2.404E-07	4.268E-07	1.859E-07	5.405E-10	1.771E+00	1.002E+00	2.244E-03
141	RNNCV013GO	142	1.750E-03	1.857E-07	2.406E-07	4.263E-07	1.853E-07	3.249E-10	1.769E+00	1.001E+00	1.349E-03
142	RNX-PM-FS	102	7.700E-04	1.838E-07	2.408E-07	4.246E-07	1.837E-07	1.415E-10	1.762E+00	1.001E+00	5.875E-04
143	RNX-KV-GO	92	6.100E-04	1.833E-07	2.408E-07	4.241E-07	1.832E-07	1.118E-10	1.760E+00	1.000E+00	4.640E-04
144	IDBBSDK1TM	64	3.000E-04	1.803E-07	2.409E-07	4.212E-07	1.803E-07	5.410E-11	1.748E+00	1.000E+00	2.246E-04
145	MDAS	799	1.000E-02	1.800E-07	2.391E-07	4.191E-07	1.782E-07	1.800E-09	1.740E+00	1.008E+00	7.471E-03
146	RNNCV056GO	61	2.190E-04	1.788E-07	2.409E-07	4.197E-07	1.788E-07	3.916E-11	1.742E+00	1.000E+00	1.625E-04
147	CANTP011RI	705	5.230E-03	1.770E-07	2.400E-07	4.170E-07	1.760E-07	9.255E-10	1.731E+00	1.004E+00	3.841E-03
148	RNBEP011SA	50	1.710E-04	1.758E-07	2.409E-07	4.167E-07	1.758E-07	3.007E-11	1.730E+00	1.000E+00	1.248E-04
149	RNDEP023SA	50	1.710E-04	1.758E-07	2.409E-07	4.167E-07	1.758E-07	3.007E-11	1.730E+00	1.000E+00	1.248E-04
150	RNAEP022SA	50	1.710E-04	1.758E-07	2.409E-07	4.167E-07	1.758E-07	3.007E-11	1.730E+00	1.000E+00	1.248E-04
151	CCX-PL303	41	9.690E-05	1.757E-07	2.409E-07	4.166E-07	1.757E-07	1.702E-11	1.729E+00	1.000E+00	7.066E-05
152	CCX-PL4MOD1	49	1.410E-04	1.757E-07	2.409E-07	4.166E-07	1.757E-07	2.477E-11	1.729E+00	1.000E+00	1.028E-04
153	CCX-PL403	47	9.690E-05	1.745E-07	2.409E-07	4.154E-07	1.745E-07	1.691E-11	1.724E+00	1.000E+00	7.019E-05
154	CCX-PLMMOD4	31	4.980E-05	1.736E-07	2.409E-07	4.145E-07	1.736E-07	8.645E-12	1.720E+00	1.000E+00	3.588E-05
155	CCX-PMAMOD4	29	4.980E-05	1.716E-07	2.409E-07	4.125E-07	1.716E-07	8.544E-12	1.712E+00	1.000E+00	3.546E-05
156	RNX-CV-GO	25	5.100E-05	1.699E-07	2.409E-07	4.108E-07	1.699E-07	8.664E-12	1.705E+00	1.000E+00	3.596E-05
157	CCX-PLMMOD4-SW	20	1.100E-05	1.694E-07	2.409E-07	4.104E-07	1.694E-07	1.864E-12	1.703E+00	1.000E+00	7.736E-06
158	CCX-PL4MOD1-SW	19	1.100E-05	1.682E-07	2.409E-07	4.091E-07	1.682E-07	1.850E-12	1.698E+00	1.000E+00	7.680E-06
159	IDAFD004RQ	19	1.200E-05	1.681E-07	2.409E-07	4.090E-07	1.681E-07	2.017E-12	1.698E+00	1.000E+00	8.374E-06
160	IDBFD014RQ	19	1.200E-05	1.681E-07	2.409E-07	4.090E-07	1.681E-07	2.017E-12	1.698E+00	1.000E+00	8.374E-06
161	EC1MOD122	19	1.680E-05	1.681E-07	2.409E-07	4.090E-07	1.681E-07	2.824E-12	1.698E+00	1.000E+00	1.172E-05
162	RNX-PM-ER	19	1.600E-05	1.681E-07	2.409E-07	4.090E-07	1.681E-07	2.689E-12	1.698E+00	1.000E+00	1.116E-05
163	OTH-PRSOV	664	1.000E-02	1.653E-07	2.393E-07	4.046E-07	1.636E-07	1.653E-09	1.679E+00	1.007E+00	6.861E-03
164	CCX-PLSMOD6	84	2.530E-04	1.636E-07	2.409E-07	4.045E-07	1.636E-07	4.140E-11	1.679E+00	1.000E+00	1.718E-04
165	IDABSDK1LF	15	4.800E-06	1.631E-07	2.409E-07	4.040E-07	1.631E-07	7.828E-13	1.677E+00	1.000E+00	3.249E-06
166	ED1BSDS1LF	15	4.800E-06	1.631E-07	2.409E-07	4.040E-07	1.631E-07	7.828E-13	1.677E+00	1.000E+00	3.249E-06
167	IDBBSDK1LF	15	4.800E-06	1.631E-07	2.409E-07	4.040E-07	1.631E-07	7.828E-13	1.677E+00	1.000E+00	3.249E-06
168	SWAMOD09T	82	2.520E-04	1.624E-07	2.409E-07	4.032E-07	1.623E-07	4.091E-11	1.674E+00	1.000E+00	1.698E-04
169	CCX-PL4EH0	14	4.030E-06	1.608E-07	2.409E-07	4.017E-07	1.608E-07	6.480E-13	1.667E+00	1.000E+00	2.690E-06
170	CCX-PMAEH0	14	4.030E-06	1.608E-07	2.409E-07	4.017E-07	1.608E-07	6.480E-13	1.667E+00	1.000E+00	2.690E-06
171	CCX-PMDEH0	14	4.030E-06	1.608E-07	2.409E-07	4.017E-07	1.608E-07	6.480E-13	1.667E+00	1.000E+00	2.690E-06
172	REC-MANDAS	381	1.160E-02	1.574E-07	2.391E-07	3.965E-07	1.555E-07	1.825E-09	1.646E+00	1.008E+00	7.577E-03
173	CCX-PL9MOD1	61	1.410E-04	1.557E-07	2.409E-07	3.966E-07	1.557E-07	2.196E-11	1.646E+00	1.000E+00	9.115E-05
174	CAX-CM-ER	58	1.200E-04	1.556E-07	2.409E-07	3.965E-07	1.556E-07	1.867E-11	1.646E+00	1.000E+00	7.749E-05
175	CCX-PLMOD3	54	1.030E-04	1.552E-07	2.409E-07	3.961E-07	1.552E-07	1.598E-11	1.644E+00	1.000E+00	6.634E-05
176	CCX-PL903	53	9.690E-05	1.551E-07	2.409E-07	3.960E-07	1.550E-07	1.502E-11	1.644E+00	1.000E+00	6.236E-05
177	CCX-PL2MOD5	41	6.980E-05	1.527E-07	2.409E-07	3.936E-07	1.527E-07	1.066E-11	1.634E+00	1.000E+00	4.425E-05
178	CCX-PL3MOD5	40	6.980E-05	1.511E-07	2.409E-07	3.920E-07	1.511E-07	1.055E-11	1.627E+00	1.000E+00	4.378E-05
179	SWX-PM-ER	12	1.400E-05	1.391E-07	2.409E-07	3.800E-07	1.391E-07	1.947E-12	1.577E+00	1.000E+00	8.083E-06
180	ATW-MAN05	5	5.200E-03	1.369E-07	2.402E-07	3.771E-07	1.362E-07	7.118E-10	1.565E+00	1.003E+00	2.954E-03
181	CCX-EAO	10	3.230E-06	1.361E-07	2.409E-07	3.770E-07	1.361E-07	4.396E-13	1.565E+00	1.000E+00	1.825E-06
182	CCX-PLSMOD6-SW	10	1.100E-05	1.359E-07	2.409E-07	3.768E-07	1.359E-07	1.495E-12	1.564E+00	1.000E+00	6.204E-06
183	CCX-PLMOD3-SW	10	1.100E-05	1.359E-07	2.409E-07	3.768E-07	1.359E-07	1.495E-12	1.564E+00	1.000E+00	6.204E-06
184	CCX-PL3MOD5-SW	10	1.100E-05	1.359E-07	2.409E-07	3.768E-07	1.359E-07	1.495E-12	1.564E+00	1.000E+00	6.204E-06
185	CCX-PL9MOD1-SW	10	1.100E-05	1.359E-07	2.409E-07	3.768E-07	1.359E-07	1.495E-12	1.564E+00	1.000E+00	6.204E-06
186	CCX-PL2MOD5-SW	10	1.100E-05	1.359E-07	2.409E-07	3.768E-07	1.359E-07	1.495E-12	1.564E+00	1.000E+00	6.204E-06
187	CCX-EAI	10	1.270E-05	1.357E-07	2.409E-07	3.767E-07	1.357E-07	1.724E-12	1.563E+00	1.000E+00	7.155E-06

Table 50-25 (Sheet 5 of 13)

RISK INCREASES SORTED BY SLOPE (BIRNBAUM) IMPORTANCE

188	SGBAV040LA	276	1.090E-03	1.346E-07	2.408E-07	3.754E-07	1.345E-07	1.467E-10	1.558E+00	1.001E+00	6.091E-04
189	CVX-PM-ER	7	3.700E-05	1.284E-07	2.409E-07	3.693E-07	1.283E-07	4.749E-12	1.533E+00	1.000E+00	1.971E-05
190	CASPPRUPT	6	2.000E-06	1.198E-07	2.409E-07	3.607E-07	1.198E-07	2.396E-13	1.497E+00	1.000E+00	9.945E-07
191	EC2BS002TM	501	2.700E-03	1.173E-07	2.406E-07	3.579E-07	1.169E-07	3.166E-10	1.485E+00	1.001E+00	1.314E-03
192	CCX-HE-AF	4	1.200E-06	1.080E-07	2.409E-07	3.489E-07	1.080E-07	1.296E-13	1.448E+00	1.000E+00	5.379E-07
193	EC2BS022TM	337	2.700E-03	1.048E-07	2.406E-07	3.454E-07	1.045E-07	2.829E-10	1.434E+00	1.001E+00	1.174E-03
194	CCX-BL-ER	2	1.200E-05	1.041E-07	2.409E-07	3.450E-07	1.041E-07	1.249E-12	1.432E+00	1.000E+00	5.184E-06
195	VWX-RF-ER	2	1.200E-05	1.041E-07	2.409E-07	3.450E-07	1.041E-07	1.249E-12	1.432E+00	1.000E+00	5.184E-06
196	CCX-PL3MOD1-SW	2	1.100E-05	1.040E-07	2.409E-07	3.449E-07	1.040E-07	1.144E-12	1.432E+00	1.000E+00	4.748E-06
197	CCX-PL3EH0	2	4.030E-06	1.040E-07	2.409E-07	3.449E-07	1.040E-07	4.190E-13	1.432E+00	1.000E+00	1.739E-06
198	DAS	322	1.000E-02	1.007E-07	2.399E-07	3.406E-07	9.967E-08	1.007E-09	1.414E+00	1.004E+00	4.179E-03
199	CCX-PMBMOD1	75	1.410E-04	9.720E-08	2.409E-07	3.381E-07	9.719E-08	1.371E-11	1.403E+00	1.000E+00	5.689E-05
200	CCX-PMB030	63	9.690E-05	9.547E-08	2.409E-07	3.364E-07	9.546E-08	9.251E-12	1.396E+00	1.000E+00	3.840E-05
201	OTH-SLSOV1	557	2.100E-02	9.277E-08	2.390E-07	3.317E-07	9.082E-08	1.948E-09	1.377E+00	1.008E+00	8.086E-03
202	EC0MOD01	1460	5.080E-03	9.180E-08	2.405E-07	3.323E-07	9.133E-08	4.663E-10	1.379E+00	1.002E+00	1.936E-03
203	EC2BS221TM	260	2.700E-03	9.117E-08	2.407E-07	3.318E-07	9.092E-08	2.462E-10	1.377E+00	1.001E+00	1.022E-03
204	EC1BS121TM	258	2.700E-03	8.138E-08	2.407E-07	3.221E-07	8.116E-08	2.197E-10	1.337E+00	1.001E+00	9.120E-04
205	IWX-EV2-SA	7	5.800E-06	7.947E-08	2.409E-07	3.204E-07	7.947E-08	4.609E-13	1.330E+00	1.000E+00	1.913E-06
206	ATW-MAN03	104	5.200E-02	7.075E-08	2.372E-07	3.080E-07	6.707E-08	3.679E-09	1.278E+00	1.016E+00	1.527E-02
207	ADX-MV-GO	75	7.480E-04	6.857E-08	2.409E-07	3.094E-07	6.852E-08	5.129E-11	1.284E+00	1.000E+00	2.129E-04
208	EC2MOD22	18	4.800E-05	6.821E-08	2.409E-07	3.091E-07	6.821E-08	3.274E-12	1.283E+00	1.000E+00	1.359E-05
209	EC2MOD221	8	1.680E-05	6.514E-08	2.409E-07	3.061E-07	6.514E-08	1.094E-12	1.270E+00	1.000E+00	4.543E-06
210	EC1MOD121	8	1.680E-05	6.514E-08	2.409E-07	3.061E-07	6.514E-08	1.094E-12	1.270E+00	1.000E+00	4.543E-06
211	EC2BS002LF	6	4.800E-06	6.304E-08	2.409E-07	3.040E-07	6.304E-08	3.026E-13	1.262E+00	1.000E+00	1.256E-06
212	IWX-EV4-SA	59	5.800E-05	5.999E-08	2.409E-07	3.009E-07	5.998E-08	3.479E-12	1.249E+00	1.000E+00	1.444E-05
213	ED4MOD11	194	3.170E-04	5.482E-08	2.409E-07	2.957E-07	5.481E-08	1.738E-11	1.227E+00	1.000E+00	7.214E-05
214	ED4BSDS1TM	190	3.000E-04	5.431E-08	2.409E-07	2.952E-07	5.429E-08	1.629E-11	1.225E+00	1.000E+00	6.762E-05
215	OTH-MGSET	29	1.750E-03	5.281E-08	2.408E-07	2.936E-07	5.272E-08	9.242E-11	1.219E+00	1.000E+00	3.836E-04
216	ED4MOD112	172	3.170E-04	5.050E-08	2.409E-07	2.914E-07	5.048E-08	1.601E-11	1.210E+00	1.000E+00	6.644E-05
217	CCX-PMCMOD1	53	1.410E-04	4.766E-08	2.409E-07	2.886E-07	4.765E-08	6.720E-12	1.198E+00	1.000E+00	2.789E-05
218	CCX-PMC030	43	9.690E-05	4.605E-08	2.409E-07	2.870E-07	4.605E-08	4.462E-12	1.191E+00	1.000E+00	1.852E-05
219	CMB-PLUG	11	7.270E-04	4.508E-08	2.409E-07	2.860E-07	4.505E-08	3.277E-11	1.187E+00	1.000E+00	1.360E-04
220	OTH-SLSOV	321	1.100E-02	4.159E-08	2.405E-07	2.821E-07	4.113E-08	4.575E-10	1.171E+00	1.002E+00	1.899E-03
221	OTH-PRES	52	2.000E-03	4.121E-08	2.408E-07	2.821E-07	4.113E-08	8.243E-11	1.171E+00	1.000E+00	3.421E-04
222	CCX-PMDMOD2	51	3.040E-04	4.041E-08	2.409E-07	2.813E-07	4.040E-08	1.229E-11	1.168E+00	1.000E+00	5.099E-05
223	CCX-PMCMOD2	51	3.040E-04	4.041E-08	2.409E-07	2.813E-07	4.040E-08	1.229E-11	1.168E+00	1.000E+00	5.099E-05
224	CCX-PMBMOD2	51	3.040E-04	4.041E-08	2.409E-07	2.813E-07	4.040E-08	1.229E-11	1.168E+00	1.000E+00	5.099E-05
225	CCX-PMAMOD2	51	3.040E-04	4.041E-08	2.409E-07	2.813E-07	4.040E-08	1.229E-11	1.168E+00	1.000E+00	5.099E-05
226	IWB-PLUG	67	2.400E-04	3.961E-08	2.409E-07	2.805E-07	3.960E-08	9.506E-12	1.164E+00	1.000E+00	3.946E-05
227	CMBOR001EB	1	7.200E-07	3.931E-08	2.409E-07	2.802E-07	3.931E-08	2.830E-14	1.163E+00	1.000E+00	1.175E-07
228	CMB-CV	1	2.000E-06	3.925E-08	2.409E-07	2.802E-07	3.925E-08	7.850E-14	1.163E+00	1.000E+00	3.258E-07
229	CMBTK002AF	1	2.400E-06	3.925E-08	2.409E-07	2.802E-07	3.925E-08	9.420E-14	1.163E+00	1.000E+00	3.910E-07
230	FWX-MV2-GO	62	5.500E-04	3.900E-08	2.409E-07	2.799E-07	3.898E-08	2.145E-11	1.162E+00	1.000E+00	8.903E-05
231	FWX-PM2-FS	62	5.400E-04	3.900E-08	2.409E-07	2.799E-07	3.898E-08	2.106E-11	1.162E+00	1.000E+00	8.741E-05
232	RC1CB061GO	186	4.200E-03	3.819E-08	2.408E-07	2.790E-07	3.803E-08	1.604E-10	1.158E+00	1.001E+00	6.658E-04
233	RC1CB053GO	186	4.200E-03	3.819E-08	2.408E-07	2.790E-07	3.803E-08	1.604E-10	1.158E+00	1.001E+00	6.658E-04
234	RC1CB063GO	186	4.200E-03	3.819E-08	2.408E-07	2.790E-07	3.803E-08	1.604E-10	1.158E+00	1.001E+00	6.658E-04
235	RC1CB051GO	186	4.200E-03	3.819E-08	2.408E-07	2.790E-07	3.803E-08	1.604E-10	1.158E+00	1.001E+00	6.658E-04

Table 50-25 (Sheet 6 of 13)

RISK INCREASES SORTED BY SLOPE (BIRNBAUM) IMPORTANCE

236	RPTMOD01	107	8.760E-04	3.585E-08	2.409E-07	2.767E-07	3.582E-08	3.141E-11	1.149E+00	1.000E+00	1.304E-04
237	RPTMOD03	107	8.760E-04	3.585E-08	2.409E-07	2.767E-07	3.582E-08	3.141E-11	1.149E+00	1.000E+00	1.304E-04
238	RPTMOD05	107	8.760E-04	3.585E-08	2.409E-07	2.767E-07	3.582E-08	3.141E-11	1.149E+00	1.000E+00	1.304E-04
239	RPTMOD07	107	8.760E-04	3.585E-08	2.409E-07	2.767E-07	3.582E-08	3.141E-11	1.149E+00	1.000E+00	1.304E-04
240	CCX-PLBMOD1	23	1.410E-04	3.295E-08	2.409E-07	2.739E-07	3.295E-08	4.646E-12	1.137E+00	1.000E+00	1.929E-05
241	CCX-PLB03	19	9.690E-05	3.260E-08	2.409E-07	2.735E-07	3.260E-08	3.159E-12	1.135E+00	1.000E+00	1.311E-05
242	IRWMOD09	67	1.460E-03	3.239E-08	2.409E-07	2.733E-07	3.234E-08	4.728E-11	1.134E+00	1.000E+00	1.963E-04
243	IRWMOD11	67	1.460E-03	3.239E-08	2.409E-07	2.733E-07	3.234E-08	4.728E-11	1.134E+00	1.000E+00	1.963E-04
244	IWARS118BFA	43	8.760E-04	3.185E-08	2.409E-07	2.727E-07	3.183E-08	2.790E-11	1.132E+00	1.000E+00	1.158E-04
245	IWBRS118AFA	43	8.760E-04	3.185E-08	2.409E-07	2.727E-07	3.183E-08	2.790E-11	1.132E+00	1.000E+00	1.158E-04
246	RC1CB052GO	174	4.200E-03	3.092E-08	2.408E-07	2.717E-07	3.079E-08	1.299E-10	1.128E+00	1.001E+00	5.391E-04
247	RC1CB054GO	174	4.200E-03	3.092E-08	2.408E-07	2.717E-07	3.079E-08	1.299E-10	1.128E+00	1.001E+00	5.391E-04
248	RC1CB062GO	146	4.200E-03	3.072E-08	2.408E-07	2.715E-07	3.059E-08	1.290E-10	1.127E+00	1.001E+00	5.355E-04
249	RC1CB064GO	146	4.200E-03	3.072E-08	2.408E-07	2.715E-07	3.059E-08	1.290E-10	1.127E+00	1.001E+00	5.355E-04
250	CCX-PLBMOD1-SW	6	1.100E-05	3.004E-08	2.409E-07	2.710E-07	3.004E-08	3.304E-13	1.125E+00	1.000E+00	1.371E-06
251	IRCEP118ASA	9	1.710E-04	2.852E-08	2.409E-07	2.694E-07	2.852E-08	4.877E-12	1.118E+00	1.000E+00	2.024E-05
252	IRDEP118BSA	9	1.710E-04	2.852E-08	2.409E-07	2.694E-07	2.852E-08	4.877E-12	1.118E+00	1.000E+00	2.024E-05
253	RPTMOD02	77	8.760E-04	2.839E-08	2.409E-07	2.693E-07	2.837E-08	2.487E-11	1.118E+00	1.000E+00	1.032E-04
254	RPTMOD06	77	8.760E-04	2.839E-08	2.409E-07	2.693E-07	2.837E-08	2.487E-11	1.118E+00	1.000E+00	1.032E-04
255	RPTMOD04	77	8.760E-04	2.839E-08	2.409E-07	2.693E-07	2.837E-08	2.487E-11	1.118E+00	1.000E+00	1.032E-04
256	RPTMOD08	77	8.760E-04	2.839E-08	2.409E-07	2.693E-07	2.837E-08	2.487E-11	1.118E+00	1.000E+00	1.032E-04
257	FWX-PM2-ER	4	5.900E-06	2.783E-08	2.409E-07	2.688E-07	2.783E-08	1.642E-13	1.116E+00	1.000E+00	6.816E-07
258	SGX-CV-GO	4	6.400E-06	2.781E-08	2.409E-07	2.687E-07	2.781E-08	1.780E-13	1.115E+00	1.000E+00	7.388E-07
259	FWX-CV2-GO	4	6.400E-06	2.781E-08	2.409E-07	2.687E-07	2.781E-08	1.780E-13	1.115E+00	1.000E+00	7.388E-07
260	SGX-MV-RP	4	7.670E-06	2.780E-08	2.409E-07	2.687E-07	2.780E-08	2.132E-13	1.115E+00	1.000E+00	8.849E-07
261	CCX-PLBEH0	4	4.030E-06	2.779E-08	2.409E-07	2.687E-07	2.779E-08	1.120E-13	1.115E+00	1.000E+00	4.649E-07
262	SGX-AV-FA	4	6.300E-06	2.778E-08	2.409E-07	2.687E-07	2.778E-08	1.750E-13	1.115E+00	1.000E+00	7.264E-07
263	ZANMOD01	54	8.400E-05	2.733E-08	2.409E-07	2.682E-07	2.733E-08	2.296E-12	1.113E+00	1.000E+00	9.528E-06
264	PRAAV108LA	208	1.090E-03	2.668E-08	2.409E-07	2.676E-07	2.665E-08	2.908E-11	1.111E+00	1.000E+00	1.207E-04
265	PRAAV130LA	208	1.090E-03	2.668E-08	2.409E-07	2.676E-07	2.665E-08	2.908E-11	1.111E+00	1.000E+00	1.207E-04
266	PRBAV130LA	208	1.090E-03	2.643E-08	2.409E-07	2.673E-07	2.641E-08	2.881E-11	1.110E+00	1.000E+00	1.196E-04
267	PRBAV108LA	208	1.090E-03	2.643E-08	2.409E-07	2.673E-07	2.641E-08	2.881E-11	1.110E+00	1.000E+00	1.196E-04
268	EC1BS013TM	192	2.700E-03	2.534E-08	2.409E-07	2.662E-07	2.527E-08	6.842E-11	1.105E+00	1.000E+00	2.840E-04
269	EC1BS011TM	329	2.700E-03	2.448E-08	2.409E-07	2.653E-07	2.441E-08	6.608E-11	1.101E+00	1.000E+00	2.743E-04
270	ED3MOD01	102	5.040E-04	2.339E-08	2.409E-07	2.643E-07	2.338E-08	1.179E-11	1.097E+00	1.000E+00	4.893E-05
271	PRBAV130TM	109	5.000E-04	2.339E-08	2.409E-07	2.643E-07	2.337E-08	1.169E-11	1.097E+00	1.000E+00	4.853E-05
272	PRBAV108TM	109	5.000E-04	2.339E-08	2.409E-07	2.643E-07	2.337E-08	1.169E-11	1.097E+00	1.000E+00	4.853E-05
273	PRAAV130TM	109	5.000E-04	2.339E-08	2.409E-07	2.643E-07	2.337E-08	1.169E-11	1.097E+00	1.000E+00	4.853E-05
274	PRAAV108TM	109	5.000E-04	2.339E-08	2.409E-07	2.643E-07	2.337E-08	1.169E-11	1.097E+00	1.000E+00	4.853E-05
275	IRBEP123ASA	16	1.710E-04	2.333E-08	2.409E-07	2.642E-07	2.332E-08	3.989E-12	1.097E+00	1.000E+00	1.656E-05
276	IRBEP123BSA	16	1.710E-04	2.333E-08	2.409E-07	2.642E-07	2.332E-08	3.989E-12	1.097E+00	1.000E+00	1.656E-05
277	ED1MOD03	168	2.700E-03	2.142E-08	2.409E-07	2.623E-07	2.136E-08	5.783E-11	1.089E+00	1.000E+00	2.400E-04
278	CDNTK02AF	2	2.400E-06	2.083E-08	2.409E-07	2.618E-07	2.083E-08	5.000E-14	1.086E+00	1.000E+00	2.075E-07
279	MSHTP001RI	19	5.230E-03	2.054E-08	2.408E-07	2.614E-07	2.044E-08	1.074E-10	1.085E+00	1.000E+00	4.460E-04
280	MSHTP002RI	19	5.230E-03	2.054E-08	2.408E-07	2.614E-07	2.044E-08	1.074E-10	1.085E+00	1.000E+00	4.460E-04
281	IEV-LCAS	417	3.480E-02	1.932E-08	2.402E-07	2.596E-07	1.865E-08	6.725E-10	1.077E+00	1.003E+00	2.791E-03
282	EC2BS023TM	101	2.700E-03	1.795E-08	2.409E-07	2.588E-07	1.790E-08	4.846E-11	1.074E+00	1.000E+00	2.011E-04
283	ED3BSDS1TM	65	3.000E-04	1.742E-08	2.409E-07	2.583E-07	1.741E-08	5.226E-12	1.072E+00	1.000E+00	2.169E-05

Table 50-25 (Sheet 7 of 13)

RISK INCREASES SORTED BY SLOPE (BIRNBAUM) IMPORTANCE

284	ED2BSDS1TM	52	3.000E-04	1.633E-08	2.409E-07	2.572E-07	1.632E-08	4.898E-12	1.068E+00	1.000E+00	2.033E-05
285	ED2MOD11	48	3.170E-04	1.576E-08	2.409E-07	2.567E-07	1.576E-08	4.997E-12	1.065E+00	1.000E+00	2.074E-05
286	OTH-PRESU	15	2.000E-03	1.561E-08	2.409E-07	2.565E-07	1.557E-08	3.121E-11	1.065E+00	1.000E+00	1.295E-04
287	IEV-SLB-D	18	5.960E-04	1.535E-08	2.409E-07	2.563E-07	1.534E-08	9.150E-12	1.064E+00	1.000E+00	3.798E-05
288	OTH-SLSOV3	511	5.400E-03	1.519E-08	2.408E-07	2.560E-07	1.510E-08	8.201E-11	1.063E+00	1.000E+00	3.404E-04
289	REC-MANDASC	723	5.060E-01	1.516E-08	2.333E-07	2.484E-07	7.487E-09	7.669E-09	1.031E+00	1.033E+00	3.183E-02
290	ZOX-PD-ES	93	2.000E-03	1.404E-08	2.409E-07	2.549E-07	1.402E-08	2.809E-11	1.058E+00	1.000E+00	1.166E-04
291	OTH-SLSOV2	97	1.000E-02	1.399E-08	2.408E-07	2.548E-07	1.385E-08	1.399E-10	1.057E+00	1.001E+00	5.807E-04
292	ZANTR-2AHF	14	2.880E-05	1.233E-08	2.409E-07	2.532E-07	1.233E-08	3.550E-13	1.051E+00	1.000E+00	1.474E-06
293	ECX-CB-GC	48	7.300E-04	1.227E-08	2.409E-07	2.532E-07	1.226E-08	8.957E-12	1.051E+00	1.000E+00	3.718E-05
294	OTH-SGTR1	75	6.700E-03	1.196E-08	2.408E-07	2.528E-07	1.188E-08	8.014E-11	1.049E+00	1.000E+00	3.326E-04
295	CONDVACUUM	35	1.000E-03	1.132E-08	2.409E-07	2.522E-07	1.131E-08	1.132E-11	1.047E+00	1.000E+00	4.698E-05
296	ZOX-DG-DR	36	4.400E-04	1.115E-08	2.409E-07	2.521E-07	1.115E-08	4.908E-12	1.046E+00	1.000E+00	2.037E-05
297	ECX-CB-GO	34	4.200E-04	1.112E-08	2.409E-07	2.520E-07	1.111E-08	4.669E-12	1.046E+00	1.000E+00	1.938E-05
298	IEV-LCOND	858	1.120E-01	1.111E-08	2.397E-07	2.508E-07	9.862E-09	1.244E-09	1.041E+00	1.005E+00	5.163E-03
299	EC1BS112TM	62	2.700E-03	1.090E-08	2.409E-07	2.518E-07	1.087E-08	2.942E-11	1.045E+00	1.000E+00	1.221E-04
300	EC1BS131TM	62	2.700E-03	1.090E-08	2.409E-07	2.518E-07	1.087E-08	2.942E-11	1.045E+00	1.000E+00	1.221E-04
301	IDDMOD32	67	3.170E-04	1.081E-08	2.409E-07	2.517E-07	1.081E-08	3.428E-12	1.045E+00	1.000E+00	1.423E-05
302	EC2BS021TM	89	2.700E-03	1.033E-08	2.409E-07	2.512E-07	1.030E-08	2.789E-11	1.043E+00	1.000E+00	1.158E-04
303	IDAMOD04	53	3.170E-04	1.014E-08	2.409E-07	2.511E-07	1.014E-08	3.215E-12	1.042E+00	1.000E+00	1.335E-05
304	ED1MOD01	35	5.040E-04	1.000E-08	2.409E-07	2.509E-07	9.997E-09	5.041E-12	1.041E+00	1.000E+00	2.092E-05
305	VWBMOD05	158	2.190E-02	9.985E-09	2.407E-07	2.507E-07	9.766E-09	2.187E-10	1.041E+00	1.001E+00	9.076E-04
306	VWBMOD04	141	1.830E-02	9.910E-09	2.407E-07	2.506E-07	9.729E-09	1.814E-10	1.040E+00	1.001E+00	7.527E-04
307	SWAMOD03	44	6.340E-04	9.692E-09	2.409E-07	2.506E-07	9.686E-09	6.145E-12	1.040E+00	1.000E+00	2.550E-05
308	IDBMOD24	42	3.170E-04	9.625E-09	2.409E-07	2.505E-07	9.622E-09	3.051E-12	1.040E+00	1.000E+00	1.266E-05
309	IDCMOD28	42	3.170E-04	9.625E-09	2.409E-07	2.505E-07	9.622E-09	3.051E-12	1.040E+00	1.000E+00	1.266E-05
310	RNAMOD09	160	5.070E-02	9.436E-09	2.404E-07	2.499E-07	8.958E-09	4.784E-10	1.037E+00	1.002E+00	1.986E-03
311	RNBMOD10	160	5.070E-02	9.436E-09	2.404E-07	2.499E-07	8.958E-09	4.784E-10	1.037E+00	1.002E+00	1.986E-03
312	VWN-MAN01	33	5.160E-03	8.947E-09	2.409E-07	2.498E-07	8.901E-09	4.617E-11	1.037E+00	1.000E+00	1.916E-04
313	VWBMOD06	33	5.180E-03	8.939E-09	2.409E-07	2.498E-07	8.893E-09	4.630E-11	1.037E+00	1.000E+00	1.922E-04
314	ED1MOD07	31	3.050E-04	8.922E-09	2.409E-07	2.498E-07	8.919E-09	2.721E-12	1.037E+00	1.000E+00	1.130E-05
315	ED1MOD13	31	3.170E-04	8.917E-09	2.409E-07	2.498E-07	8.914E-09	2.827E-12	1.037E+00	1.000E+00	1.173E-05
316	EC2BS212TM	31	2.700E-03	8.884E-09	2.409E-07	2.498E-07	8.860E-09	2.399E-11	1.037E+00	1.000E+00	9.956E-05
317	EC2BS231TM	31	2.700E-03	8.884E-09	2.409E-07	2.498E-07	8.860E-09	2.399E-11	1.037E+00	1.000E+00	9.956E-05
318	CCX-IV-XR1	6	2.400E-05	8.821E-09	2.409E-07	2.497E-07	8.821E-09	2.117E-13	1.037E+00	1.000E+00	8.787E-07
319	IEV-LOSP	530	1.200E-01	7.981E-09	2.400E-07	2.479E-07	7.023E-09	9.577E-10	1.029E+00	1.004E+00	3.975E-03
320	PMDMOD11	186	2.090E-03	7.809E-09	2.409E-07	2.487E-07	7.793E-09	1.632E-11	1.032E+00	1.000E+00	6.775E-05
321	VWAMOD02	14	6.120E-04	7.732E-09	2.409E-07	2.486E-07	7.727E-09	4.732E-12	1.032E+00	1.000E+00	1.964E-05
322	CANAV014LA	88	8.760E-03	7.581E-09	2.409E-07	2.484E-07	7.514E-09	6.641E-11	1.031E+00	1.000E+00	2.756E-04
323	IEV-ATWS	136	4.810E-01	7.495E-09	2.373E-07	2.448E-07	3.890E-09	3.605E-09	1.016E+00	1.015E+00	1.496E-02
324	IEV-ATW-S	55	1.480E-02	7.475E-09	2.408E-07	2.483E-07	7.364E-09	1.106E-10	1.031E+00	1.000E+00	4.592E-04
325	RNAMOD06	312	3.400E-02	7.420E-09	2.407E-07	2.481E-07	7.167E-09	2.523E-10	1.030E+00	1.001E+00	1.047E-03
326	PMAMOD11	190	2.090E-03	7.405E-09	2.409E-07	2.483E-07	7.389E-09	1.548E-11	1.031E+00	1.000E+00	6.424E-05
327	ZOX-DG-DS	20	2.800E-04	7.319E-09	2.409E-07	2.482E-07	7.317E-09	2.049E-12	1.030E+00	1.000E+00	8.507E-06
328	PLMMOD41	33	6.350E-04	7.247E-09	2.409E-07	2.482E-07	7.243E-09	4.602E-12	1.030E+00	1.000E+00	1.910E-05
329	CDNTF01BRI	82	5.230E-03	7.195E-09	2.409E-07	2.481E-07	7.157E-09	3.763E-11	1.030E+00	1.000E+00	1.562E-04
330	CCAMOD03	26	6.140E-04	7.159E-09	2.409E-07	2.481E-07	7.155E-09	4.396E-12	1.030E+00	1.000E+00	1.825E-05
331	CIAEP014SA	8	1.710E-04	7.147E-09	2.409E-07	2.481E-07	7.146E-09	1.222E-12	1.030E+00	1.000E+00	5.073E-06

Table 50-25 (Sheet 8 of 13)

RISK INCREASES SORTED BY SLOPE (BIRNBAUM) IMPORTANCE

332	RNBMOD07	199	3.400E-02	6.901E-09	2.407E-07	2.476E-07	6.667E-09	2.346E-10	1.028E+00	1.001E+00	9.739E-04
333	PMD0301ASA	113	1.160E-03	6.897E-09	2.409E-07	2.478E-07	6.889E-09	8.001E-12	1.029E+00	1.000E+00	3.321E-05
334	PMD0301BSA	103	1.160E-03	6.712E-09	2.409E-07	2.476E-07	6.704E-09	7.786E-12	1.028E+00	1.000E+00	3.232E-05
335	ATW-MAN04C	34	5.260E-01	6.695E-09	2.374E-07	2.441E-07	3.174E-09	3.522E-09	1.013E+00	1.015E+00	1.462E-02
336	PMA0301ASA	110	1.160E-03	6.475E-09	2.409E-07	2.474E-07	6.467E-09	7.511E-12	1.027E+00	1.000E+00	3.117E-05
337	PMA0301BSA	100	1.160E-03	6.289E-09	2.409E-07	2.472E-07	6.282E-09	7.296E-12	1.026E+00	1.000E+00	3.028E-05
338	PMBMOD11	112	2.090E-03	6.037E-09	2.409E-07	2.469E-07	6.024E-09	1.262E-11	1.025E+00	1.000E+00	5.237E-05
339	IDDMOD33	63	5.160E-04	5.936E-09	2.409E-07	2.469E-07	5.933E-09	3.063E-12	1.025E+00	1.000E+00	1.271E-05
340	RNAEP01ASA	19	1.710E-04	5.848E-09	2.409E-07	2.468E-07	5.847E-09	1.000E-12	1.024E+00	1.000E+00	4.151E-06
341	VWAMOD01	6	2.520E-04	5.758E-09	2.409E-07	2.467E-07	5.756E-09	1.451E-12	1.024E+00	1.000E+00	6.023E-06
342	VWAMOD03	6	2.520E-04	5.758E-09	2.409E-07	2.467E-07	5.756E-09	1.451E-12	1.024E+00	1.000E+00	6.023E-06
343	PMCMOD11	97	2.090E-03	5.729E-09	2.409E-07	2.466E-07	5.717E-09	1.197E-11	1.024E+00	1.000E+00	4.970E-05
344	ZO1DG001TM	762	4.600E-02	5.727E-09	2.407E-07	2.464E-07	5.463E-09	2.634E-10	1.023E+00	1.001E+00	1.093E-03
345	PMAMOD31	46	5.020E-03	5.707E-09	2.409E-07	2.466E-07	5.679E-09	2.865E-11	1.024E+00	1.000E+00	1.189E-04
346	PMBMOD32	46	5.020E-03	5.707E-09	2.409E-07	2.466E-07	5.679E-09	2.865E-11	1.024E+00	1.000E+00	1.189E-04
347	RNAEP01BSA	17	1.710E-04	5.699E-09	2.409E-07	2.466E-07	5.698E-09	9.745E-13	1.024E+00	1.000E+00	4.045E-06
348	CVBPM01BTM	68	2.190E-02	5.457E-09	2.408E-07	2.463E-07	5.338E-09	1.195E-10	1.022E+00	1.000E+00	4.961E-04
349	PMBMOD21	98	4.070E-03	5.373E-09	2.409E-07	2.463E-07	5.351E-09	2.187E-11	1.022E+00	1.000E+00	9.077E-05
350	PMDMOD21	98	4.070E-03	5.373E-09	2.409E-07	2.463E-07	5.351E-09	2.187E-11	1.022E+00	1.000E+00	9.077E-05
351	PMCMOD21	98	4.070E-03	5.373E-09	2.409E-07	2.463E-07	5.351E-09	2.187E-11	1.022E+00	1.000E+00	9.077E-05
352	PMAMOD21	98	4.070E-03	5.373E-09	2.409E-07	2.463E-07	5.351E-09	2.187E-11	1.022E+00	1.000E+00	9.077E-05
353	MSX-AV2-FA	44	2.310E-03	5.315E-09	2.409E-07	2.462E-07	5.303E-09	1.228E-11	1.022E+00	1.000E+00	5.096E-05
354	CVMOD03	44	1.120E-02	5.308E-09	2.409E-07	2.462E-07	5.249E-09	5.945E-11	1.022E+00	1.000E+00	2.468E-04
355	PL3MOD11	20	2.090E-03	5.297E-09	2.409E-07	2.462E-07	5.286E-09	1.107E-11	1.022E+00	1.000E+00	4.595E-05
356	IDAMOD05	47	5.160E-04	5.203E-09	2.409E-07	2.461E-07	5.200E-09	2.685E-12	1.022E+00	1.000E+00	1.114E-05
357	PMB0301ASA	60	1.160E-03	5.177E-09	2.409E-07	2.461E-07	5.171E-09	6.005E-12	1.021E+00	1.000E+00	2.492E-05
358	PMC0301ASA	60	1.160E-03	5.177E-09	2.409E-07	2.461E-07	5.171E-09	6.005E-12	1.021E+00	1.000E+00	2.492E-05
359	ZO1MOD01	439	2.020E-02	5.150E-09	2.408E-07	2.460E-07	5.046E-09	1.040E-10	1.021E+00	1.000E+00	4.318E-04
360	PMB0301BSA	58	1.160E-03	5.149E-09	2.409E-07	2.461E-07	5.143E-09	5.973E-12	1.021E+00	1.000E+00	2.479E-05
361	PMC0301BSA	58	1.160E-03	5.149E-09	2.409E-07	2.461E-07	5.143E-09	5.973E-12	1.021E+00	1.000E+00	2.479E-05
362	CVMOD02	13	1.410E-03	5.121E-09	2.409E-07	2.460E-07	5.113E-09	7.220E-12	1.021E+00	1.000E+00	2.997E-05
363	PMCMOD33	27	5.020E-03	5.057E-09	2.409E-07	2.460E-07	5.032E-09	2.539E-11	1.021E+00	1.000E+00	1.054E-04
364	PMDMOD34	27	5.020E-03	5.057E-09	2.409E-07	2.460E-07	5.032E-09	2.539E-11	1.021E+00	1.000E+00	1.054E-04
365	CANCV015GC	415	2.450E-02	4.976E-09	2.408E-07	2.458E-07	4.854E-09	1.219E-10	1.020E+00	1.001E+00	5.060E-04
366	DUMP-MAN01	31	1.320E-03	4.945E-09	2.409E-07	2.459E-07	4.939E-09	6.528E-12	1.020E+00	1.000E+00	2.709E-05
367	ZOX-PD-ER	6	1.300E-04	4.850E-09	2.409E-07	2.458E-07	4.849E-09	6.305E-13	1.020E+00	1.000E+00	2.617E-06
368	IDCMOD29	39	5.160E-04	4.837E-09	2.409E-07	2.458E-07	4.834E-09	2.496E-12	1.020E+00	1.000E+00	1.036E-05
369	IDBMOD25	39	5.160E-04	4.837E-09	2.409E-07	2.458E-07	4.834E-09	2.496E-12	1.020E+00	1.000E+00	1.036E-05
370	PL30301ASA	12	1.160E-03	4.756E-09	2.409E-07	2.457E-07	4.751E-09	5.517E-12	1.020E+00	1.000E+00	2.290E-05
371	EC1BS111TM	163	2.700E-03	4.704E-09	2.409E-07	2.456E-07	4.691E-09	1.270E-11	1.019E+00	1.000E+00	5.272E-05
372	REACV119GO	79	1.750E-03	4.693E-09	2.409E-07	2.456E-07	4.685E-09	8.213E-12	1.019E+00	1.000E+00	3.409E-05
373	REBCV119GO	79	1.750E-03	4.693E-09	2.409E-07	2.456E-07	4.685E-09	8.213E-12	1.019E+00	1.000E+00	3.409E-05
374	PL30301BSA	11	1.160E-03	4.670E-09	2.409E-07	2.456E-07	4.664E-09	5.417E-12	1.019E+00	1.000E+00	2.248E-05
375	IRWMOD10	71	1.460E-03	4.649E-09	2.409E-07	2.456E-07	4.643E-09	6.788E-12	1.019E+00	1.000E+00	2.818E-05
376	IRWMOD12	71	1.460E-03	4.649E-09	2.409E-07	2.456E-07	4.643E-09	6.788E-12	1.019E+00	1.000E+00	2.818E-05
377	EC2MOD23	8	4.800E-05	4.613E-09	2.409E-07	2.455E-07	4.612E-09	2.214E-13	1.019E+00	1.000E+00	9.190E-07
378	EC1MOD13	8	4.800E-05	4.613E-09	2.409E-07	2.455E-07	4.612E-09	2.214E-13	1.019E+00	1.000E+00	9.190E-07
379	CCX-BY-PN1	5	5.700E-05	4.589E-09	2.409E-07	2.455E-07	4.589E-09	2.616E-13	1.019E+00	1.000E+00	1.086E-06

Table 50-25 (Sheet 9 of 13)

RISK INCREASES SORTED BY SLOPE (BIRNBAUM) IMPORTANCE

380	FSMOD255A	14	5.800E-04	4.424E-09	2.409E-07	2.453E-07	4.422E-09	2.566E-12	1.018E+00	1.000E+00	1.065E-05
381	CASMOD01	63	2.410E-03	4.384E-09	2.409E-07	2.453E-07	4.374E-09	1.057E-11	1.018E+00	1.000E+00	4.386E-05
382	IWCRS120BFA	44	8.760E-04	4.127E-09	2.409E-07	2.450E-07	4.124E-09	3.616E-12	1.017E+00	1.000E+00	1.501E-05
383	IWDRS120AFA	44	8.760E-04	4.127E-09	2.409E-07	2.450E-07	4.124E-09	3.616E-12	1.017E+00	1.000E+00	1.501E-05
384	PL2MOD11	12	2.090E-03	4.127E-09	2.409E-07	2.450E-07	4.118E-09	8.625E-12	1.017E+00	1.000E+00	3.580E-05
385	CVN-MAN03	11	1.070E-03	4.064E-09	2.409E-07	2.450E-07	4.060E-09	4.349E-12	1.017E+00	1.000E+00	1.805E-05
386	PRAMOD9	51	1.410E-02	4.007E-09	2.409E-07	2.449E-07	3.951E-09	5.650E-11	1.016E+00	1.000E+00	2.345E-04
387	ADN-MAN01C	13	5.000E-01	3.993E-09	2.389E-07	2.429E-07	1.996E-09	1.996E-09	1.008E+00	1.008E+00	8.287E-03
388	CV3EPCPASA	4	1.710E-04	3.901E-09	2.409E-07	2.448E-07	3.900E-09	6.670E-13	1.016E+00	1.000E+00	2.769E-06
389	PL20301ASA	8	1.160E-03	3.822E-09	2.409E-07	2.447E-07	3.817E-09	4.433E-12	1.016E+00	1.000E+00	1.840E-05
390	PL20301BSA	8	1.160E-03	3.822E-09	2.409E-07	2.447E-07	3.817E-09	4.433E-12	1.016E+00	1.000E+00	1.840E-05
391	PMBXS00ASA	12	8.000E-05	3.709E-09	2.409E-07	2.446E-07	3.708E-09	2.967E-13	1.015E+00	1.000E+00	1.232E-06
392	PMAXS00ASA	12	8.000E-05	3.709E-09	2.409E-07	2.446E-07	3.708E-09	2.967E-13	1.015E+00	1.000E+00	1.232E-06
393	PMDXS00ASA	12	8.000E-05	3.709E-09	2.409E-07	2.446E-07	3.708E-09	2.967E-13	1.015E+00	1.000E+00	1.232E-06
394	PMCXS00ASA	12	8.000E-05	3.709E-09	2.409E-07	2.446E-07	3.708E-09	2.967E-13	1.015E+00	1.000E+00	1.232E-06
395	CMAAV014LA	17	1.590E-03	3.653E-09	2.409E-07	2.446E-07	3.647E-09	5.809E-12	1.015E+00	1.000E+00	2.411E-05
396	CMAAV015LA	17	1.590E-03	3.653E-09	2.409E-07	2.446E-07	3.647E-09	5.809E-12	1.015E+00	1.000E+00	2.411E-05
397	EC1CB100VO	133	4.200E-03	3.638E-09	2.409E-07	2.445E-07	3.623E-09	1.528E-11	1.015E+00	1.000E+00	6.342E-05
398	VW2EPTRBSA	4	1.710E-04	3.556E-09	2.409E-07	2.445E-07	3.555E-09	6.080E-13	1.015E+00	1.000E+00	2.524E-06
399	CCX-PL2MOD1	4	1.410E-04	3.546E-09	2.409E-07	2.445E-07	3.546E-09	5.000E-13	1.015E+00	1.000E+00	2.075E-06
400	MSX-AV4-FA	3	2.000E-04	3.430E-09	2.409E-07	2.443E-07	3.429E-09	6.860E-13	1.014E+00	1.000E+00	2.847E-06
401	MSAEPSD5SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	5.860E-13	1.014E+00	1.000E+00	2.432E-06
402	MSAEPSD6SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	5.860E-13	1.014E+00	1.000E+00	2.432E-06
403	MSAEPSD4SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	5.860E-13	1.014E+00	1.000E+00	2.432E-06
404	MSAEPSD7SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	5.860E-13	1.014E+00	1.000E+00	2.432E-06
405	MSAEPSD2SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	5.860E-13	1.014E+00	1.000E+00	2.432E-06
406	MSAEPSD8SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	5.860E-13	1.014E+00	1.000E+00	2.432E-06
407	MSAEPSD3SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	5.860E-13	1.014E+00	1.000E+00	2.432E-06
408	MSAEPSD1SA	3	1.710E-04	3.427E-09	2.409E-07	2.443E-07	3.426E-09	5.860E-13	1.014E+00	1.000E+00	2.432E-06
409	ED3MOD03	104	2.700E-03	3.426E-09	2.409E-07	2.443E-07	3.416E-09	9.249E-12	1.014E+00	1.000E+00	3.839E-05
410	PRAMOD10	19	2.110E-03	3.423E-09	2.409E-07	2.443E-07	3.416E-09	7.223E-12	1.014E+00	1.000E+00	2.998E-05
411	PRBMOD10	19	2.110E-03	3.423E-09	2.409E-07	2.443E-07	3.416E-09	7.223E-12	1.014E+00	1.000E+00	2.998E-05
412	ED2MOD03	71	2.700E-03	3.370E-09	2.409E-07	2.443E-07	3.361E-09	9.100E-12	1.014E+00	1.000E+00	3.777E-05
413	CVMOD05	163	2.880E-02	3.197E-09	2.408E-07	2.440E-07	3.105E-09	9.207E-11	1.013E+00	1.000E+00	3.821E-04
414	CVMOD07	148	2.710E-02	3.195E-09	2.408E-07	2.440E-07	3.109E-09	8.660E-11	1.013E+00	1.000E+00	3.594E-04
415	CA9EPCMPASA	10	1.710E-04	3.138E-09	2.409E-07	2.441E-07	3.137E-09	5.366E-13	1.013E+00	1.000E+00	2.227E-06
416	LPM-MAN01C	5	5.000E-01	3.044E-09	2.394E-07	2.424E-07	1.522E-09	1.522E-09	1.006E+00	1.006E+00	6.317E-03
417	WLOAV006LA	52	8.760E-03	2.682E-09	2.409E-07	2.436E-07	2.658E-09	2.349E-11	1.011E+00	1.000E+00	9.750E-05
418	WLOAV057LA	52	8.760E-03	2.682E-09	2.409E-07	2.436E-07	2.658E-09	2.349E-11	1.011E+00	1.000E+00	9.750E-05
419	WLIAV004LA	52	8.760E-03	2.682E-09	2.409E-07	2.436E-07	2.658E-09	2.349E-11	1.011E+00	1.000E+00	9.750E-05
420	WLIAV055LA	52	8.760E-03	2.682E-09	2.409E-07	2.436E-07	2.658E-09	2.349E-11	1.011E+00	1.000E+00	9.750E-05
421	ZO1MOD04	47	1.250E-03	2.652E-09	2.409E-07	2.436E-07	2.649E-09	3.315E-12	1.011E+00	1.000E+00	1.376E-05
422	IEV-LMFW	1334	3.350E-01	2.596E-09	2.401E-07	2.426E-07	1.726E-09	8.697E-10	1.007E+00	1.004E+00	3.610E-03
423	REG-MAN00	232	2.040E-01	2.560E-09	2.404E-07	2.430E-07	2.038E-09	5.223E-10	1.008E+00	1.002E+00	2.168E-03
424	EC1CB100RQ	2	1.440E-05	2.535E-09	2.409E-07	2.435E-07	2.535E-09	3.650E-14	1.011E+00	1.000E+00	1.515E-07
425	CCX-PLAMOD1	6	1.410E-04	2.527E-09	2.409E-07	2.434E-07	2.527E-09	3.563E-13	1.010E+00	1.000E+00	1.479E-06
426	EC1MOD11	4	4.800E-05	2.496E-09	2.409E-07	2.434E-07	2.496E-09	1.198E-13	1.010E+00	1.000E+00	4.973E-07
427	AD4MOD08D	42	8.760E-04	2.405E-09	2.409E-07	2.433E-07	2.402E-09	2.106E-12	1.010E+00	1.000E+00	8.743E-06

Table 50-25 (Sheet 10 of 13)

RISK INCREASES SORTED BY SLOPE (BIRNBAUM) IMPORTANCE

428	AD4MOD09C	42	8.760E-04	2.405E-09	2.409E-07	2.433E-07	2.402E-09	2.106E-12	1.010E+00	1.000E+00	8.743E-06
429	AD4MOD07C	42	8.760E-04	2.405E-09	2.409E-07	2.433E-07	2.402E-09	2.106E-12	1.010E+00	1.000E+00	8.743E-06
430	AD4MOD10D	42	8.760E-04	2.405E-09	2.409E-07	2.433E-07	2.402E-09	2.106E-12	1.010E+00	1.000E+00	8.743E-06
431	IEV-LMFW1	763	1.920E-01	2.359E-09	2.405E-07	2.428E-07	1.906E-09	4.528E-10	1.008E+00	1.002E+00	1.880E-03
432	CCX-PLA03	4	9.690E-05	2.341E-09	2.409E-07	2.433E-07	2.340E-09	2.268E-13	1.010E+00	1.000E+00	9.414E-07
433	HPM-MAN01	6	5.020E-04	2.298E-09	2.409E-07	2.432E-07	2.296E-09	1.153E-12	1.010E+00	1.000E+00	4.787E-06
434	PRDEP108SA	2	1.710E-04	2.251E-09	2.409E-07	2.432E-07	2.251E-09	3.850E-13	1.009E+00	1.000E+00	1.598E-06
435	PRCEP101SA	2	1.710E-04	2.251E-09	2.409E-07	2.432E-07	2.251E-09	3.850E-13	1.009E+00	1.000E+00	1.598E-06
436	PRCEP108SA	2	1.710E-04	2.251E-09	2.409E-07	2.432E-07	2.251E-09	3.850E-13	1.009E+00	1.000E+00	1.598E-06
437	PRI-MAN01	2	4.960E-04	2.250E-09	2.409E-07	2.432E-07	2.249E-09	1.116E-12	1.009E+00	1.000E+00	4.632E-06
438	IEV-LCCW	690	1.440E-01	2.241E-09	2.406E-07	2.428E-07	1.919E-09	3.228E-10	1.008E+00	1.001E+00	1.340E-03
439	IEV-TRANS	1500	1.400E+00	2.203E-09	2.378E-07	2.400E-07	-8.814E-10	3.085E-09	9.963E-01	1.013E+00	1.280E-02
440	ADF-MAN01	374	5.000E-01	2.029E-09	2.399E-07	2.419E-07	1.015E-09	1.015E-09	1.004E+00	1.004E+00	4.212E-03
441	IEV-LRCS	143	1.800E-02	1.957E-09	2.409E-07	2.428E-07	1.921E-09	3.522E-11	1.008E+00	1.000E+00	1.462E-04
442	ZOX-BL-ES	1	6.000E-05	1.867E-09	2.409E-07	2.428E-07	1.867E-09	1.120E-13	1.008E+00	1.000E+00	4.649E-07
443	CCX-PLDMOD1	1	1.410E-04	1.851E-09	2.409E-07	2.428E-07	1.851E-09	2.610E-13	1.008E+00	1.000E+00	1.083E-06
444	CCX-PLD03	1	9.690E-05	1.847E-09	2.409E-07	2.428E-07	1.847E-09	1.790E-13	1.008E+00	1.000E+00	7.430E-07
445	CV3EPCPBSA	2	1.710E-04	1.778E-09	2.409E-07	2.427E-07	1.777E-09	3.040E-13	1.007E+00	1.000E+00	1.262E-06
446	FWMOD03A	184	1.700E-02	1.626E-09	2.409E-07	2.425E-07	1.598E-09	2.764E-11	1.007E+00	1.000E+00	1.147E-04
447	PL4MOD11	71	2.090E-03	1.604E-09	2.409E-07	2.425E-07	1.601E-09	3.353E-12	1.007E+00	1.000E+00	1.392E-05
448	FWMOD013A	155	1.410E-02	1.590E-09	2.409E-07	2.425E-07	1.568E-09	2.242E-11	1.007E+00	1.000E+00	9.307E-05
449	ZO2DG002TM	230	4.600E-02	1.468E-09	2.409E-07	2.423E-07	1.401E-09	6.755E-11	1.006E+00	1.000E+00	2.804E-04
450	FWMOD03B	154	1.700E-02	1.407E-09	2.409E-07	2.423E-07	1.383E-09	2.392E-11	1.006E+00	1.000E+00	9.927E-05
451	ATW-MAN06C	1	5.000E-01	1.390E-09	2.402E-07	2.416E-07	6.950E-10	6.950E-10	1.003E+00	1.003E+00	2.885E-03
452	FWMOD013B	135	1.410E-02	1.384E-09	2.409E-07	2.423E-07	1.365E-09	1.952E-11	1.006E+00	1.000E+00	8.101E-05
453	OTH-R05	530	7.000E-01	1.368E-09	2.400E-07	2.413E-07	4.105E-10	9.577E-10	1.002E+00	1.004E+00	3.975E-03
454	SWN-MAN03	55	4.000E-02	1.333E-09	2.409E-07	2.422E-07	1.280E-09	5.333E-11	1.005E+00	1.000E+00	2.214E-04
455	PL40301ASA	43	1.160E-03	1.319E-09	2.409E-07	2.422E-07	1.317E-09	1.530E-12	1.005E+00	1.000E+00	6.350E-06
456	PL9MOD11	46	2.090E-03	1.318E-09	2.409E-07	2.422E-07	1.315E-09	2.754E-12	1.005E+00	1.000E+00	1.143E-05
457	ZO2MOD01	112	2.020E-02	1.236E-09	2.409E-07	2.421E-07	1.211E-09	2.496E-11	1.005E+00	1.000E+00	1.036E-04
458	PL9MOD12	32	2.090E-03	1.220E-09	2.409E-07	2.421E-07	1.217E-09	2.550E-12	1.005E+00	1.000E+00	1.058E-05
459	PMDMOD41	29	6.350E-04	1.183E-09	2.409E-07	2.421E-07	1.182E-09	7.510E-13	1.005E+00	1.000E+00	3.117E-06
460	PL40301BSA	35	1.160E-03	1.161E-09	2.409E-07	2.421E-07	1.160E-09	1.347E-12	1.005E+00	1.000E+00	5.591E-06
461	PL90301ASA	32	1.160E-03	1.127E-09	2.409E-07	2.420E-07	1.126E-09	1.307E-12	1.005E+00	1.000E+00	5.427E-06
462	EC2BS222TM	29	2.700E-03	1.121E-09	2.409E-07	2.420E-07	1.118E-09	3.026E-12	1.005E+00	1.000E+00	1.256E-05
463	SG2TF50ARI	18	5.230E-03	1.120E-09	2.409E-07	2.420E-07	1.114E-09	5.855E-12	1.005E+00	1.000E+00	2.430E-05
464	SGBAV074LA	79	8.760E-03	1.089E-09	2.409E-07	2.420E-07	1.080E-09	9.542E-12	1.004E+00	1.000E+00	3.961E-05
465	SGBAV075LA	79	8.760E-03	1.089E-09	2.409E-07	2.420E-07	1.080E-09	9.542E-12	1.004E+00	1.000E+00	3.961E-05
466	PL3MOD51	24	8.740E-04	1.046E-09	2.409E-07	2.420E-07	1.045E-09	9.138E-13	1.004E+00	1.000E+00	3.793E-06
467	PL90301BSA	28	1.160E-03	1.002E-09	2.409E-07	2.419E-07	1.001E-09	1.162E-12	1.004E+00	1.000E+00	4.824E-06
468	PMAMOD12	56	2.090E-03	9.911E-10	2.409E-07	2.419E-07	9.890E-10	2.071E-12	1.004E+00	1.000E+00	8.598E-06
469	PL90302ASA	16	1.160E-03	9.731E-10	2.409E-07	2.419E-07	9.720E-10	1.129E-12	1.004E+00	1.000E+00	4.685E-06
470	PMDMOD12	53	2.090E-03	9.717E-10	2.409E-07	2.419E-07	9.697E-10	2.031E-12	1.004E+00	1.000E+00	8.430E-06
471	CASMOD02	101	2.310E-02	9.210E-10	2.409E-07	2.418E-07	8.997E-10	2.128E-11	1.004E+00	1.000E+00	8.831E-05
472	ED2MOD01	12	5.040E-04	8.750E-10	2.409E-07	2.418E-07	8.746E-10	4.410E-13	1.004E+00	1.000E+00	1.830E-06
473	FWACV012GO	8	2.190E-04	8.658E-10	2.409E-07	2.418E-07	8.656E-10	1.896E-13	1.004E+00	1.000E+00	7.870E-07
474	FWBCV012GO	8	2.190E-04	8.658E-10	2.409E-07	2.418E-07	8.656E-10	1.896E-13	1.004E+00	1.000E+00	7.870E-07
475	ED3MOD11	8	3.170E-04	8.656E-10	2.409E-07	2.418E-07	8.653E-10	2.744E-13	1.004E+00	1.000E+00	1.139E-06

Table 50-25 (Sheet 11 of 13)

RISK INCREASES SORTED BY SLOPE (BIRNBAUM) IMPORTANCE

476	ED3MOD111	8	3.170E-04	8.656E-10	2.409E-07	2.418E-07	8.653E-10	2.744E-13	1.004E+00	1.000E+00	1.139E-06
477	ED4MOD111	8	3.170E-04	8.656E-10	2.409E-07	2.418E-07	8.653E-10	2.744E-13	1.004E+00	1.000E+00	1.139E-06
478	PL90302BSA	12	1.160E-03	8.479E-10	2.409E-07	2.418E-07	8.469E-10	9.836E-13	1.004E+00	1.000E+00	4.083E-06
479	AD4MOD10B	16	8.760E-04	7.664E-10	2.409E-07	2.417E-07	7.658E-10	6.714E-13	1.003E+00	1.000E+00	2.787E-06
480	AD4MOD08B	16	8.760E-04	7.664E-10	2.409E-07	2.417E-07	7.658E-10	6.714E-13	1.003E+00	1.000E+00	2.787E-06
481	AD4MOD07A	16	8.760E-04	7.664E-10	2.409E-07	2.417E-07	7.658E-10	6.714E-13	1.003E+00	1.000E+00	2.787E-06
482	AD4MOD09A	16	8.760E-04	7.664E-10	2.409E-07	2.417E-07	7.658E-10	6.714E-13	1.003E+00	1.000E+00	2.787E-06
483	SFBEPSFPBSA	6	1.710E-04	7.661E-10	2.409E-07	2.417E-07	7.660E-10	1.310E-13	1.003E+00	1.000E+00	5.437E-07
484	SFBEP013ASA	6	1.710E-04	7.661E-10	2.409E-07	2.417E-07	7.660E-10	1.310E-13	1.003E+00	1.000E+00	5.437E-07
485	SFBEPSFPASA	6	1.710E-04	7.661E-10	2.409E-07	2.417E-07	7.660E-10	1.310E-13	1.003E+00	1.000E+00	5.437E-07
486	SFBEP013BSA	6	1.710E-04	7.661E-10	2.409E-07	2.417E-07	7.660E-10	1.310E-13	1.003E+00	1.000E+00	5.437E-07
487	EC2CB200VO	21	4.200E-03	7.334E-10	2.409E-07	2.417E-07	7.303E-10	3.080E-12	1.003E+00	1.000E+00	1.279E-05
488	PL4MOD12	41	2.090E-03	7.288E-10	2.409E-07	2.416E-07	7.272E-10	1.523E-12	1.003E+00	1.000E+00	6.322E-06
489	PLSMOD61	26	3.460E-03	7.103E-10	2.409E-07	2.416E-07	7.078E-10	2.458E-12	1.003E+00	1.000E+00	1.020E-05
490	PL2MOD51	16	8.740E-04	6.970E-10	2.409E-07	2.416E-07	6.964E-10	6.092E-13	1.003E+00	1.000E+00	2.529E-06
491	PMD0302ASA	28	1.160E-03	6.935E-10	2.409E-07	2.416E-07	6.927E-10	8.045E-13	1.003E+00	1.000E+00	3.339E-06
492	PMA0302ASA	28	1.160E-03	6.935E-10	2.409E-07	2.416E-07	6.927E-10	8.045E-13	1.003E+00	1.000E+00	3.339E-06
493	CABCM00BTM	20	1.500E-03	6.929E-10	2.409E-07	2.416E-07	6.919E-10	1.039E-12	1.003E+00	1.000E+00	4.314E-06
494	PLSMOD62	20	3.460E-03	6.649E-10	2.409E-07	2.416E-07	6.626E-10	2.300E-12	1.003E+00	1.000E+00	9.548E-06
495	IEV-ATW-T	13	1.170E+00	6.086E-10	2.402E-07	2.408E-07	-1.035E-10	7.120E-10	9.996E-01	1.003E+00	2.955E-03
496	FWA-CV-EO	4	1.000E-04	5.930E-10	2.409E-07	2.415E-07	5.929E-10	5.930E-14	1.002E+00	1.000E+00	2.461E-07
497	PL2MOD52	3	8.740E-04	5.684E-10	2.409E-07	2.415E-07	5.679E-10	4.968E-13	1.002E+00	1.000E+00	2.062E-06
498	AD3MOD03	75	5.640E-02	5.307E-10	2.409E-07	2.414E-07	5.008E-10	2.993E-11	1.002E+00	1.000E+00	1.242E-04
499	AD3MOD04	75	5.640E-02	5.307E-10	2.409E-07	2.414E-07	5.008E-10	2.993E-11	1.002E+00	1.000E+00	1.242E-04
500	AD2MOD01	75	5.640E-02	5.307E-10	2.409E-07	2.414E-07	5.008E-10	2.993E-11	1.002E+00	1.000E+00	1.242E-04
501	AD2MOD02	75	5.640E-02	5.307E-10	2.409E-07	2.414E-07	5.008E-10	2.993E-11	1.002E+00	1.000E+00	1.242E-04
502	ED3MOD04	73	2.190E-02	5.306E-10	2.409E-07	2.414E-07	5.190E-10	1.162E-11	1.002E+00	1.000E+00	4.824E-05
503	PMA0302BSA	18	1.160E-03	5.082E-10	2.409E-07	2.414E-07	5.076E-10	5.895E-13	1.002E+00	1.000E+00	2.447E-06
504	PMD0302BSA	18	1.160E-03	5.082E-10	2.409E-07	2.414E-07	5.076E-10	5.895E-13	1.002E+00	1.000E+00	2.447E-06
505	PL7MOD12	2	2.090E-03	5.029E-10	2.409E-07	2.414E-07	5.018E-10	1.051E-12	1.002E+00	1.000E+00	4.362E-06
506	PL70302ASA	2	1.160E-03	5.026E-10	2.409E-07	2.414E-07	5.020E-10	5.830E-13	1.002E+00	1.000E+00	2.420E-06
507	PL70302BSA	2	1.160E-03	5.026E-10	2.409E-07	2.414E-07	5.020E-10	5.830E-13	1.002E+00	1.000E+00	2.420E-06
508	PL40302ASA	21	1.160E-03	4.944E-10	2.409E-07	2.414E-07	4.938E-10	5.735E-13	1.002E+00	1.000E+00	2.380E-06
509	PMAMOD41	11	6.350E-04	4.176E-10	2.409E-07	2.413E-07	4.174E-10	2.652E-13	1.002E+00	1.000E+00	1.101E-06
510	ZO2MOD04	7	1.250E-03	4.053E-10	2.409E-07	2.413E-07	4.048E-10	5.066E-13	1.002E+00	1.000E+00	2.103E-06
511	PL3MOD12	4	2.090E-03	3.895E-10	2.409E-07	2.413E-07	3.887E-10	8.140E-13	1.002E+00	1.000E+00	3.379E-06
512	EC2BS211TM	28	2.700E-03	3.860E-10	2.409E-07	2.413E-07	3.850E-10	1.042E-12	1.002E+00	1.000E+00	4.326E-06
513	PL40302BSA	13	1.160E-03	3.369E-10	2.409E-07	2.413E-07	3.365E-10	3.908E-13	1.001E+00	1.000E+00	1.622E-06
514	PLBMOD11	20	2.090E-03	3.319E-10	2.409E-07	2.413E-07	3.312E-10	6.936E-13	1.001E+00	1.000E+00	2.879E-06
515	PMBMOD12	17	2.090E-03	3.157E-10	2.409E-07	2.412E-07	3.151E-10	6.599E-13	1.001E+00	1.000E+00	2.739E-06
516	VFOAV009	8	8.760E-03	3.066E-10	2.409E-07	2.412E-07	3.039E-10	2.686E-12	1.001E+00	1.000E+00	1.115E-05
517	VFIAV004	8	8.760E-03	3.066E-10	2.409E-07	2.412E-07	3.039E-10	2.686E-12	1.001E+00	1.000E+00	1.115E-05
518	VFIAV010	8	8.760E-03	3.066E-10	2.409E-07	2.412E-07	3.039E-10	2.686E-12	1.001E+00	1.000E+00	1.115E-05
519	VFOAV003	8	8.760E-03	3.066E-10	2.409E-07	2.412E-07	3.039E-10	2.686E-12	1.001E+00	1.000E+00	1.115E-05
520	ED1MOD06	8	3.480E-04	3.063E-10	2.409E-07	2.412E-07	3.062E-10	1.066E-13	1.001E+00	1.000E+00	4.425E-07
521	ATW-MAN04	26	5.200E-02	2.974E-10	2.409E-07	2.412E-07	2.819E-10	1.547E-11	1.001E+00	1.000E+00	6.419E-05
522	PLB0301ASA	16	1.160E-03	2.928E-10	2.409E-07	2.412E-07	2.924E-10	3.396E-13	1.001E+00	1.000E+00	1.410E-06
523	IDDMOD38	6	3.170E-04	2.845E-10	2.409E-07	2.412E-07	2.845E-10	9.020E-14	1.001E+00	1.000E+00	3.744E-07

Table 50-25 (Sheet 12 of 13)

RISK INCREASES SORTED BY SLOPE (BIRNBAUM) IMPORTANCE

524	IDAMOD08	6	3.170E-04	2.845E-10	2.409E-07	2.412E-07	2.845E-10	9.020E-14	1.001E+00	1.000E+00	3.744E-07
525	ED3MOD06	1	3.480E-04	2.819E-10	2.409E-07	2.412E-07	2.818E-10	9.810E-14	1.001E+00	1.000E+00	4.072E-07
526	ZO1MOD03	2	1.000E-04	2.810E-10	2.409E-07	2.412E-07	2.810E-10	2.810E-14	1.001E+00	1.000E+00	1.166E-07
527	PMDMOD22	17	4.070E-03	2.693E-10	2.409E-07	2.412E-07	2.682E-10	1.096E-12	1.001E+00	1.000E+00	4.549E-06
528	PMCMOD22	17	4.070E-03	2.693E-10	2.409E-07	2.412E-07	2.682E-10	1.096E-12	1.001E+00	1.000E+00	4.549E-06
529	PMBMOD22	17	4.070E-03	2.693E-10	2.409E-07	2.412E-07	2.682E-10	1.096E-12	1.001E+00	1.000E+00	4.549E-06
530	PMAMOD22	17	4.070E-03	2.693E-10	2.409E-07	2.412E-07	2.682E-10	1.096E-12	1.001E+00	1.000E+00	4.549E-06
531	PLB0301BSA	14	1.160E-03	2.686E-10	2.409E-07	2.412E-07	2.683E-10	3.116E-13	1.001E+00	1.000E+00	1.293E-06
532	PMCMOD12	14	2.090E-03	2.598E-10	2.409E-07	2.412E-07	2.593E-10	5.430E-13	1.001E+00	1.000E+00	2.254E-06
533	CVBEP081SA	3	1.710E-04	2.462E-10	2.409E-07	2.412E-07	2.462E-10	4.210E-14	1.001E+00	1.000E+00	1.747E-07
534	CVAEP084SA	3	1.710E-04	2.462E-10	2.409E-07	2.412E-07	2.462E-10	4.210E-14	1.001E+00	1.000E+00	1.747E-07
535	PL30302ASA	2	1.160E-03	2.414E-10	2.409E-07	2.412E-07	2.411E-10	2.800E-13	1.001E+00	1.000E+00	1.162E-06
536	CCBMOD01	48	4.800E-02	2.259E-10	2.409E-07	2.411E-07	2.150E-10	1.084E-11	1.001E+00	1.000E+00	4.500E-05
537	SGAOR--DAS-SP	7	7.220E-03	2.203E-10	2.409E-07	2.411E-07	2.187E-10	1.590E-12	1.001E+00	1.000E+00	6.601E-06
538	SGBOR--DAS-SP	7	7.220E-03	2.203E-10	2.409E-07	2.411E-07	2.187E-10	1.590E-12	1.001E+00	1.000E+00	6.601E-06
539	SWB-001TM	34	3.800E-02	2.149E-10	2.409E-07	2.411E-07	2.068E-10	8.168E-12	1.001E+00	1.000E+00	3.390E-05
540	SWBMOD02	31	2.440E-02	2.109E-10	2.409E-07	2.411E-07	2.057E-10	5.145E-12	1.001E+00	1.000E+00	2.136E-05
541	PMC0302ASA	8	1.160E-03	2.081E-10	2.409E-07	2.411E-07	2.079E-10	2.414E-13	1.001E+00	1.000E+00	1.002E-06
542	PMB0302ASA	8	1.160E-03	2.081E-10	2.409E-07	2.411E-07	2.079E-10	2.414E-13	1.001E+00	1.000E+00	1.002E-06
543	SGATL--DAS-UF	5	5.230E-03	2.038E-10	2.409E-07	2.411E-07	2.027E-10	1.066E-12	1.001E+00	1.000E+00	4.423E-06
544	SGBTL--DAS-UF	5	5.230E-03	2.038E-10	2.409E-07	2.411E-07	2.027E-10	1.066E-12	1.001E+00	1.000E+00	4.423E-06
545	IWBCV124AO	9	1.750E-03	2.011E-10	2.409E-07	2.411E-07	2.007E-10	3.519E-13	1.001E+00	1.000E+00	1.461E-06
546	IRWMOD08	7	1.460E-03	1.877E-10	2.409E-07	2.411E-07	1.875E-10	2.741E-13	1.001E+00	1.000E+00	1.138E-06
547	PMC0302BSA	6	1.160E-03	1.803E-10	2.409E-07	2.411E-07	1.800E-10	2.091E-13	1.001E+00	1.000E+00	8.679E-07
548	PMB0302BSA	6	1.160E-03	1.803E-10	2.409E-07	2.411E-07	1.800E-10	2.091E-13	1.001E+00	1.000E+00	8.679E-07
549	PL30302BSA	1	1.160E-03	1.552E-10	2.409E-07	2.411E-07	1.550E-10	1.800E-13	1.001E+00	1.000E+00	7.471E-07
550	EC1MOD01	1	6.910E-05	1.505E-10	2.409E-07	2.411E-07	1.505E-10	1.040E-14	1.001E+00	1.000E+00	4.317E-08
551	ED1MOD02	2	1.920E-04	1.490E-10	2.409E-07	2.411E-07	1.489E-10	2.860E-14	1.001E+00	1.000E+00	1.187E-07
552	PLAMOD12	4	2.090E-03	1.336E-10	2.409E-07	2.411E-07	1.333E-10	2.792E-13	1.001E+00	1.000E+00	1.159E-06
553	MSMODV003	14	2.710E-02	1.201E-10	2.409E-07	2.410E-07	1.169E-10	3.255E-12	1.000E+00	1.000E+00	1.351E-05
554	MSMODV001	14	2.710E-02	1.201E-10	2.409E-07	2.410E-07	1.169E-10	3.255E-12	1.000E+00	1.000E+00	1.351E-05
555	PLBMOD12	8	2.090E-03	1.065E-10	2.409E-07	2.410E-07	1.063E-10	2.226E-13	1.000E+00	1.000E+00	9.240E-07
556	IDCMOD37	2	3.170E-04	1.013E-10	2.409E-07	2.410E-07	1.012E-10	3.210E-14	1.000E+00	1.000E+00	1.332E-07
557	IDBMOD36	2	3.170E-04	1.013E-10	2.409E-07	2.410E-07	1.012E-10	3.210E-14	1.000E+00	1.000E+00	1.332E-07
558	OTH-BL	23	1.900E-01	9.931E-11	2.409E-07	2.410E-07	8.044E-11	1.887E-11	1.000E+00	1.000E+00	7.832E-05
559	ED4MOD03	2	2.700E-03	9.111E-11	2.409E-07	2.410E-07	9.087E-11	2.460E-13	1.000E+00	1.000E+00	1.021E-06
560	PLA0302ASA	2	1.160E-03	7.517E-11	2.409E-07	2.410E-07	7.509E-11	8.720E-14	1.000E+00	1.000E+00	3.619E-07
561	PLA0302BSA	2	1.160E-03	7.517E-11	2.409E-07	2.410E-07	7.509E-11	8.720E-14	1.000E+00	1.000E+00	3.619E-07
562	ED2MOD07	2	3.050E-04	7.213E-11	2.409E-07	2.410E-07	7.211E-11	2.200E-14	1.000E+00	1.000E+00	9.132E-08
563	ED2MOD13	2	3.170E-04	7.192E-11	2.409E-07	2.410E-07	7.190E-11	2.280E-14	1.000E+00	1.000E+00	9.464E-08
564	ED2MOD06	2	3.480E-04	7.184E-11	2.409E-07	2.410E-07	7.181E-11	2.500E-14	1.000E+00	1.000E+00	1.038E-07
565	PLB0302ASA	4	1.160E-03	6.776E-11	2.409E-07	2.410E-07	6.768E-11	7.860E-14	1.000E+00	1.000E+00	3.262E-07
566	SWBMOD11P	6	1.410E-02	6.383E-11	2.409E-07	2.410E-07	6.293E-11	9.000E-13	1.000E+00	1.000E+00	3.736E-06
567	CASMOD03	10	2.310E-02	6.295E-11	2.409E-07	2.410E-07	6.150E-11	1.454E-12	1.000E+00	1.000E+00	6.036E-06
568	CMBAV014LA	1	1.590E-03	6.239E-11	2.409E-07	2.410E-07	6.229E-11	9.920E-14	1.000E+00	1.000E+00	4.118E-07
569	CMBAV015LA	1	1.590E-03	6.239E-11	2.409E-07	2.410E-07	6.229E-11	9.920E-14	1.000E+00	1.000E+00	4.118E-07
570	ATW-MAN01C	9	5.170E-01	5.922E-11	2.409E-07	2.409E-07	2.860E-11	3.062E-11	1.000E+00	1.000E+00	1.271E-04
571	IWBCV122AO	3	1.750E-03	5.297E-11	2.409E-07	2.410E-07	5.288E-11	9.270E-14	1.000E+00	1.000E+00	3.848E-07

Table 50-25 (Sheet 13 of 13)

RISK INCREASES SORTED BY SLOPE (BIRNBAUM) IMPORTANCE

572	IRWMOD07	3	1.460E-03	5.295E-11	2.409E-07	2.410E-07	5.287E-11	7.730E-14	1.000E+00	1.000E+00	3.209E-07
573	EC3BS003TM	1	2.700E-03	4.667E-11	2.409E-07	2.410E-07	4.654E-11	1.260E-13	1.000E+00	1.000E+00	5.230E-07
574	VFSFRAC	16	1.200E-01	4.476E-11	2.409E-07	2.410E-07	3.939E-11	5.371E-12	1.000E+00	1.000E+00	2.229E-05
575	PLB0302BSA	2	1.160E-03	4.362E-11	2.409E-07	2.410E-07	4.357E-11	5.060E-14	1.000E+00	1.000E+00	2.100E-07
576	IWCRS125BFA	2	8.760E-04	4.167E-11	2.409E-07	2.410E-07	4.163E-11	3.650E-14	1.000E+00	1.000E+00	1.515E-07
577	IWARS123BFA	2	8.760E-04	4.167E-11	2.409E-07	2.410E-07	4.163E-11	3.650E-14	1.000E+00	1.000E+00	1.515E-07
578	SGAAV040LA	2	1.090E-03	3.706E-11	2.409E-07	2.410E-07	3.702E-11	4.040E-14	1.000E+00	1.000E+00	1.677E-07
579	PLMMOD42	2	6.350E-04	3.512E-11	2.409E-07	2.410E-07	3.510E-11	2.230E-14	1.000E+00	1.000E+00	9.256E-08
580	PMDMOD42	2	6.350E-04	3.512E-11	2.409E-07	2.410E-07	3.510E-11	2.230E-14	1.000E+00	1.000E+00	9.256E-08
581	PMAMOD42	2	6.350E-04	3.512E-11	2.409E-07	2.410E-07	3.510E-11	2.230E-14	1.000E+00	1.000E+00	9.256E-08
582	SFNMV067GC	14	1.100E-02	3.182E-11	2.409E-07	2.410E-07	3.147E-11	3.500E-13	1.000E+00	1.000E+00	1.453E-06
583	ATW-MAN01	6	3.300E-02	1.802E-11	2.409E-07	2.409E-07	1.743E-11	5.947E-13	1.000E+00	1.000E+00	2.468E-06
584	CVX-MV-GC2	4	4.400E-03	1.684E-11	2.409E-07	2.409E-07	1.677E-11	7.410E-14	1.000E+00	1.000E+00	3.076E-07
585	CVN-MAN02	2	1.580E-03	1.570E-11	2.409E-07	2.409E-07	1.567E-11	2.480E-14	1.000E+00	1.000E+00	1.029E-07
586	CCAMOD02	1	7.100E-03	1.352E-11	2.409E-07	2.409E-07	1.343E-11	9.600E-14	1.000E+00	1.000E+00	3.985E-07
587	AD1MOD06	11	5.640E-02	1.251E-11	2.409E-07	2.409E-07	1.181E-11	7.057E-13	1.000E+00	1.000E+00	2.929E-06
588	SGBAV057LA	1	1.090E-03	1.000E-11	2.409E-07	2.409E-07	9.989E-12	1.090E-14	1.000E+00	1.000E+00	4.524E-08
589	TCBMOD01B	1	2.520E-02	5.000E-12	2.409E-07	2.409E-07	4.874E-12	1.260E-13	1.000E+00	1.000E+00	5.230E-07
590	IDBMOD27	6	2.190E-02	3.973E-12	2.409E-07	2.409E-07	3.886E-12	8.700E-14	1.000E+00	1.000E+00	3.611E-07
591	IDAMOD07	6	2.190E-02	3.973E-12	2.409E-07	2.409E-07	3.886E-12	8.700E-14	1.000E+00	1.000E+00	3.611E-07
592	IDCMOD31	6	2.190E-02	3.973E-12	2.409E-07	2.409E-07	3.886E-12	8.700E-14	1.000E+00	1.000E+00	3.611E-07
593	IDDMOD35	6	2.190E-02	3.973E-12	2.409E-07	2.409E-07	3.886E-12	8.700E-14	1.000E+00	1.000E+00	3.611E-07
594	CVNMV091GC	11	8.760E-02	2.499E-12	2.409E-07	2.409E-07	2.280E-12	2.189E-13	1.000E+00	1.000E+00	9.086E-07
595	CVNMV090GC	11	8.760E-02	2.499E-12	2.409E-07	2.409E-07	2.280E-12	2.189E-13	1.000E+00	1.000E+00	9.086E-07
596	ATW-MAN06	1	5.200E-03	2.173E-12	2.409E-07	2.409E-07	2.162E-12	1.130E-14	1.000E+00	1.000E+00	4.690E-08
597	AD1MOD05	6	5.640E-02	1.555E-12	2.409E-07	2.409E-07	1.467E-12	8.770E-14	1.000E+00	1.000E+00	3.640E-07
598	SGBAV250LA	1	8.760E-03	1.244E-12	2.409E-07	2.409E-07	1.233E-12	1.090E-14	1.000E+00	1.000E+00	4.524E-08
599	SGBCV058GC	1	2.450E-02	4.449E-13	2.409E-07	2.409E-07	4.340E-13	1.090E-14	1.000E+00	1.000E+00	4.524E-08

CHAPTER 54

LOW-POWER AND SHUTDOWN RISK ASSESSMENT

54.1 Introduction

This section provides an assessment of the risk to the AP1000 during low-power and shutdown conditions. In the AP600 PRA, an evaluation of the risk associated with low-power and shutdown conditions was provided in Chapter 54 of the AP600 PRA. The AP600 shutdown PRA provided the basis for this AP1000 shutdown PRA assessment.

The evaluation, which covers shutdown and low-power operation, encompasses operation when the reactor is in a subcritical state or is in transition between subcriticality and power operation up to 5 percent of rated power. The evaluation addresses conditions for which there is fuel in the reactor vessel and includes aspects of nuclear steam supply, the containment, and all systems that support the nuclear steam supply and containment. However, the evaluation does not address events involving fuel handling outside of the containment and fuel storage in the fuel storage building.

The AP600 shutdown PRA was performed in accordance with the requirements outlined in the EPRI ALWR Utility Requirements Document, which specified that a simplified assessment of the risk of the plant should be performed for shutdown conditions. In addition to the initial AP600 shutdown PRA provided in Chapter 54, three additional shutdown PRA assessments were performed and submitted to the NRC as Attachments A, B and C to Chapter 54. These attachments addressed design changes incorporated in the AP600 subsequent to the shutdown PRA, as well as changes in PRA modeling which resulted from NRC questions concerning shutdown phenomena such as surge line flooding.

The results of the AP600 shutdown PRA quantification of the core damage frequency and large early release frequency from internal events that can occur during shutdown modes, (including the three attachments described above) were reported as follows:

Core damage frequency from events at shutdown:	1.04 E-07 per year
Large early release frequency from events at shutdown:	1.5 E-08 per year

These results demonstrate that the risk to the AP600 plant during shutdown was very low. The AP1000 design is based extensively on the AP600. Moreover, the AP1000 systems and equipment designed to protect the plant during shutdown modes have the same configuration as those of the AP600. Appendix E of Chapter 19 provides a description of the AP1000 systems and equipment that are designed to function during shutdown modes.

The AP1000 shutdown PRA is based on the results of the AP600 Level 1 shutdown PRA, in that the cutset results of the AP600 shutdown PRA are used as the starting point for making the necessary changes to reflect the AP1000 design and operating cycle. Similar to the AP600 PRA documentation, in the AP1000 shutdown PRA report, the events during hot/cold shutdown conditions are grouped and referred to as non-drained events, and events during drain down of the RCS and when the plant is at mid-loop are referred to as drained events.

The AP1000 shutdown PRA model is created by incorporating the changes reflected in Attachments A, B and C to the AP600 PRA Chapter 54, and making any additional modifications to the PRA model necessary to reflect the AP1000. The two most significant modeling changes incorporated for AP1000 are:

- Modification to the initiating event frequencies to reflect an 18-month refueling cycle for AP1000 versus the 24-month refueling cycle assumed for the AP600
- Modification to the modeling of the passive residual heat removal system (PRHR) to require operation of the containment gutter isolation valves to change position to assure PRHR success. The AP1000 shutdown PRA has assumed that the success of the PRHR is dependent on the gutter isolation valves closing, thus re-directing condensate from the steel containment shell to the in-containment refueling water storage tank (IRWST), and thus providing the heat sink for the PRHR heat exchanger. As the gutter isolation valves are air-operated, as are the PRHR isolation valves, the major impact of this modeling change was accounted for in the AP1000 shutdown model by doubling the common-cause failure probability of the air-operated valves used in the AP600 model. This modeling change was also incorporated in the AP1000 at-power PRA model.

54.2 Data Analysis

There are no fault trees developed specifically for the AP1000 shutdown model. The data used in the AP600 shutdown model (i.e., the cutset results) are used in the AP1000 shutdown evaluation, with the exception of the revised initiating event frequencies and common-cause failure probability of the PRHR system air-operated valves.

The data used in developing the initiating event frequencies for the AP1000 Level 1 shutdown evaluation is discussed in this section. This data is based on the maintenance frequencies calculated for the AP600 shutdown PRA and the 18-month refueling cycle for the AP1000.

The yearly frequencies of the AP1000 plant in hot/cold shutdown conditions and drained conditions are as follows:

- Non-drained maintenance frequency – 1.8 events per year
- Drained maintenance frequency – 0.38 events per year
- Refueling outage frequency – 0.69 events per year

The refueling outage frequency is estimated by taking the product of the controlled shutdown frequency (1.8) and the percentage of controlled shutdowns that takes the plant to refueling mode (1%), summed with the refueling cycle frequency (0.67). Thus, the AP1000 refueling outage frequency is: 0.67 + (1.8 x 0.01) = 0.69 events per year.

From these frequencies, the yearly frequencies of the AP1000 in hot/cold and mid-loop conditions are estimated as follows:

- Yearly frequency of AP1000 in hot/cold shutdown condition: 1.8 + 0.38 + 0.69 = 2.87
- Yearly frequency of AP1000 in mid-loop condition: 0.38 + 0.69 = 1.07.

54.3 Initiating Event Analysis

Based on these yearly frequencies of the AP1000 plant in non-drained and drained shutdown conditions, the calculated initiating event frequencies for events during these conditions are shown in Table 54-1.

54.4 Event Tree/Mitigation System Evaluation

The accident sequences for the AP1000 shutdown model are based on the event trees used in the AP600 model. The accident sequences for events during non-drained conditions and during drained conditions are presented in Figures 54-1 through 54-10.

The various mitigation systems credited in the shutdown accident sequences of the AP600 plant are also applied to the AP1000 model. Several system or modeling changes are required for the AP1000. These system and modeling changes are evaluated in Table 54-2 to assess their effects on the AP1000 shutdown model.

Endstates: The sequences in the event trees in Figures 54-1 through 54-10 lead to endstates "OK," "LP-ADS," "LP-3D," "LP-3BE," "LP-3BL," and 'LP-CBP". These low power event endstates are described as follows:

OK	Sequence does NOT lead to core damage
LP-ADS	Sequence leads to core damage; RCS is not fully depressurized to permit gravity injection
LP-3D	Sequence leads to core damage; RCS depressurization is partially failed to not permit gravity injection
LP-3BE	Sequence leads to core damage; RCS is fully depressurized with failure of gravity injection prior to core damage
LP-3BL	Sequence leads to core damage; RCS is fully depressurized, gravity injection succeeds, but containment sump recirculation fails prior to core damage
LP-CBP	Sequence leads to containment bypass event.

54.5 Common Cause Analysis Update for AP1000

The common-cause events that are modified or clarified in creating the AP1000 shutdown model are discussed in this section. The other common-cause failures (CCFs) are assumed to be the same for the AP600 and AP1000 plants.

IWX-MV-GO1/IWX-EV-SA: In the early versions of the AP600 shutdown PRA, the basic event IWX-MV-GO1 was used to model "CCF of 4 of 4 IRWST injection motor-operated valves (MOVs) to open" with a failure probability of 5.5E-04. In Attachments A, B and C to the AP600 shutdown PRA, later analyses were performed to evaluate the design changes following the initial shutdown PRA. One such sensitivity was the change of the these

4 MOVs to squib values, which was considered by changing the CCF probability of 4 of 4 IRWST injection MOVs to the CCF probability of 4 of 4 IRWST injection squib valves. This was accomplished by changing the failure probability of basic event IWX-MV-GO1 to 2.6E-05 and its description to reflect the CCF of IRWST injection squib valves. However, in the internal documentation, the CCF of 4 of 4 IRWST injection squib valves was designated by IWX-EV-SA with the failure probability of 2.6E-05. The AP1000 PRA shows basic event IWX-EV-SA as CCF of 6 of 6 high pressure (HP) squib valves with the same failure probability of 2.6E-05. The CCF group of 6 reflects the change of the low pressure (LP) squib valves (120A/B) in the recirculation lines to HP squib valves similar to those in the IRWST injection lines. In preparing the AP600 cutset file for use as the starting point in creating the AP1000 shutdown model, the basic event IWX-MV-GO1 is changed to IWX-EV-SA with a failure probability of 2.6E-05 and description "CCF of IRWST HP squib valves."

IWX-EV4-SA: Based on the AP600 design changes after the initial AP600 shutdown PRA submittal, valves 118A/B and 120A/B in the recirculation lines were changed to low pressure squib valves, and CCF of these valves was designated by IWX-EV4-SA (CCF of 4 of 4 sump recirculation low-pressure (LP) squib valves (EVs) with a probability of 2.6E-05. However, as discussed with the staff during the review of the AP600 PRA, the squib valves 120A/B are designed for higher pressure than low-pressure squib valves 118A/B, and therefore IWX-EV4-SA is recalculated to reflect CCF of 2 of 2 LP squib valves (118A/B); the new failure probability is 5.8E-05. Note that in the AP600 design, IWX-EV4-SA is among the dominant shutdown risk contributors in the top 5 cutsets consisting of 2 elements. With the recognition of the diversity between valves 118A/B and 120A/B, IWX-EV4-SA will no longer be among the 2-element cutsets since the common-cause failure of valves 118A/B by themselves will not prevent sump recirculation; one of several combinations of valves in the recirculation lines will have to also fail. Such combinations of check valves, motor-operated valves and squib valves have a much lower probability than that reflected in the model. Therefore, retaining the cutsets from the AP600 design with IWX-EV4-SA set to 2.6E-05 provides a conservative AP1000 shutdown model. In other words, no credit is taken in the AP1000 shutdown assessment for the improved AP1000 design in using diverse squib valves in containment sump recirculation lines.

PXX-AV-LA: In the AP600 model, PXX-AV-LA is used in the PRHR system fault trees to represents CCF of air-operated valves PXS-V108A/B with a failure probability of 9.6E-05. In the AP1000 design, success of the PRHR system requires operation of two additional valves (i.e., IRWST gutter air-operated valves (AOVs). CCF of these gutter valves is designated by PXX-AV-LA1 with a failure probability of 9.6E-05 also. Since the AP1000 shutdown evaluation is done by manipulating the cutsets from the AP600 model, PXX-AV-LA is doubled (i.e., set to 1.92E-04) in the cutsets representing the AP1000 model. Note that, with this change, the core damage frequency (CDF) is essentially the same; the CDF changed from 1.23E-07 to 1.231E-07.

This method is acceptable, since examination of the cutsets of the revised PRHR at-power fault tree for the AP1000 shows that the system failure probability is twice the AP600 value and the dominant contributors are common-cause failure of the air-operated valves.

54.6 Human Reliability Assessment for AP1000

The operator actions and human error probabilities for events during AP1000 shutdown conditions are judged to be similar for the AP600 plant. Moreover, based on the conservative modeling of the operator actions discussed in Chapter 30, and given that the operator actions were not among the most dominant contributors to the AP600 shutdown risk, these human error probabilities (HEP) are judged to be conservative for use in the AP1000 Shutdown model.

The differences in the plant response times in the AP600 and AP1000 plants for a loss of the normal residual heat removal system (RNS) at mid-loop conditions when injection from IRWST is lost is shown in Table 54-3. The operator actions for this scenario in the AP600 model are assessed herein to determine if they are affected by the shorter response times for the AP1000.

The AP600 Level 1 shutdown model uses five event trees for the accident sequences during drained conditions; these are IEV-RCSOD, IEV-LOSPD, IEV-RNSD, IEV-CCWD and IEV-LOCA24D. The event trees contain sequences with failure of normal IRWST injection followed by failure of gravity injection via the RNS suction valve. The affected system fault trees are: IW2AO, IW2A, IW2AP and IWRNS. Fault trees IW2AO, IW2A and IW2AP use operator action IWN-MAN00 to model the actuation of normal IRWST injection, and fault tree IWRNS uses RHN-MAN05 to model gravity injection through the RNS suction valve. Therefore, operator actions IWN-MAN00 and RHN-MAN05 are inspected to determine if their AP600 application is valid for the AP1000 model with the shorter times shown in Table 54-4.

The accident sequences quantified in the PRA lead to the core damage end-state which is assumed to occur upon core uncovery (i.e., in 40 minutes from event initiating for the AP1000). For a conservative evaluation, the time to core damage is assumed to be 22 minutes (i.e., the time to empty hot leg).

Based on the human reliability analysis (HRA) procedure discussed in Chapter 30, approximately 12 minutes of slack time exists for completing these tasks in the AP1000 model, as shown in the table below. According to the HRA procedure, the recovery and dependency models of the HRA are insensitive to changes in the time window if the slack time is greater than 10 minutes. Also shown in the following table, both the unconditional and conditional HEPs for these operator actions are the same for the AP600 and AP1000 models.

HEP Evaluation for Loss of RNS at Mid-loop Without IRWST Injection							
	AP600		Times (min)		AP1000		
Basic Event Identifier	Uncond. HEP	Cond. HEP	AP600	AP1000	Slack Time	Uncond. HEP	Cond. HEP
IWN-MAN00	1.15E-03	1.5E-01	Tw > 60 Ta = 10	Tw = 22 Ta = 10	> 10 min	1.15E-03	1.5E-01
RHN-MAN05	1.60E-03	1.5E-01	Tw > 60 Ta = 10	Tw = 22 Ta = 10	> 10 min	1.60E-03	1.5E-01

Tw: time window
Ta: actual time

54.7 Core Damage Quantification

The core damage frequency of the AP600 shutdown model is 1.04E-07 events per year. The top 200 cutsets from this quantification output file are shown in Table 54-5. The core damage frequency of the AP1000 shutdown model is 1.23E-07 events per year. The top 200 cutsets from this quantification output file are shown in Table 54-6.

As shown by the dominant cutsets of the AP600 and AP1000 shutdown models, the risk profiles of these plants for events during shutdown conditions are almost identical. The results indicate that the three events dominating the CDF for each plant are loss of component cooling/service water during drained condition, loss-of-offsite power during drained condition, and loss of RNS during drained condition. The AP1000 and AP600 initiating event core damage contributions are included in Table 54-4. This data shows the initiating event importance to be similar for the two plants.

The dominant sequences are described in the subsections that follow. The twelve dominant accident sequences comprise 77 percent of the level 1 shutdown core damage frequency. These dominant sequences consists of:

- Loss of component cooling water system (CWS) or service water system (SWS) initiating event during drained condition with a contribution of 64 percent of the CDF
- Loss of RNS initiating event during drained condition with a contribution of 6 percent of the CDF
- Loss-of-offsite power initiating event during drained condition with a contribution of 5 percent of the CDF
- RCS overdraining event during drainage to mid-loop with a contribution of 2 percent of the CDF.

Loss of Component Cooling or Service Water System Initiating Event During Drained Condition

These sequences are described as the loss of decay heat removal initiated by failure of the component cooling water or service water system during drained condition. The loss of decay heat removal occurs following loss of CWS or SWS during mid-loop/vessel flange operation which has an estimated duration of 120 hours.

The major contributors to risk due to loss of CWS or SWS during drained condition are the following failures:

- Hardware failures of both service water pumps or common-cause failure of output logic I/Os from the plant control system (PLS)
- Common-cause failure of the automatic depressurization system (ADS) 4th stage squib valves
- Common-cause failure of the IRWST high pressure squib valves
- Common-cause failure of the strainers in the IRWST tank
- Common-cause failure of the recirculation sump strainers.

Loss of RNS Initiating Event During Drained Condition

This sequence is described as the loss of decay heat removal initiated by failure of the RNS during drained condition. The loss of decay heat removal occurs following loss of RNS during mid-loop/vessel flange operation which has an estimated duration of 120 hours.

The major contributors to risk due to loss of RNS during drained condition are the following failures:

- Common-cause failure of the RNS pumps to run
- Common-cause failure of the ADS 4th stage squib valves
- Common-cause failure of the IRWST high pressure squib valves
- Common-cause failure of the strainers in the IRWST tank
- Common-cause failure of the recirculation sump strainers.

Loss-of-Offsite Power Initiating Event During Drained Condition (with failure of grid recovery within 1 hour)

This sequence is initiated by loss-of-offsite power during mid-loop/vessel flange operation, which has an estimated duration of 120 hours. Following this initiating event, the RNS does not restart automatically, and the grid is not recovered within 1 hour.

The major contributors to risk given loss-of-offsite power (without grid recovery) are the following failures:

- Software common-cause failure of all cards
- Failure of the RNS pump to run or restart
- Failure of the diesel generator to start or run
- Failure of the main breaker (100 or 200) to open
- Failure to recover ac power within 1 hour
- Common-cause failure of the ADS 4th stage squib valves
- Common-cause failure of the IRWST high pressure squib valves
- Common-cause failure of the strainers in the IRWST tank
- Common-cause failure of the recirculation sump strainers.

Loss-of-Offsite Power Initiating Event During Drained Condition (with success of grid recovery within 1 hour)

This sequence is initiated by loss-of-offsite power during mid-loop/vessel flange operation which has an estimated duration of 120 hours. Following this initiating event, the RNS does not restart automatically, the grid is recovered within 1 hour but manual RNS restart after grid recovery fails.

The major contributors to risk, given loss-of-offsite power (with grid recovery), are the following failures:

- Software common-cause failure of all cards
- Failure of the RNS pump to run or restart
- Common-cause failure of the ADS 4th stage squib valves
- Common-cause failure of the IRWST high pressure squib valves
- Common-cause failure of the strainers in the IRWST tank
- Common-cause failure of the recirculation sump strainers.

RCS Overdraining Event During Drainage to Mid-loop

This sequence is described as RCS overdraining initiating event during drainage to mid-loop condition; draining to mid-loop has an estimated duration of 39 hours. Following the initiating event, manual isolation of the RNS fails.

The major contributors to risk due to RCS overdraining are the following failures:

- Common-cause failure of the chemical and volume control system (CVS) air-operated valves to close automatically upon receipt of low hot leg level signals and failure of the operator to stop draining

- Operator fails to isolate the RNS

- Common-cause failure of the ADS 4th stage squib valves

- Operator fails to open IRWST injection squib valves
- Common-cause failure of the strainers in the IRWST tank
- Common-cause failure of the recirculation sump strainers.

54.7.1 Discussion of Results

The AP1000 Level 1 shutdown PRA has an estimated CDF of 1.23E-07 events/year. This CDF is conservative because credit is not taken for the design enhancement in using diverse squib valves in the recirculation lines. The failure of the recirculation function is represented by basic event IWX-EV4-SA (CCF of 2 of 2 LP squib valves) with a probability of 2.6E-05. However, the failure of the recirculation function would require other combinations of valves, in addition to these low pressure squib valves, to fail. Thus, the cutsets with basic event IWX-EV4-SA (such as cutset #3) are overly conservative. The combined common-cause failure of valves (i.e., combinations of check valves, squib valves and motor-operated valves) that could fail the recirculation function has a probability judged to be less than 1.0E-6. If the failure of the valves in the recirculation lines is assigned a conservative CCF probability of 1.0E-06, the estimated CDF of the AP1000 Level 1 shutdown PRA becomes 1.0E-07 events/year. Therefore, if credit is taken for the diverse squib valves in the recirculation lines of the AP1000 plant, the estimated CDF of the Level 1 shutdown PRA would be the same for the AP1000 and AP600 plants.

The risk importances of basic events appearing in CDF cutsets are presented in Tables 54-18 and 54-19 for RAW and RRW risk importance measures.

54.8 Estimation of Shutdown Large Release Frequency

AP600 shutdown level 2 model is applicable to the AP1000 design for estimating plant LRF; moreover, the dominant sequences contributing to AP1000 shutdown risk are the same as those of AP600. The conditional containment failure probability for AP600 was calculated to be 1.5E-08/9.0E-08 = 0.1667. Thus, the containment effectiveness is 83.3 percent. This conditional probability is used to estimate the AP1000 LRF as follows:

LRF(AP1000) = 0.1667 * 1.23E-07 = 2.05E-08/yr.

Note that the AP600 shutdown CDF from Revision 0 of 9.0E-08/yr is used to estimate the conditional containment damage probability since it gives the largest estimate and is also the only CDF revision available to go with an LRF calculation.

The release frequency for events at shutdown is comparable to the release frequency for internal events at power. The shutdown risk assessment for AP1000 indicates that the risk profile and insights of the AP600 shutdown PRA are applicable to the AP1000 design. Based on that assessment, the following breakdown of the AP1000 LRF is provided:

- 77.4 percent of the LRF is caused by containment failure after 24 hours (release category CFV). This release is due to accident class LP-3BE with the following characteristics:
  - RCS is fully depressurized; no cavity flooding, vessel failure, debris dryout, long-term core-concrete interaction, basemat melt-through.
- 22.5 percent of the LRF is caused by the compromised containment integrity, such as containment bypass (BP, 14.6 percent), containment isolation failure (CI, 5.0 percent) and intact containment with excessive leakage (XL, 2.9 percent). This release is mainly due to accident classes LP-CBP and LP-3BE with the following characteristics:
  - LP-CBP (BY) = RCS overdraining during mid-loop or RNS pipe rupture during non-drained conditions, failure to manually isolate leak, failure of gravity injection or sump recirculation.
  - LP-3BE (CI/XL) = Fully depressurized RCS, cavity flooded, vessel intact, containment isolation failed or excessive leakage.
- 0.15 percent of the LRF is caused by containment failure before 24 hours. This is an insignificant contributor to plant risk.

54.9 Sensitivity Analyses

This section contains the sensitivity analyses performed for the AP1000 shutdown PRA.

54.9.1 Case 1 – Minimum Equipment per Tech Specs During Drained Conditions

AP1000 Technical Specification (TS) 3.5.8 allows one of the IRWST injection trains and one of the containment sump recirculation trains to be out of service during reduced inventory conditions; and TS 3.4.14 allows two ADS stage 4 valves to be out of service during reduced inventory conditions. This sensitivity study is performed to estimate the core damage frequency if one train of IRWST, the associated containment sump recirculation train, and two ADS stage 4 valves are out of service at the same time.

It is assumed that the A train of IRWST and corresponding sump recirculation train are unavailable. This also makes the IRWST to RNS connection via valve V23 unavailable. Moreover, the first two lines of the ADS stage 4 are assumed unavailable. The sensitivity analysis is done on the drained initiating events. The non-drained cases remain the same as the base case.

The affected components and their corresponding basic events are identified. These components are set to failure to simulate their being out of service. The CCF events associated with these component groups are also identified, and their failure probabilities are increased. Table 54-7 shows the components, basic events, and CCF events that are modified. Table 54-8 shows the CCF and other relevant calculations.

The CDF result of the sensitivity analysis for the drained cases is 1.95E-06/year. The base non-drained CDF contribution is added to give the total CDF of 2.19E-06 for this sensitivity analysis. This should be compared to the base case of 1.23E-07/year CDF.

The results of the sensitivity analysis are summarized in Table 54-9.

The sensitivity analysis shows that although there is a factor of 18 increase in the CDF compared to the base case, the plant CDF for shutdown events is still small (2.2E-06/year) even if the IRWST, sump recirculation, and ADS trains identified above are out of service during drained shutdown cases as allowed by the Technical Specifications.

54.9.2 Case 2 – No Credit for Standby Nonsafety Systems

In the AP1000 PRA, a sensitivity case was performed for events at-power (case 36), in which the standby systems were assumed to be unavailable when an initiating event occurs. This case was used as the reference for RTNSS evaluation. The same sensitivity case is performed for shutdown PRA. The standby systems assumed to be unavailable in response to a shutdown event are:

- CVS
- SFW
- RNS
- DAS
- DGs

These are the same systems used in sensitivity case 36. Note that CVS and SFW are not credited in the shutdown PRA and, thus, do not appear in the core damage cutsets.

Motor-operated valve MOV23 in the RNS path can be used for gravity injection by an operator action, if the normal IRWST injection fails. This function of the valve is safety-related and is already credited in the AP1000 shutdown PRA event trees, in the node GIRNS (gravity injection via RNS). This path is also credited in the current sensitivity analysis.

The sensitivity analysis results in a plant CDF of 1.23E-06/year. The top core damage cutsets are reported in Table 54-10. The basic events set to failure ("dropped") to make the sensitivity analysis are reported in Table 54-11 to enable future duplication of the case.

Table 54-12 gives the contribution of initiating events to plant CDF. Results of the table show that three events per 100 years of plant operation are postulated. This corresponds to about one event per plant lifetime. If such an event occurs, and is assumed not to be mitigated by nonsafety systems of RNS, DAS, and DGs, the average conditional core damage probability (CDP) of the AP1000 is 4E-05. This result indicates that the plant is robust against shutdown accidents even with only safety front-line systems credited to mitigate such events. When the above-mentioned nonsafety systems are credited, the average conditional core damage probability becomes 4E-06 (1.23E-07/2.94E-02). This is a low CDP, given a challenge to the plant systems occur during low power and shutdown operations.

The risk importances of basic events appearing in case 2 CDF cutsets are presented in Tables 54-20 and 54-21 for RAW and RRW risk importance measures.

Estimation of Large Release Frequency

The large release frequency (LRF) associated with the CDF in this sensitivity case is estimated as 6.88E-07/year. For this estimate, the conditional containment failure probability of 0.559, which was calculated for the AP600 focused PRA, is used. This relatively high failure fraction is deemed to be applicable to the AP1000.

The benefit of crediting manual DAS in this sensitivity analysis is presented in case 4, which is reported in the following paragraphs.

54.9.3 Case 3 – HEPs Set Equal to 0.5

In this sensitivity analysis, the HEPs appearing in the shutdown CDF cutsets are set equal to 0.5, if they are less than that value. The operator actions used in IEV-RCSOD (RCS-MANODS1 and RCS-MANODS2) are also set equal to 0.5. The shutdown CDF becomes 5.533E-05/year. The top 200 cutsets are shown in Table 54-13. The basic events, whose probabilities are changed, are shown in Table 54-14.

54.9.4 Case 4 – No Credit for Standby Nonsafety Systems – Credit for Manual DAS

This case is similar to Case 2, except credit is taken for manual DAS actuation, which has adminsitrative controls placed on it. Other than this credit, the same standby systems as in case 2 were assumed to be unavailable when an initiating event occurs. The standby systems assumed to be unavailable in response to a shutdown event are:

- CVS
- SFW
- RNS
- Automatic DAS (manual DAS is credited)
- DGs

Note that CVS and SFW are not credited in the shutdown PRA and, thus, do not appear in the core damage cutsets.

Motor-operated valve MOV23 in the RNS path can be used for gravity injection by an operator action, if the normal IRWST injection fails. This function of the valve is safety-related and is already credited in the AP1000 shutdown PRA event trees, in the node GIRNS (gravity injection via RNS). This path is also credited in the current sensitivity analysis.

The sensitivity analysis results in a plant CDF of 9.73E-07/year. This is a modest 21 percent decrease in CDF calculated in case 2 where credit is not taken for manual DAS actuation.

Table 54-15 contains the top CDF cutsets for this case. The list of basic events set to failure to generate this case is given in Table 54-16 to allow duplication of this case. The contribution of initiating events to plant CDF is given in Table 54-17.

Estimation of Large Release Frequency

The large release frequency (LRF) associated with the CDF in this sensitivity case is estimated as 3.84E-07/year. For this estimate, a conditional containment failure probability of 0.349 is estimated and used.

54.9.5 Case 5 – Assessment of Containment Closure Failure Probability

This section provides an assessment of the failure probabilities for containment isolation during shutdown modes where containment closure is required. In Modes 5 and 6 when the upper internals are in place, containment closure capability is required. Containment closure capability is defined in the Technical Specifications as having all potential escape paths from containment closed or capable of being closed. Therefore, containment can be closed prior to the time steam would be released to the containment following an event, such as a loss of the normal decay heat removal capability through the normal residual heat removal system.

According to the Technical Specification requirements, the capability to close the containment before steam is released to the containment must be confirmed in order for the hatches and/or penetrations to be kept open during the respective plant conditions in Modes 5 and 6. In that regard, the containment would need to be closed during the mid-loop period at the beginning of a refueling since the diagnosis and decision time is greater than the time to steaming in this condition. Containment closure may not be required for the mid-loop period at the end of a refueling since the core decay heat is lower due to decay time and the partial core replacement with new fuel, and there is a longer time window for the operators to complete this task prior to steaming. The need for containment closure during the end of refueling mid-loop would need to be confirmed based on the time to steaming for that condition. Figure B 3.6.8-1 of AP1000 DCD Chapter 16.1 is applicable only to conditions before fuel replacement.

In other plant conditions, earlier in time during Modes 5 and 6, decay heat level would be higher than during the mid-loop period discussed previously; however, steaming to the containment would occur later than for mid-loop conditions in these modes because there is more water in the reactor. This provides a longer time window for the operators to close the hatches and penetrations. Therefore, it is possible that the containment would be open during such periods of higher decay heat levels since there is a longer time window for the operators to complete the task.

The following assumptions are made in this evaluation:

- Equipment and maintenance hatches, personnel hatches, and temporary electrical and instrument penetrations are open.
- The openings include: one main equipment hatch, one maintenance hatch, two personnel hatches, and three spare penetrations.

- More than one temporary line or cable can fit through each spare penetration. Such lines are fitted with quick disconnect attachments.

- Each personnel hatch consists of two doors in series that are normally interlocked to maintain containment integrity. The interlock is defeated to allow both doors to be kept open.

- The openings are closed manually; the equipment and maintenance hatches are closed from inside containment, and the other openings are closed from outside containment.

- The openings are manned by maintenance personnel with responsibilities as follows:

  - Two persons for closing main equipment hatch
  - Two persons for closing maintenance hatch
  - Two persons for closing each personnel hatch
  - Two persons for disconnecting the lines and closing the spare penetrations

  One person can close each opening with the second person serving as backup or assistant.

- Based on the existence of AP1000 shutdown emergency response guidelines, it is assumed that detailed written procedures will be developed and used for closing the openings.

- It is assumed that loss of RNS is the cue for initiating closure of these openings; therefore, there is a time window of approximately 50 minutes to complete these actions. It is further assumed the containment environment is habitable up to 145°F.

- Personnel are required to evacuate the containment before closing the personnel hatches; in that regard, the equipment and maintenance hatches must be closed prior to closing the personnel hatches. It is assumed that it takes about 30 minutes to close the equipment and maintenance hatches, and during that time, personnel in the containment are evacuated.

- It is assumed the other openings, all of which are closed from outside containment, can be also closed within the actual time of 30 minutes discussed in the previous paragraph.

- Although the loss of RNS is expected to be diagnosed by the control room personnel, it is expected that an alarm would be annunciated in the containment to signify the need for containment closure. To be conservative, it is assumed that cognitive diagnosis for closing the hatches (by the maintenance crew) is required and this diagnosis must be completed within 15 minutes from the alarm. According to previous assumptions, a time window of about 35 minutes remains to physically close the openings.

- On closing each opening, one maintenance crew (MC) member is assigned a low dependency on the other crew member.

- A high stress level is assigned for this task according to THERP 20-16, item 5 (Reference 54-1).

- It is assumed that the hatches and doors for the openings are exercised (when they are first opened) to ensure they can close on demand. Therefore, hardware failures of these openings are judged to be highly unlikely; (that is, an estimated failure probability less than 1.0E-06 per demand for each opening). However, if 1.0E-05 per demand is conservatively applied for the failure probability of one of these openings to close, then a failure probability of 7.0E-05 per demand is assumed for hardware failure of these openings.

HEP Quantification

Quantification of the human error probability for this task is as follows:

- (D_{HEP}) Diagnosis Error Calculation:
  - D1: Failure to diagnose need for closing containment hatches within 15 minutes = 4.0E-02 (THERP 20-3 and Figure 12-4 [Reference 54-1])
  - $D2_{(MC1)}$: Failure to respond to 1 of 1 local alarm = 2.7E-04 (THERP 20-23 [Reference 54-1])
  - $D2_{(MC2)}$: Low crew dependency assigned to the second crew member = 0.05 (THERP 20-4 [Reference 54-1])
  - $D2 = D2_{(MC1)} \times D2_{(MC2)} = 2.7E\text{-}04 \times 0.05 = 1.35E\text{-}05$;
  - $(D_{HEP}) = D1 \times D2 < 1.0E\text{-}05$.
- (A_{HEP}) Action Execution Calculation:
  - A1 a) Omit action to close assigned opening (omission error) = 1.3E-03 (THERP 20-7 [Reference 54-1])
    b) Stress multiplier = 5
  - $A1_{(MC1)}$ = a x b = 6.5E-03
  - $A1_{(MC2)}$ = 0.05 (THERP 20-18 [Reference 54-1])

Therefore, action execution failure for one opening is estimated as:

$$A1_{HEP} = A1_{(MC1)} \times A1_{(MC2)} = 3.25E\text{-}04.$$

Since there are seven openings, the total action execution failure is:

$$A_{HEP} = A1_{HEP} \times 7 = 3.25E\text{-}04 \times 7 = 2.28E\text{-}03.$$

Therefore, the HEP for closing the containment hatches and temporary penetrations is:

$$D_{HEP} + A_{HEP} = 2.28E\text{-}03.$$

Result

The estimated failure probability of the openings for containment closure is the summation of the assumed hardware failure probability (7.0E-05) and the HEP (2.28E-03); that is, a failure probability of 2.35E-03.

Fault tree analysis is used to calculate the failure probability of the containment isolation (CIST) as 1.71E-02; this result was used to calculate the frequency associated with the CI release category. This fault tree model does not include the additional failure probability in case the hatches are open. By including the failure probability of 2.35E-03 in the CIST fault tree, the estimated failure probability of containment isolation changes from 1.71E-02 to 1.95E-02 for the cases when the hatches are open. This is an increase of approximately 14 percent. This increase of 14 percent is judged to be insignificant and has no effect on the PRA results.

Summary of Containment Closure During Shutdown

During shutdown operations, the containment isolation requirements are governed by the plant Technical Specifications. According to these Technical Specifications,

- During plant operation in Modes 1, 2, 3, and 4, Technical Specifications 3.6.1, 3.6.2, and 3.6.3 of AP1000 DCD Chapter 16.1 require that the containment isolation must be maintained (therefore, the containment hatches cannot be opened);

- During Modes 5 and 6, containment penetrations, such as the equipment hatches, may be open only if the time it takes to manually close the penetrations is less than the time it takes to steam to the containment after a loss of RCS heat removal accident. Otherwise, the containment hatches are not allowed to be open. The time to close the penetrations before steaming must include the diagnosis and decision-making time, in addition to the time required to physically complete the closure action.

- Based on the criteria discussed above, the containment hatches will not be open during mid-loop operations before refueling, when the time to containment steaming after a loss of RCS cooling events is minimum.

The failure probability of the containment isolation is calculated in the above; it is the same as calculated in the AP600 PRA. The results and major insights of the containment isolation PRA analysis during shutdown conditions are summarized below:

- The time window for manually closing the containment hatches (and associated penetrations) is 50 minutes in calculation of the failure probability of the manual closure of the hatches. It is expected that upon loss of RCS cooling, the first 15 minutes will be used up for diagnosis and decision-making to close the hatches. It is also estimated that it will take 30 minutes for the hatches to be closed. Thus, a total of 45 minutes is needed to complete the closure of the hatches.

- The containment isolation failure probability (when the hatches are not open) is calculated to be 1.71E-02.

- The containment isolation failure probability when the hatches are open is calculated to be 1.95E-02. This probability includes an operator failure probability of 2.28E-03, failure to close the hatches.

  There is no significant difference between the two probabilities mentioned above, with and without the hatches being open, as long as the time window of 50 minutes is applicable.

- Although the minimum time to boiling during mid-loop operations is mentioned, and is different in the AP600 and AP1000 designs, this fact has no bearing on the calculation of the failure probability of the manual closure of the hatches. By the Technical Specifications, hatch opening is not permitted unless the specified time window of 50 minutes to steaming is available (in Modes 5 and 6); the opening of the hatch(es) would be delayed until the 50-minute time window to steaming is feasible.

  Therefore, given the criteria in the Technical Specifications that governs containment closure, the AP1000 plant will effectively improve containment closure reliability because the containment will not be allowed to open for the same time period as assumed for the AP600.

54.10 Conclusions

The AP1000 shutdown PRA assessment demonstrates that, like the AP600, the risk to the AP1000 plant from events that can occur during shutdown is low. The core damage frequency for the AP1000 is similar to that of the AP600. In addition, the at-power CDF and large, release frequency (LRF) are also similar for both plants. Based on this assessment, it is judged that no additional insights would be gained by performing a quantification of the LRF from events that could occur at shutdown for the AP1000. However, an estimate of LRF is provided.

54.11 Reference

54-1 NUREG CR-1278; Handbook of Human Reliability Analysis, A. D. Swain, August 1983.

Table 54-1

AP1000 INITIATING EVENT FREQUENCIES DURING SHUTDOWN CONDITIONS

Initiating Events Description	IE Identifier	Probability
Loss-of-offsite power during non-drained conditions	IEV-LOSPND	1.82E-02
Loss of decay heat removal during non-drained conditions due to failure of normal residual heat removal system	IEV-RNSND	1.02E-03
Loss of decay heat removal during non-drained conditions due to failure of component cooling water or service water system	IEV-CCWND	3.99E-03
Loss-of-coolant accident during non-drained conditions due to rupture of the normal residual heat removal system piping	IEV-LOCAPRND	1.61E-05
Loss-of-coolant accident during non-drained conditions due to inadvertent or spurious opening of the normal residual heat removal system motor-operated valve RNS-V024	IEV-LOCA24ND	1.73E-05
Overdraining of the reactor coolant system during drain-down to mid-loop	IEV-RCSOD	5.28E-06
Loss-of-offsite power during drained conditions	IEV-LOSPD	5.28E-03
Loss of decay heat removal during drained conditions due to failure of normal residual heat removal system	IEV-RNSD	9.69E-05
Loss of decay heat removal during drained conditions due to failure of component cooling water or service water system	IEV-CCWD	7.16E-04
Loss-of-coolant accident during drained conditions due to inadvertent or spurious opening of the normal residual heat removal system motor-operated valve RNS-V024	IEV-LOCA24D	1.15E-05

Table 54-2

AP1000 DESIGN IMPACT ON AP600 SHUTDOWN MODEL

System	Design/Modeling Change	Impact on Shutdown Model	Comment
IRWST	a) MOV 117 A&B changed from normally closed to normally open (fail-as-is) b) Recirc LP squib 120A/B changed to HP squib 120A/B	Possible lower random failure prob for spurious closure; No adverse effect on CCF CCF of 120A/B is combined with four IRWST HP inj squib (123A/B, 125A/B); – Lower overall recirc squib CCF due to diversity (i.e., CCF of 2/2 LP times CCF of 6/6 HP)	a) CCF of MOVs used in IWF FT for Level 2 analysis b) Recirc squib 118A/B remain LP; this design change is a risk benefit
CMT	Volume increase; orifice resized for more flow	None	Injection duration same as AP600
RNS	RNS pump suction from the cask loading pit eliminates potential draining of IRWST. MOV 055 and CV 056 are RNS new suction source interface	No adverse effect on RNS initial operation; Additional operator action in task to realign RHR for recirc	Given the conservatism in the existing unconditional and conditional HEPs, the current HEP can be used
PCS	Addition of third passive containment cooling system (PCS) flow path.	No impact on model	Additional valve is not credited in shutdown PRA.
ADS	Full and partial ADS success criteria changed for full power: – full ADS: 3 of 4 stage 4 (instead of 2 of 4 stage 4) – Partial ADS: 2 stage 2/3 (instead of 1 stage 2/3) Note: Stage 4 lines increased from 10" to 14", and line size common to each pair of stage 4 increased from 12" to 18". Flow resistance reduced & vent flow area increased	Changes in the at-power ADS success criteria for AP1000 would NOT affect success criteria for shutdown. Partial ADS (1/4 stage 4) is adequately modeled in drained conditions which dominates shutdown risk. The conservative ADS model for full ADS does not impact shutdown risk	Full ADS: Quantification model is based on success of (3 of 4 stage 2/3) OR (1 of 4 stage 4) Partial ADS: Quantification model is based on success of 1 of 4 stage 4
PRHR	Success criteria require 1 of 2 gutter isolation AOVs to close	AP600 shutdown success criteria require AOVs 108A/B to open. In the AP1000 shutdown model, the CCF of AOVs 108A/B is modified to include the gutter isolation AOVs.	At-power system failure probability for AP1000 is twice the AP600 failure probability. See discussion of PXX-AV-LA in Section 54.5
FWS	Success criteria require 1 of 3 main feed (MF) pumps instead of 1 of 2	None	SGs are not credited in shutdown. SGs are available during filled conditions as a diverse heat removal means. Shutdown risk is already dominated by drained events

Table 54-3

TIMES FOR LOSS OF RNS AT MID-LOOP WITHOUT IRWST INJECTION

	Time after Shutdown (min)	Time to Boiling (min)	Time to Empty Hot Leg (min)	Time to Core Uncovery (min)
AP600	28	17	59	102
AP1000	28	10	22	40

Table 54-4

AP1000 & AP600 INITIATING EVENT CDF CONTRIBUTIONS

AP1000 IEV CDF Contributions

SYSTEM UNAVAILABILITY (Q) = 1.231E-07
NUMBER OF BASIC EVENTS = 10
NUMBER OF CUTSETS = 8674

	Initiating Event	Importance (% Decrease)	Number of Cutsets	Core Damage Contribution Probability	Basic Event Probability
1	IEV-CCWD	68.50	2182	8.4309E-08	7.1600E-04
2	IEV-LOSPD	14.13	3154	1.7386E-08	5.2800E-03
3	IEV-RNSD	9.27	1075	1.1411E-08	9.6900E-05
4	IEV-RCSOD	3.05	523	3.7497E-09	5.2800E-06
5	IEV-LOCA24ND	1.65	718	2.0288E-09	1.7300E-05
6	IEV-CCWND	1.44	164	1.7690E-09	3.9900E-03
7	IEV-LOCA24D	1.10	488	1.3539E-09	1.1500E-05
8	IEV-LOSPND	.41	56	5.1025E-10	1.8200E-02
9	IEV-RNSND	.37	127	4.5210E-10	1.0200E-03
10	IEV-LOCAPRND	.09	187	1.1650E-10	1.6100E-05
		100	8674	1.23E-07	

AP600 IEV CDF Contributions

SYSTEM UNAVAILABILITY (Q) = 1.04E-07
NUMBER OF BASIC EVENTS = 10
NUMBER OF CUTSETS = 8674

	Initiating Event	Importance (% Decrease)	Number of Cutsets	Core Damage Contribution Probability	Basic Event Probability
1	IEV-CCWD	68.09	2182	7.10E-08	6.02E-04
2	IEV-LOSPD	14.02	3154	1.46E-08	4.44E-03
3	IEV-RNSD	9.21	1075	9.61E-09	8.15E-05
4	IEV-RCSOD	3.02	523	3.15E-09	4.44E-06
5	IEV-LOCA24ND	1.89	718	1.97E-09	1.68E-05
6	IEV-CCWND	1.54	164	1.60E-09	3.75E-03
7	IEV-LOCA24D	1.28	488	1.33E-09	1.13E-05
8	IEV-LOSPND	0.46	56	4.78E-10	1.71E-02
9	IEV-RNSND	0.39	127	4.11E-10	9.61E-04
10	IEV-LOCAPRND	0.1	187	1.09E-10	1.51E-05
		100	8674	1.04E-07	

Table 54-5 (Sheet 1 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

***** DOMINANT CUTSETS ***** Page: 1

Title: AP600 CDF Sensitivity with Surge Line Flood, Design Changes & Final Model Updates
File: AP600FNL.W1 (AP600 SD Base Case – 1/15/2002)
Reduced Sum of Cutsets: 1.0420E-07

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
1	1.81E-08	17.37	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
2	1.57E-08	15.07	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
3	1.57E-08	15.07	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
4	7.22E-09	6.93	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
5	7.22E-09	6.93	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
6	3.09E-09	2.97	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
7	2.45E-09	2.35	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	8.15E-05	IEV-RNSD
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
8	2.24E-09	2.15	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
9	2.19E-09	2.10	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			CCF OF ORIFICES	3.63E-06	CCX-ORY-SPX
10	2.12E-09	2.03	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	8.15E-05	IEV-RNSD
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
11	2.12E-09	2.03	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	8.15E-05	IEV-RNSD
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA

Table 54-5 (Sheet 2 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
12	1.83E-09	1.76	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EVENT	4.44E-06	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.50E-02	RHN-MAN04
			COND. PROB. OF IWN-MAN00 (OP. FAILS TO ACTUATE IRWST INJ)	5.00E-02	IWN-MAN00C
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	1.50E-01	RHN-MAN05C
13	1.58E-09	1.52	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			CCF OF PRESSURE TRANSMITTERS	2.63E-06	CCX-XMTRX
14	1.21E-09	1.16	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			CCF OF IRWST TANK LEVEL TRANSMITTER	2.01E-04	IWX-XMTR
			OPERATOR FAILS TO ACTUATE SUMP RECIRC WHEN IRWST SIGNAL FAILS	1.00E-02	REN-MAN04
15	9.78E-10	.94	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	8.15E-05	IEV-RNSD
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
16	9.78E-10	.94	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	8.15E-05	IEV-RNSD
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
17	7.24E-10	.69	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EVENT	4.44E-06	IEV-RCSOD
			OPERATOR SUCCEEDS IN ISOLATING RNS LEAK	9.45E-01	RHN-MAN04-SUCC
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	1.15E-03	IWN-MAN00
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	1.50E-01	RHN-MAN05C
18	7.22E-10	.69	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
19	5.04E-10	.48	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILLED	1.68E-05	IEV-LOCA24ND
			CCF OF GRAVITY INJECTION CHECK VALVES TO OPEN	3.00E-05	IWX-CV-AO
20	5.04E-10	.48	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILLED	1.68E-05	IEV-LOCA24ND
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
21	4.37E-10	.42	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILLED	1.68E-05	IEV-LOCA24ND
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
22	4.33E-10	.42	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			MECHANICAL FAILURE CAUSES MOV 121A TO FAIL-TO-OPEN	3.00E-03	IRWMOD05S
			IRWST DISCHARGE LINE "B" STRAINER PLUGGED	2.40E-04	IWB-PLUG

Table 54-5 (Sheet 3 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
23	3.75E-10	.36	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.75E-03	IEV-CCWND
			FAILURE OF MANUAL DAS ACTUATION	1.16E-02	REC-MANDAS
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
24	3.59E-10	.34	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.75E-03	IEV-CCWND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATION)	5.06E-01	REC-MANDASC
			CCF OF ORIFICES	2.77E-04	CCX-ORY-SP
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZATION	6.83E-04	LPM-MAN05
25	3.39E-10	.33	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS DRAINED	1.13E-05	IEV-LOCA24D
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
26	3.23E-10	.31	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.75E-03	IEV-CCWND
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
27	2.96E-10	.28	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	8.15E-05	IEV-RNSD
			CCF OF ORIFICES	3.63E-06	CCX-ORY-SPX
28	2.94E-10	.28	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS DRAINED	1.13E-05	IEV-LOCA24D
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
29	2.94E-10	.28	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS DRAINED	1.13E-05	IEV-LOCA24D
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
30	2.60E-10	.25	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.75E-03	IEV-CCWND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATION)	5.06E-01	REC-MANDASC
			CCF OF PRESSURE TRANSMITTERS	2.01E-04	CCX-XMTR195
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZATION	6.83E-04	LPM-MAN05
31	2.37E-10	.23	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
32	2.14E-10	.21	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	8.15E-05	IEV-RNSD
			CCF OF PRESSURE TRANSMITTERS	2.63E-06	CCX-XMTRX
33	2.02E-10	.19	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILLED	1.68E-05	IEV-LOCA24ND
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP

Table 54-5 (Sheet 4 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
34	2.02E-10	.19	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILLED	1.68E-05	IEV-LOCA24ND
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
35	1.83E-10	.18	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PLS OUTPUT LOGIC I/Os	2.09E-03	PL5MOD11
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
36	1.81E-10	.17	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS FILLED	1.71E-02	IEV-LOSPND
			OFFSITE AC POWER RECOVERED IN 2 HOURS	7.60E-01	SUC-R2S
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
			FAILURE OF MANUAL DAS ACTUATION	1.16E-02	REC-MANDAS
37	1.75E-10	.17	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
38	1.64E-10	.16	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	8.15E-05	IEV-RNSD
			CCF OF IRWST TANK LEVEL TRANSMITTER	2.01E-04	IWX-XMTR
			OPERATOR FAILS TO ACTUATE SUMP RECIRC WHEN IRWST SIGNAL FAILS	1.00E-02	REN-MAN04
39	1.56E-10	.15	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS FILLED	1.71E-02	IEV-LOSPND
			OFFSITE AC POWER RECOVERED IN 2 HOURS	7.60E-01	SUC-R2S
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
40	1.51E-10	.14	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
41	1.36E-10	.13	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS DRAINED	1.13E-05	IEV-LOCA24D
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
42	1.36E-10	.13	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS DRAINED	1.13E-05	IEV-LOCA24D
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP

Table 54-5 (Sheet 5 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
43	1.33E-10	.13	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.75E-03	IEV-CCWND
			COND. PROB. OF REC-MANDAS FAILURE OF MANUAL DAS ACTUATION)	5.06E-01	REC-MANDASC
			COMMON MODE FAILURE OF INPUT LOGIC GROUPS	1.03E-04	CCX-INPUT-LOGIC
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZATION	6.83E-04	LPM-MAN05
44	1.31E-10	.13	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
45	1.31E-10	.13	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
46	1.26E-10	.12	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EVENT	4.44E-06	IEV-RCSOD
			OPERATOR SUCCEEDS IN ISOLATING RNS LEAK	9.45E-01	RHN-MAN04-SUCC
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
47	1.21E-10	.12	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
48	1.17E-10	.11	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PLS OUTPUT LOGIC I/Os	2.09E-03	PL5MOD11
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
49	1.12E-10	.11	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
50	1.09E-10	.10	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EVENT	4.44E-06	IEV-RCSOD
			OPERATOR SUCCEEDS IN ISOLATING RNS LEAK	9.45E-01	RHN-MAN04-SUCC
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA

Table 54-5 (Sheet 6 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
51	1.09E-10	.10	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EVENT	4.44E-06	IEV-RCSOD
			OPERATOR SUCCEEDS IN ISOLATING RNS LEAK	9.45E-01	RHN-MAN04-SUCC
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
52	1.05E-10	.10	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN	1.20E-03	ECX-CB-GO
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
53	1.02E-10	.10	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301BSA
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
54	1.02E-10	.10	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301ASA
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
55	1.01E-10	.10	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PLS OUTPUT LOGIC I/Os	2.09E-03	PLSMOD11
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
56	1.01E-10	.10	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PLS OUTPUT LOGIC I/Os	2.09E-03	PLSMOD11
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
57	9.78E-11	.09	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	8.15E-05	IEV-RNSD
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
58	9.70E-11	.09	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA

Table 54-5 (Sheet 7 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
59	9.70E-11	.09	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
60	9.61E-11	.09	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS	9.61E-04	IEV-RNSND
			FAILURE OF MANUAL DAS ACTUATION	1.16E-02	REC-MANDAS
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
61	9.35E-11	.09	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PLS OUTPUT LOGIC I/Os	2.09E-03	PL5MOD11
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
62	9.20E-11	.09	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS	9.61E-04	IEV-RNSND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATION)	5.06E-01	REC-MANDASC
			CCF OF ORIFICES	2.77E-04	CCX-ORY-SP
			OPERATOR FAILS O RECOGNIZE THE NEED FOR RCS DEPRESSURIZATION	6.83E-04	LPM-MAN05
63	8.95E-11	.09	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
64	8.28E-11	.08	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS	9.61E-04	IEV-RNSND
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
65	6.75E-11	.06	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
66	6.71E-11	.06	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN	1.20E-03	ECX-CB-GO
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA

Table 54-5 (Sheet 8 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
67	6.68E-11	.06	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS	9.61E-04	IEV-RNSND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATION)	5.06E-01	REC-MANDASC
			CCF OF PRESSURE TRANSMITTERS	2.01E-04	CCX-XMTR195
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZATION	6.83E-04	LPM-MAN05
68	6.49E-11	.06	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301ASA
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
69	6.49E-11	.06	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301BSA
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
70	6.40E-11	.06	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKER TO CLOSE	7.30E-04	ECX-CB-GC
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
71	6.16E-11	.06	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			CCF OF ACTUATION LOGIC GROUPS	4.63E-05	CCX-PMAMOD1X
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S
72	6.04E-11	.06	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
73	6.04E-11	.06	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
74	6.02E-11	.06	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			FAILURE OF MANUAL DAS ACTUATION	1.16E-02	REC-MANDAS
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM

Table 54-5 (Sheet 9 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
75	5.95E-11	.06	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
76	5.87E-11	.06	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	8.15E-05	IEV-RNSD
			MECHANICAL FAILURE CAUSES MOV 121A TO FAIL-TO-OPEN	3.00E-03	IRWMOD05S
			IRWST DISCHARGE LINE "B" STRAINER PLUGGED	2.40E-04	IWB-PLUG
77	5.82E-11	.06	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN	1.20E-03	ECX-CB-GO
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
78	5.82E-11	.06	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN	1.20E-03	ECX-CB-GO
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
79	5.71E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS FILLED	1.71E-02	IEV-LOSPND
			FAILURE TO RECOVER AC POWER IN 2 HOURS	2.40E-01	OTH-R2
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
			FAILURE OF MANUAL DAS ACTUATION	1.16E-02	REC-MANDAS
80	5.62E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301ASA
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
81	5.62E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301ASA
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
82	5.62E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301BSA
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA

Table 54-5 (Sheet 10 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
83	5.62E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301BSA
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
84	5.37E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN	1.20E-03	ECX-CB-GO
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
85	5.35E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO OPEN OF THE STOP CHECK VALVES	6.10E-04	RNX-KV-GO
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
86	5.22E-11	.05	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.75E-03	IEV-CCWND
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
			FAILURE OF MANUAL DAS ACTUATION	1.16E-02	REC-MANDAS
87	5.19E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301ASA
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
88	5.19E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301BSA
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
89	5.19E-11	.05	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
90	5.16E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA

Table 54-5 (Sheet 11 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
91	5.16E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
92	5.03E-11	.05	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EVENT	4.44E-06	IEV-RCSOD
			OPERATOR SUCCEEDS IN ISOLATING RNS LEAK	9.45E-01	RHN-MAN04-SUCC
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
93	5.03E-11	.05	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EVENT	4.44E-06	IEV-RCSOD
			OPERATOR SUCCEEDS IN ISOLATING RNS LEAK	9.45E-01	RHN-MAN04-SUCC
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
94	4.92E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS FILLED	1.71E-02	IEV-LOSPND
			FAILURE TO RECOVER AC POWER IN 2 HOURS	2.40E-01	OTH-R2
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
95	4.71E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF TO OPEN OF THE STOP CHECK VALVES	6.10E-04	RNX-KV-GO
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
96	4.68E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PLS OUTPUT LOGIC I/Os	2.09E-03	PL5MOD11
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
97	4.68E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PLS OUTPUT LOGIC I/Os	2.09E-03	PL5MOD11
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
98	4.50E-11	.04	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.75E-03	IEV-CCWND
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS

Table 54-5 (Sheet 12 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
99	4.48E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
100	4.48E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
101	4.46E-11	.04	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			CCF OF ACTUATION LOGIC GROUPS	4.63E-05	CCX-PMAMOD1X
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	1.60E-03	RHN-MAN05
102	4.42E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENT FAILURES	5.04E-04	ED1MOD01
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
103	4.34E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
104	4.33E-11	.04	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			IRWST DISCHARGE LINE "B" STRAINER PLUGGED	2.40E-04	IWB-PLUG
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDBBSDK1TM
105	4.33E-11	.04	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			IRWST DISCHARGE LINE "B" STRAINER PLUGGED	2.40E-04	IWB-PLUG
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDBBSDD1TM
106	4.33E-11	.04	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			IRWST DISCHARGE LINE "B" STRAINER PLUGGED	2.40E-04	IWB-PLUG
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDBBSDS1TM

Table 54-5 (Sheet 13 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
107	4.32E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP MP 01B SEGMENT HARDWARE FAILURE OR DIVERTED FLOW	2.44E-02	SWBMOD02
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			COMMON CAUSE FAILURE OF THE BATTERIE IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
108	4.31E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
109	4.10E-11	.04	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS DRAINED	1.13E-05	IEV-LOCA24D
			CCF OF ORIFICES	3.63E-06	CCX-ORY-SPX
110	4.08E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF TO OPEN OF THE STOP CHECK VALVES	6.10E-04	RNX-KV-GO
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
111	4.08E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF TO OPEN OF THE STOP CHECK VALVES	6.10E-04	RNX-KV-GO
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
112	4.08E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKER TO CLOSE	7.30E-04	ECX-CB-GC
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
113	3.99E-11	.04	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			CCF OF GRAVITY INJECTION CHECK VALVES TO OPEN	3.00E-05	IWX-CV-AO
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S
114	3.86E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE STANDBY DG TO RUN	4.40E-04	ZOX-DG-DR
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN

Table 54-5 (Sheet 14 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
115	3.73E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
116	3.73E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
117	3.58E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			D/G FAILS TO START & RUN OR BKR 202 FAILS TO CLOSE	2.02E-02	ZO2MOD01
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
118	3.54E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKER TO CLOSE	7.30E-04	ECX-CB-GC
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
119	3.54E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKER TO CLOSE	7.30E-04	ECX-CB-GC
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
120	3.47E-11	.03	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			SUMP SCREEN A PLUGS AND PREVENTS FLOW	2.40E-04	REA-PLUG
			SUMP SCREEN B PLUGS AND PREVENTS FLOW	2.40E-04	REB-PLUG
121	3.47E-11	.03	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			IRWST DISCHARGE LINE "A" STRAINER PLUGGED	2.40E-04	IWA-PLUG
			IRWST DISCHARGE LINE "B" STRAINER PLUGGED	2.40E-04	IWB-PLUG
122	3.45E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR

Table 54-5 (Sheet 15 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
123	3.42E-11	.03	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS	9.61E-04	IEV-RNSND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATION)	5.06E-01	REC-MANDASC
			COMMON MODE FAILURE OF INPUT LOGIC GROUPS	1.03E-04	CCX-INPUT-LOGIC
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZATION	6.83E-04	LPM-MAN05
124	3.41E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO OPEN OF THE STOP CHECK VALVES	6.10E-04	RNX-KV-GO
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
125	3.38E-11	.03	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILLED	1.68E-05	IEV-LOCA24ND
			CCF OF IRWST TANK LEVEL TRANSMITTER	2.01E-04	IWX-XMTR
			OPERATOR FAILS TO ACTUATE SUMP RECIRC WHEN IRWST SIGNAL FAILS	1.00E-02	REN-MAN04
126	3.36E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PLS OUTPUT LOGIC I/Os	2.09E-03	PL5MOD11
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
127	3.27E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKER TO CLOSE	7.30E-04	ECX-CB-GC
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
128	3.21E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
129	2.97E-11	.03	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS DRAINED	1.13E-05	IEV-LOCA24D
			CCF OF PRESSURE TRANSMITTERS	2.63E-06	CCX-XMTRX
130	2.96E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO OPEN OF THE STOP CHECK VALVES	6.10E-04	RNX-KV-GO
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA

Table 54-5 (Sheet 16 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
131	2.96E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO OPEN OF THE STOP CHECK VALVES	6.10E-04	RNX-KV-GO
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
132	2.89E-11	.03	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			CCF OF GRAVITY INJECTION CHECK VALVES TO OPEN	3.00E-05	IWX-CV-AO
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	1.60E-03	RHN-MAN05
133	2.82E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENT FAILURES	5.04E-04	ED1MOD01
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
134	2.78E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENTS FAILURE	3.17E-04	ED1MOD113
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
135	2.78E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENTS FAILURE	3.17E-04	ED1MOD11
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
136	2.78E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENTS FAILURE	3.17E-04	ED1MOD13
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
137	2.76E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP MP 01B SEGMENT HARDWARE FAILURE OR DIVERTED FLOW	2.44E-02	SWBMOD02
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
138	2.73E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO OPEN OF THE STOP CHECK VALVES	6.10E-04	RNX-KV-GO
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR

Table 54-5 (Sheet 17 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
139	2.71E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP 01B FAILS & ST CK V007B & C B FTC & RE FTC & CB ECS221 SPO	1.53E-02	RNBMOD07S
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
140	2.71E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP 01A FAILS; STOP CK V007A, CB & RELAY FTC; CB ECS122 SPO	1.53E-02	RNAMOD06S
			D/G FAILS TO START & RUN OR BKR 202 FAILS TO CLOSE	2.02E-02	ZO2MOD01
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
141	2.70E-11	.03	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EVENT	4.44E-06	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.50E-02	RHN-MAN04
			COND. PROB. OF IWN-MAN00 (OP. FAILS TO ACTUATE IRWST INJ)	5.00E-02	IWN-MAN00C
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S
142	2.69E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN	1.20E-03	ECX-CB-GO
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
143	2.69E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN	1.20E-03	ECX-CB-GO
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
144	2.67E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			EDS1 EA 1 DISTR. PNL FAILURE OR T&M	3.05E-04	ED1MOD07
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
145	2.63E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP MP 01B SEGMENT HARDWARE FAILURE OR DIVERTED FLOW	2.44E-02	SWBMOD02
			BREAKER 100 FAILS TO OPEN [#3,5]	1.23E-02	EC1CB100VO
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN

Table 54-5 (Sheet 18 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
146	2.60E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301BSA
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
147	2.60E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301ASA
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
148	2.60E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301ASA
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
149	2.60E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301BSA
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
150	2.49E-11	.02	LOCA/RNS PIPE RUPTURE WITH RCS FILLED INIT. EVENT OCCURS	1.51E-05	IEV-LOCAPRND
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.50E-02	RHN-MAN04
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
151	2.49E-11	.02	LOCA/RNS PIPE RUPTURE WITH RCS FILLED INIT. EVENT OCCURS	1.51E-05	IEV-LOCAPRND
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.50E-02	RHN-MAN04
			CCF OF GRAVITY INJECTION CHECK VALVES TO OPEN	3.00E-05	IWX-CV-AO
152	2.46E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE STANDBY DG TO RUN	4.40E-04	ZOX-DG-DR
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
153	2.45E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE STANDBY DG TO START	2.80E-04	ZOX-DG-DS
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN

Table 54-5 (Sheet 19 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
154	2.44E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENT FAILURES	5.04E-04	ED1MOD01
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
155	2.44E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENT FAILURES	5.04E-04	ED1MOD01
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
156	2.39E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP MP 01B SEGMENT HARDWARE FAILURE OR DIVERTED FLOW	2.44E-02	SWBMOD02
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
157	2.39E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP MP 01B SEGMENT HARDWARE FAILURE OR DIVERTED FLOW	2.44E-02	SWBMOD02
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
158	2.38E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
159	2.38E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
160	2.33E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S

Table 54-5 (Sheet 20 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
161	2.28E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			D/G FAILS TO START & RUN OR BKR 202 FAILS TO CLOSE	2.02E-02	ZO2MOD01
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
162	2.27E-11	.02	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS DRAINED	1.13E-05	IEV-LOCA24D
			CCF OF IRWST TANK LEVEL TRANSMITTER	2.01E-04	IWX-XMTR
			OPERATOR FAILS TO ACTUATE SUMP RECIRC WHEN IRWST SIGNAL FAILS	1.00E-02	REN-MAN04
163	2.26E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENT FAILURES	5.04E-04	ED1MOD01
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
164	2.21E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP MP 01B SEGMENT HARDWARE FAILURE OR DIVERTED FLOW	2.44E-02	SWBMOD02
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
165	2.18E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			BREAKER 200 FAILS TO OPEN [#5,3]	1.23E-02	EC2CB200VO
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
166	2.18E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BREAKER 100 FAILS TO OPEN [#3,5]	1.23E-02	EC1CB100VO
			D/G FAILS TO START & RUN OR BKR 202 FAILS TO CLOSE	2.02E-02	ZO2MOD01
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
167	2.16E-11	.02	LOCA/RNS PIPE RUPTURE WITH RCS FILLED INIT. EVENT OCCURS	1.51E-05	IEV-LOCAPRND
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.50E-02	RHN-MAN04
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA

Table 54-5 (Sheet 21 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
168	2.13E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE STANDBY DG TO RUN	4.40E-04	ZOX-DG-DR
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
169	2.13E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE STANDBY DG TO RUN	4.40E-04	ZOX-DG-DR
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
170	2.05E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP 01A FAILS; STOP CK V007A, CB & RELAY FTC; CB ECS122 SPO	1.53E-02	RNAMOD06S
			PUMP 01B FAILS & ST CK V007B & C B FTC & RE FTC & CB ECS221 SPO	1.53E-02	RNBMOD07S
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
171	1.98E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			D/G FAILS TO START & RUN OR BKR 202 FAILS TO CLOSE	2.02E-02	ZO2MOD01
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
172	1.98E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			D/G FAILS TO START & RUN OR BKR 202 FAILS TO CLOSE	2.02E-02	ZO2MOD01
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
173	1.97E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE STANDBY DG TO RUN	4.40E-04	ZOX-DG-DR
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
174	1.93E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN	1.20E-03	ECX-CB-GO
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM

Table 54-5 (Sheet 22 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
175	1.89E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF TO OPEN OF THE STOP CHECK VALVES	6.10E-04	RNX-KV-GO
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
176	1.89E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF TO OPEN OF THE STOP CHECK VALVES	6.10E-04	RNX-KV-GO
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
177	1.86E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301BSA
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
178	1.86E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301ASA
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
179	1.84E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP SUBLOOP B HARDWARE FAILURE OR DIVERTED FLOW	1.04E-02	CCBMOD01S
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
180	1.84E-11	.02	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	6.02E-04	IEV-CCWD
			CCF OF LOGIC GROUP PROCESSING	1.38E-05	CCX-PMA030X
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S
181	1.83E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			CCF OF ORIFICES	3.63E-06	CCX-ORY-SPX
182	1.83E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			D/G FAILS TO START & RUN OR BKR 202 FAILS TO CLOSE	2.02E-02	ZO2MOD01
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR

Table 54-5 (Sheet 23 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
183	1.81E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			PUMP 01A FAILS; STOP CK V007A, CB & RELAY FTC; CB ECS122 SPO	1.53E-02	RNAMOD06S
			PUMP 01B FAILS & ST CK V007B & C B FTC & RE FTC & CB ECS221 SPO	1.53E-02	RNBMOD07S
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
184	1.77E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENTS FAILURE	3.17E-04	ED1MOD13
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
185	1.77E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENTS FAILURE	3.17E-04	ED1MOD11
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
186	1.77E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENTS FAILURE	3.17E-04	ED1MOD113
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
187	1.73E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP 01A FAILS; STOP CK V007A, CB & RELAY FTC; CB ECS122 SPO	1.53E-02	RNAMOD06S
			D/G FAILS TO START & RUN OR BKR 202 FAILS TO CLOSE	2.02E-02	ZO2MOD01
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
188	1.73E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP 01B FAILS & ST CK V007B & C B FTC & RE FTC & CB ECS221 SPO	1.53E-02	RNBMOD07S
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
189	1.72E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP

Table 54-5 (Sheet 24 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
190	1.72E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
191	1.72E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S
192	1.71E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			EDS1 EA 1 DISTR. PNL FAILURE OR T&M	3.05E-04	ED1MOD07
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
193	1.68E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	1.60E-03	RHN-MAN05
194	1.68E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP MP 01B SEGMENT HARDWARE FAILURE OR DIVERTED FLOW	2.44E-02	SWBMOD02
			BREAKER 100 FAILS TO OPEN [#3,5]	1.23E-02	EC1CB100VO
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
195	1.65E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP 01A FAILS; STOP CK V007A, CB & RELAY FTC; CB ECS122 SPO	1.53E-02	RNAMOD06S
			BREAKER 200 FAILS TO OPEN [#5,3]	1.23E-02	EC2CB200VO
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
196	1.65E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP 01B FAILS & ST CK V007B & C B FTC & RE FTC & CB ECS221 SPO	1.53E-02	RNBMOD07S
			BREAKER 100 FAILS TO OPEN [#3,5]	1.23E-02	EC1CB100VO
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN

Table 54-5 (Sheet 25 of 25)

AP600 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
197	1.63E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKER TO CLOSE	7.30E-04	ECX-CB-GC
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
198	1.63E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKER TO CLOSE	7.30E-04	ECX-CB-GC
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
199	1.57E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			PUMP 01A FAILS; STOP CK V007A, CB & RELAY FTC; CB ECS122 SPO	1.53E-02	RNAMOD06S
			PUMP 01B FAILS & ST CK V007B & C B FTC & RE FTC & CB ECS221 SPO	1.53E-02	RNBMOD07S
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
200	1.57E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	4.44E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			PUMP 01A FAILS; STOP CK V007A, CB & RELAY FTC; CB ECS122 SPO	1.53E-02	RNAMOD06S
			PUMP 01B FAILS & ST CK V007B & C B FTC & RE FTC & CB ECS221 SPO	1.53E-02	RNBMOD07S
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA

Table 54-6 (Sheet 1 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

***** DOMINANT CUTSETS ***** Page: 1

Title: AP1000 SD PRA
File: 1000sn1.w1 (Case 1)
Reduced Sum of Cutsets: 1.2310E-07

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
1	2.15E-08	17.47	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
2	1.86E-08	15.11	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
3	1.86E-08	15.11	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
4	8.59E-09	6.98	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
5	8.59E-09	6.98	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
6	3.67E-09	2.98	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
7	2.91E-09	2.36	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
8	2.66E-09	2.16	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
9	2.60E-09	2.11	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF ORIFICES	3.63E-06	CCX-ORY-SPX
10	2.52E-09	2.05	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA

Table 54-6 (Sheet 2 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
11	2.52E-09	2.05	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
12	2.18E-09	1.77	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EVENT	5.28E-06	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.50E-02	RHN-MAN04
			COND. PROB. OF IWN-MAN00 (OP. FAILS TO ACTUATE IRWST INJ)	5.00E-02	IWN-MAN00C
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	1.50E-01	RHN-MAN05C
13	1.88E-09	1.53	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF PRESSURE TRANSMITTERS	2.63E-06	CCX-XMTRX
14	1.44E-09	1.17	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF IRWST TANK LEVEL TRANSMITTER	2.01E-04	IWX-XMTR
			OPERATOR FAILS TO ACTUATE SUMP RECIRC WHEN IRWST SIGNAL FAILS	1.00E-02	REN-MAN04
15	1.16E-09	.94	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
16	1.16E-09	.94	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
17	8.61E-10	.70	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EVENT	5.28E-06	IEV-RCSOD
			OPERATOR SUCCEEDS IN ISOLATING RNS LEAK	9.45E-01	RHN-MAN04-SUCC
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	1.15E-03	IWN-MAN00
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	1.50E-01	RHN-MAN05C
18	8.59E-10	.70	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
19	5.19E-10	.42	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILLED	1.73E-05	IEV-LOCA24ND
			CCF OF GRAVITY INJECTION CHECK VALVES TO OPEN	3.00E-05	IWX-CV-AO
20	5.19E-10	.42	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILLED	1.73E-05	IEV-LOCA24ND
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
21	5.16E-10	.42	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			MECHANICAL FAILURE CAUSES MOV 121A TO FAIL-TO-OPEN	3.00E-03	IRWMOD05S
			IRWST DISCHARGE LINE "B" STRAINER PLUGGED	2.40E-04	IWB-PLUG
22	4.50E-10	.37	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILLED	1.73E-05	IEV-LOCA24ND
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA

Table 54-6 (Sheet 3 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
23	3.99E-10	.32	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			FAILURE OF MANUAL DAS ACTUATION	1.16E-02	REC-MANDAS
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
24	3.82E-10	.31	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATION)	5.06E-01	REC-MANDASC
			CCF OF ORIFICES	2.77E-04	CCX-ORY-SP
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZATION	6.83E-04	LPM-MAN05
25	3.52E-10	.29	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF ORIFICES	3.63E-06	CCX-ORY-SPX
26	3.45E-10	.28	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS DRAINED	1.15E-05	IEV-LOCA24D
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
27	3.44E-10	.28	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
28	2.99E-10	.24	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS DRAINED	1.15E-05	IEV-LOCA24D
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
29	2.99E-10	.24	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS DRAINED	1.15E-05	IEV-LOCA24D
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
30	2.81E-10	.23	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
31	2.77E-10	.23	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATION)	5.06E-01	REC-MANDASC
			CCF OF PRESSURE TRANSMITTERS	2.01E-04	CCX-XMTR195
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZATION	6.83E-04	LPM-MAN05
32	2.55E-10	.21	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF PRESSURE TRANSMITTERS	2.63E-06	CCX-XMTRX

Table 54-6 (Sheet 4 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
33	2.18E-10	.18	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PLS OUTPUT LOGIC I/Os	2.09E-03	PL5MOD11
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
34	2.08E-10	.17	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
35	2.08E-10	.17	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILLED	1.73E-05	IEV-LOCA24ND
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
36	2.08E-10	.17	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILLED	1.73E-05	IEV-LOCA24ND
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
37	1.95E-10	.16	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF IRWST TANK LEVEL TRANSMITTER	2.01E-04	IWX-XMTR
			OPERATOR FAILS TO ACTUATE SUMP RECIRC WHEN IRWST SIGNAL FAILS	1.00E-02	REN-MAN04
38	1.93E-10	.16	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS FILLED	1.82E-02	IEV-LOSPND
			OFFSITE AC POWER RECOVERED IN 2 HOURS	7.60E-01	SUC-R2S
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
			FAILURE OF MANUAL DAS ACTUATION	1.16E-02	REC-MANDAS
39	1.80E-10	.15	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
40	1.66E-10	.13	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS FILLED	1.82E-02	IEV-LOSPND
			OFFSITE AC POWER RECOVERED IN 2 HOURS	7.60E-01	SUC-R2S
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
41	1.56E-10	.13	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA

Table 54-6 (Sheet 5 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
42	1.56E-10	.13	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
43	1.50E-10	.12	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EVENT	5.28E-06	IEV-RCSOD
			OPERATOR SUCCEEDS IN ISOLATING RNS LEAK	9.45E-01	RHN-MAN04-SUCC
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
44	1.44E-10	.12	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
45	1.42E-10	.12	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATION)	5.06E-01	REC-MANDASC
			COMMON MODE FAILURE OF INPUT LOGIC GROUPS	1.03E-04	CCX-INPUT-LOGIC
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZATION	6.83E-04	LPM-MAN05
46	1.39E-10	.11	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PLS OUTPUT LOGIC I/Os	2.09E-03	PL5MOD11
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
47	1.38E-10	.11	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS DRAINED	1.15E-05	IEV-LOCA24D
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
48	1.38E-10	.11	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS DRAINED	1.15E-05	IEV-LOCA24D
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
49	1.33E-10	.11	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
50	1.30E-10	.11	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EVENT	5.28E-06	IEV-RCSOD
			OPERATOR SUCCEEDS IN ISOLATING RNS LEAK	9.45E-01	RHN-MAN04-SUCC
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA

Table 54-6 (Sheet 6 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
51	1.30E-10	.11	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EVENT	5.28E-06	IEV-RCSOD
			OPERATOR SUCCEEDS IN ISOLATING RNS LEAK	9.45E-01	RHN-MAN04-SUCC
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
52	1.25E-10	.10	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN	1.20E-03	ECX-CB-GO
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
53	1.21E-10	.10	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301BSA
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
54	1.21E-10	.10	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301ASA
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
55	1.21E-10	.10	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PLS OUTPUT LOGIC I/Os	2.09E-03	PL5MOD11
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
56	1.21E-10	.10	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PLS OUTPUT LOGIC I/Os	2.09E-03	PL5MOD11
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
57	1.16E-10	.09	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
58	1.15E-10	.09	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA

Table 54-6 (Sheet 7 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
59	1.15E-10	.09	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
60	1.11E-10	.09	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PLS OUTPUT LOGIC I/Os	2.09E-03	PL5MOD11
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
61	1.06E-10	.09	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
62	1.02E-10	.08	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS	1.02E-03	IEV-RNSND
			FAILURE OF MANUAL DAS ACTUATION	1.16E-02	REC-MANDAS
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
63	9.76E-11	.08	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS	1.02E-03	IEV-RNSND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATION)	5.06E-01	REC-MANDASC
			CCF OF ORIFICES	2.77E-04	CCX-ORY-SP
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZATION	6.83E-04	LPM-MAN05
64	8.79E-11	.07	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS	1.02E-03	IEV-RNSND
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
65	8.03E-11	.07	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF THE PUMPS	7.70E-04	RNX-PM-FS
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
66	7.98E-11	.06	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN	1.20E-03	ECX-CB-GO
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA

Table 54-6 (Sheet 8 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
67	7.72E-11	.06	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301BSA
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
68	7.72E-11	.06	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301ASA
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
69	7.61E-11	.06	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKER TO CLOSE	7.30E-04	ECX-CB-GC
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
70	7.33E-11	.06	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF ACTUATION LOGIC GROUPS	4.63E-05	CCX-PMAMOD1X
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S
71	7.19E-11	.06	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
72	7.19E-11	.06	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
73	7.16E-11	.06	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			FAILURE OF MANUAL DAS ACTUATION	1.16E-02	REC-MANDAS
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
74	7.09E-11	.06	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS	1.02E-03	IEV-RNSND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATION)	5.06E-01	REC-MANDASC
			CCF OF PRESSURE TRANSMITTERS	2.01E-04	CCX-XMTR195
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZATION	6.83E-04	LPM-MAN05

Table 54-6 (Sheet 9 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
75	7.07E-11	.06	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF TO START OF THE PUMPS	7.70E-04	RNX-PM-FS
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
76	6.98E-11	.06	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			MECHANICAL FAILURE CAUSES MOV 121A TO FAIL-TO-OPEN	3.00E-03	IRWMOD05S
			IRWST DISCHARGE LINE "B" STRAINER PLUGGED	2.40E-04	IWB-PLUG
77	6.92E-11	.06	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN	1.20E-03	ECX-CB-GO
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
78	6.92E-11	.06	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN	1.20E-03	ECX-CB-GO
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
79	6.69E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301BSA
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
80	6.69E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301ASA
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
81	6.69E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301ASA
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
82	6.69E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301BSA
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA

Table 54-6 (Sheet 10 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
83	6.39E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN	1.20E-03	ECX-CB-GO
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
84	6.36E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO OPEN OF THE STOP CHECK VALVES	6.10E-04	RNX-KV-GO
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
85	6.17E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301ASA
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
86	6.17E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301BSA
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
87	6.17E-11	.05	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
88	6.13E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
89	6.13E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
90	6.08E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS FILLED	1.82E-02	IEV-LOSPND
			FAILURE TO RECOVER AC POWER IN 2 HOURS	2.40E-01	OTH-R2
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
			FAILURE OF MANUAL DAS ACTUATION	1.16E-02	REC-MANDAS

Table 54-6 (Sheet 11 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
91	5.99E-11	.05	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EVENT	5.28E-06	IEV-RCSOD
			OPERATOR SUCCEEDS IN ISOLATING RNS LEAK	9.45E-01	RHN-MAN04-SUCC
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
92	5.99E-11	.05	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EVENT	5.28E-06	IEV-RCSOD
			OPERATOR SUCCEEDS IN ISOLATING RNS LEAK	9.45E-01	RHN-MAN04-SUCC
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
93	5.60E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF TO OPEN OF THE STOP CHECK VALVES	6.10E-04	RNX-KV-GO
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
94	5.56E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PLS OUTPUT LOGIC I/Os	2.09E-03	PL5MOD11
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
95	5.56E-11	.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PLS OUTPUT LOGIC I/Os	2.09E-03	PL5MOD11
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
96	5.55E-11	.05	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
			FAILURE OF MANUAL DAS ACTUATION	1.16E-02	REC-MANDAS
97	5.32E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
98	5.32E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
99	5.30E-11	.04	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF ACTUATION LOGIC GROUPS	4.63E-05	CCX-PMAMOD1X
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	1.60E-03	RHN-MAN05

Table 54-6 (Sheet 12 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
100	5.25E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENT FAILURES	5.04E-04	ED1MOD01
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
101	5.24E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS FILLED	1.82E-02	IEV-LOSPND
			FAILURE TO RECOVER AC POWER IN 2 HOURS	2.40E-01	OTH-R2
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
102	5.16E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
103	5.16E-11	.04	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			IRWST DISCHARGE LINE "B" STRAINER PLUGGED	2.40E-04	IWB-PLUG
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDBBSDS1TM
104	5.16E-11	.04	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			IRWST DISCHARGE LINE "B" STRAINER PLUGGED	2.40E-04	IWB-PLUG
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDBBSDK1TM
105	5.16E-11	.04	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			IRWST DISCHARGE LINE "B" STRAINER PLUGGED	2.40E-04	IWB-PLUG
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDBBSDD1TM
106	5.14E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP MP 01B SEGMENT HARDWARE FAILURE OR DIVERTED FLOW	2.44E-02	SWBMOD02
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
107	5.12E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA

Table 54-6 (Sheet 13 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
108	4.86E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF TO OPEN OF THE STOP CHECK VALVES	6.10E-04	RNX-KV-GO
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
109	4.86E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF TO OPEN OF THE STOP CHECK VALVES	6.10E-04	RNX-KV-GO
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
110	4.86E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKER TO CLOSE	7.30E-04	ECX-CB-GC
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
111	4.79E-11	.04	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
112	4.75E-11	.04	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF GRAVITY INJECTION CHECK VALVES TO OPEN	3.00E-05	IWX-CV-AO
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S
113	4.59E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE STANDBY DG TO RUN	4.40E-04	ZOX-DG-DR
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
114	4.44E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
115	4.44E-11	.04	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA

Table 54-6 (Sheet 14 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
116	4.25E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			D/G FAILS TO START & RUN OR BKR 202 FAILS TO CLOSE	2.02E-02	ZO2MOD01
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
117	4.21E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKER TO CLOSE	7.30E-04	ECX-CB-GC
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
118	4.21E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKER TO CLOSE	7.30E-04	ECX-CB-GC
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
119	4.17E-11	.03	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS DRAINED	1.15E-05	IEV-LOCA24D
			CCF OF ORIFICES	3.63E-06	CCX-ORY-SPX
120	4.12E-11	.03	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			SUMP SCREEN A PLUGS AND PREVENTS FLOW	2.40E-04	REA-PLUG
			SUMP SCREEN B PLUGS AND PREVENTS FLOW	2.40E-04	REB-PLUG
121	4.12E-11	.03	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			IRWST DISCHARGE LINE "A" STRAINER PLUGGED	2.40E-04	IWA-PLUG
			IRWST DISCHARGE LINE "B" STRAINER PLUGGED	2.40E-04	IWB-PLUG
122	4.10E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
123	4.06E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO OPEN OF THE STOP CHECK VALVES	6.10E-04	RNX-KV-GO
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA

Table 54-6 (Sheet 15 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
124	4.00E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PLS OUTPUT LOGIC I/Os	2.09E-03	PL5MOD11
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
125	3.89E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKER TO CLOSE	7.30E-04	ECX-CB-GC
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
126	3.82E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
127	3.63E-11	.03	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS	1.02E-03	IEV-RNSND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATION)	5.06E-01	REC-MANDASC
			COMMON MODE FAILURE OF INPUT LOGIC GROUPS	1.03E-04	CCX-INPUT-LOGIC
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZATION	6.83E-04	LPM-MAN05
128	3.52E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO OPEN OF THE STOP CHECK VALVES	6.10E-04	RNX-KV-GO
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
129	3.52E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO OPEN OF THE STOP CHECK VALVES	6.10E-04	RNX-KV-GO
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
130	3.48E-11	.03	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILLED	1.73E-05	IEV-LOCA24ND
			CCF OF IRWST TANK LEVEL TRANSMITTER	2.01E-04	IWX-XMTR
			OPERATOR FAILS TO ACTUATE SUMP RECIRC WHEN IRWST SIGNAL FAILS	1.00E-02	REN-MAN04
131	3.44E-11	.03	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF GRAVITY INJECTION CHECK VALVES TO OPEN	3.00E-05	IWX-CV-AO
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	1.60E-03	RHN-MAN05

Table 54-6 (Sheet 16 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
132	3.35E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENT FAILURES	5.04E-04	ED1MOD01
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
133	3.30E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENTS FAILURE	3.17E-04	ED1MOD13
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
134	3.30E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENTS FAILURE	3.17E-04	ED1MOD113
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
135	3.30E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENTS FAILURE	3.17E-04	ED1MOD11
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
136	3.28E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP MP 01B SEGMENT HARDWARE FAILURE OR DIVERTED FLOW	2.44E-02	SWBMOD02
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
137	3.25E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO OPEN OF THE STOP CHECK VALVES	6.10E-04	RNX-KV-GO
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
138	3.22E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP 01A FAILS; STOP CK V007A, CB & RELAY FTC; CB ECS122 SPO	1.53E-02	RNAMOD06S
			D/G FAILS TO START & RUN OR BKR 202 FAILS TO CLOSE	2.02E-02	ZO2MOD01
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN

Table 54-6 (Sheet 17 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
139	3.22E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP 01B FAILS & ST CK V007B & C B FTC & RE FTC & CB ECS221 SPO	1.53E-02	RNBMOD07S
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
140	3.21E-11	.03	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EVENT	5.28E-06	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.50E-02	RHN-MAN04
			COND. PROB. OF IWN-MAN00 (OP. FAILS TO ACTUATE IRWST INJ)	5.00E-02	IWN-MAN00C
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S
141	3.19E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN	1.20E-03	ECX-CB-GO
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
142	3.19E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN	1.20E-03	ECX-CB-GO
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
143	3.18E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			EDS1 EA 1 DISTR. PNL FAILURE OR T&M	3.05E-04	ED1MOD07
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
144	3.13E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP MP 01B SEGMENT HARDWARE FAILURE OR DIVERTED FLOW	2.44E-02	SWBMOD02
			BREAKER 100 FAILS TO OPEN [#3,5]	1.23E-02	EC1CB100VO
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
145	3.09E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301BSA
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP

Table 54-6 (Sheet 18 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
146	3.09E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301BSA
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
147	3.09E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301ASA
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
148	3.09E-11	.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301ASA
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
149	3.02E-11	.02	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS DRAINED	1.15E-05	IEV-LOCA24D
			CCF OF PRESSURE TRANSMITTERS	2.63E-06	CCX-XMTRX
150	2.93E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE STANDBY DG TO RUN	4.40E-04	ZOX-DG-DR
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
151	2.92E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE STANDBY DG TO START	2.80E-04	ZOX-DG-DS
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
152	2.91E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENT FAILURES	5.04E-04	ED1MOD01
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
153	2.91E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENT FAILURES	5.04E-04	ED1MOD01
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA

Table 54-6 (Sheet 19 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
154	2.84E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP MP 01B SEGMENT HARDWARE FAILURE OR DIVERTED FLOW	2.44E-02	SWBMOD02
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
155	2.84E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP MP 01B SEGMENT HARDWARE FAILURE OR DIVERTED FLOW	2.44E-02	SWBMOD02
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
156	2.83E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
157	2.83E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
158	2.77E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S
159	2.71E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			D/G FAILS TO START & RUN OR BKR 202 FAILS TO CLOSE	2.02E-02	ZO2MOD01
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
160	2.68E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENT FAILURES	5.04E-04	ED1MOD01
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR

Table 54-6 (Sheet 20 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
161	2.66E-11	.02	LOCA/RNS PIPE RUPTURE WITH RCS FILLED INIT. EVENT OCCURS	1.61E-05	IEV-LOCAPRND
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.50E-02	RHN-MAN04
			CCF OF GRAVITY INJECTION CHECK VALVES TO OPEN	3.00E-05	IWX-CV-AO
162	2.66E-11	.02	LOCA/RNS PIPE RUPTURE WITH RCS FILLED INIT. EVENT OCCURS	1.61E-05	IEV-LOCAPRND
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.50E-02	RHN-MAN04
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
163	2.62E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP MP 01B SEGMENT HARDWARE FAILURE OR DIVERTED FLOW	2.44E-02	SWBMOD02
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
164	2.59E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BREAKER 100 FAILS TO OPEN [#3,5]	1.23E-02	EC1CB100VO
			D/G FAILS TO START & RUN OR BKR 202 FAILS TO CLOSE	2.02E-02	ZO2MOD01
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
165	2.59E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			BREAKER 200 FAILS TO OPEN [#5,3]	1.23E-02	EC2CB200VO
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
166	2.54E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE STANDBY DG TO RUN	4.40E-04	ZOX-DG-DR
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
167	2.54E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE STANDBY DG TO RUN	4.40E-04	ZOX-DG-DR
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA

Table 54-6 (Sheet 21 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
168	2.44E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP 01A FAILS; STOP CK V007A, CB & RELAY FTC; CB ECS122 SPO	1.53E-02	RNAMOD06S
			PUMP 01B FAILS & ST CK V007B & C B FTC & RE FTC & CB ECS221 SPO	1.53E-02	RNBMOD07S
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
169	2.35E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			D/G FAILS TO START & RUN OR BKR 202 FAILS TO CLOSE	2.02E-02	ZO2MOD01
			CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
170	2.35E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			D/G FAILS TO START & RUN OR BKR 202 FAILS TO CLOSE	2.02E-02	ZO2MOD01
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
171	2.34E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE STANDBY DG TO RUN	4.40E-04	ZOX-DG-DR
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
172	2.31E-11	.02	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS DRAINED	1.15E-05	IEV-LOCA24D
			CCF OF IRWST TANK LEVEL TRANSMITTER	2.01E-04	IWX-XMTR
			OPERATOR FAILS TO ACTUATE SUMP RECIRC WHEN IRWST SIGNAL FAILS	1.00E-02	REN-MAN04
173	2.30E-11	.02	LOCA/RNS PIPE RUPTURE WITH RCS FILLED INIT. EVENT OCCURS	1.61E-05	IEV-LOCAPRND
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.50E-02	RHN-MAN04
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA
174	2.30E-11	.02	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			FAILURE OF PRHR DUE TO COMMON CAUSE OF AOVs	1.92E-04	PXX-AV-LA
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
175	2.30E-11	.02	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			FAILURE OF PRHR DUE TO COMMON CAUSE OF AOVs	1.92E-04	PXX-AV-LA
			CCF OF GRAVITY INJECTION CHECK VALVES TO OPEN	3.00E-05	IWX-CV-AO

Table 54-6 (Sheet 22 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
176	2.29E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN	1.20E-03	ECX-CB-GO
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
177	2.24E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF TO OPEN OF THE STOP CHECK VALVES	6.10E-04	RNX-KV-GO
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
178	2.24E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF TO OPEN OF THE STOP CHECK VALVES	6.10E-04	RNX-KV-GO
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
179	2.22E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301ASA
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
180	2.22E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND	1.16E-03	PL50301BSA
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
181	2.19E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP SUBLOOP B HARDWARE FAILURE OR DIVERTED FLOW	1.04E-02	CCBMOD01S
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
182	2.18E-11	.02	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF LOGIC GROUP PROCESSING	1.38E-05	CCX-PMA030X
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S
183	2.17E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			CCF OF ORIFICES	3.63E-06	CCX-ORY-SPX

Table 54-6 (Sheet 23 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
184	2.17E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			D/G FAILS TO START & RUN OR BKR 202 FAILS TO CLOSE	2.02E-02	ZO2MOD01
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
185	2.15E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			PUMP 01A FAILS; STOP CK V007A, CB & RELAY FTC; CB ECS122 SPO	1.53E-02	RNAMOD06S
			PUMP 01B FAILS & ST CK V007B & C B FTC & RE FTC & CB ECS221 SPO	1.53E-02	RNBMOD07S
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
186	2.11E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENTS FAILURE	3.17E-04	ED1MOD113
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
187	2.11E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENTS FAILURE	3.17E-04	ED1MOD11
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
188	2.11E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENTS FAILURE	3.17E-04	ED1MOD13
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
189	2.06E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP 01B FAILS & ST CK V007B & C B FTC & RE FTC & CB ECS221 SPO	1.53E-02	RNBMOD07S
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
190	2.06E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP 01A FAILS; STOP CK V007A, CB & RELAY FTC; CB ECS122 SPO	1.53E-02	RNAMOD06S
			D/G FAILS TO START & RUN OR BKR 202 FAILS TO CLOSE	2.02E-02	ZO2MOD01
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA

Table 54-6 (Sheet 24 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
191	2.05E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			CCF OF IRWST RECIRC SUMP STRAINERS PLUGGING	1.20E-05	REX-FL-GP
192	2.05E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF RNS PUMPS P01A/B TO START	7.70E-04	RNX-PM-FS
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
193	2.05E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S
194	2.03E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			EDS1 EA 1 DISTR. PNL FAILURE OR T&M	3.05E-04	ED1MOD07
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
195	2.00E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	1.60E-03	RHN-MAN05
196	2.00E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP MP 01B SEGMENT HARDWARE FAILURE OR DIVERTED FLOW	2.44E-02	SWBMOD02
			BREAKER 100 FAILS TO OPEN [#3,5]	1.23E-02	EC1CB100VO
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
197	1.99E-11	.02	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			FAILURE OF PRHR DUE TO COMMON CAUSE OF AOVs	1.92E-04	PXX-AV-LA
			CCF OF 2/2 IRWST LP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV4-SA

Table 54-6 (Sheet 25 of 25)

AP1000 SHUTDOWN LEVEL 1 PRA TOP 200 CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
198	1.96E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP 01B FAILS & ST CK V007B & C B FTC & RE FTC & CB ECS221 SPO	1.53E-02	RNBMOD07S
			BREAKER 100 FAILS TO OPEN [#3,5]	1.23E-02	EC1CB100VO
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
199	1.96E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP 01A FAILS; STOP CK V007A, CB & RELAY FTC; CB ECS122 SPO	1.53E-02	RNAMOD06S
			BREAKER 200 FAILS TO OPEN [#5,3]	1.23E-02	EC2CB200VO
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
200	1.94E-11	.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKER TO CLOSE	7.30E-04	ECX-CB-GC
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
TOTAL:	1.18E-07	95.7%			

Table 54-7

BASIC EVENT PROBABILITIES REVISED IN CASE 1

	Component		Basic Event	Old Prob.	New Prob.
1	CCF of ADS-4 EVs	2	ADX-EV-SA	3.00E-05	3.80E-05
2	EV-118A	143	IRWMOD09	1.46E-03	1
3	EV-120A	144	IRWMOD10	1.46E-03	1
4	Screen Plug	151	IWA-PLUG	2.40E-04	1
5	CV-122A	152	IWACV122AO	8.76E-03	1
6	EV-123 A	153	IWACV123AO	8.76E-03	1
7	CV-124A	154	IWACV124AO	8.76E-03	1
8	EV-125A	155	IWACV125AO	8.76E-03	1
9	CCF IRWST CVs	167	IWX-CV-AO	3.00E-05	4.00E-05
10	CCF IRWST EVs	168	IWX-EV4-SA	2.60E-05	3.30E-05
11	Screen Plug	228	REA-PLUG	2.40E-04	1
12	CV-120A	229	REACV119GO	1.75E-03	1
13	MOV-RNS-23	243	RN23MOD5S	2.21E-03	1
	ADS-4 Line 1 EV		AD4MOD7	not in cutsets	
	ADS-4 Line 2 EV		AD4MOD8	not in cutsets	
	OK	157	IWB-PLUG	2.40E-04	
	OK	158	IWBCV122AO	8.76E-03	
	OK	159	IWBCV123AO	8.76E-03	
	OK	160	IWBCV124AO	8.76E-03	
	OK	161	IWBCV125AO	8.76E-03	

Basic Events Revised:
; SENDATA 1 1
; 03/13/03, 13:34:27

h:\ap1000~2\38-1\case-1\drained.wlk

Case 1
h:\ap1000~2\38-1\case-1\drained.wl1

ADX-EV-SA 3.8E-05
IWA-PLUG R
IWACV122AO R
IWACV123AO R
IWACV124AO R
IWACV125AO R
IWX-CV-AO 4.0e-05
RN23MOD5S R
IRWMOD09 R
IRWMOD10 R
IWX-EV4-SA 3.3e-05
REA-PLUG R
REACV119GO R

Table 54-8 (Sheet 1 of 2)

REVISED CCF BASIC EVENT PROBABILITIES

CCF calcs CCF basic event probabilities must be increased since some redundant components are out of service.

ADS 4th stage EVs. 1/4 needed for success; group size is 4; only 2 available.

Random Failure probability = 5.80E-04

	CCF Multiplier	Q	N # of Comb.	Q*N	Original Should have been # of Comb.	Original Should have been Q*N	Original used # of Comb.	Original used Q*N
2/4	1.70E-02	9.860E-06	1	9.860E-06	0	0.000E+00	0	0.000E+00
3/4	1.70E-03	9.860E-07	2	1.972E-06	0	0.000E+00	4	3.944E-06
4/4	4.50E-02	2.610E-05	1	2.610E-05	1	2.610E-05	1	2.610E-05
Calc 1		**ADX-EV-SA**		**3.8E-05**		2.610E-05		**3.0E-05**

replace ADX-EV-SA with the new value but 3.0E-05 was used; was conservative

IRWST Check valves 1/4 needed for success; group size is 4; only two available

Random Failure Probability = 1.75E-03

		Q	N # of Comb.	Q*N	Original used # of Comb.	Original used Q*N
2/4	3.10E-04	5.425E-07	1	5.425E-07	0	0.000E+00
3/4	2.80E-03	4.900E-06	2	9.800E-06	0	0.000E+00
4/4	1.70E-02	2.975E-05	1	2.975E-05	1	2.975E-05
Calc 2		**IWX-CV-AO**		**4.0E-05**		**3.0E-05**

replace IWX-CV-AO with the new value

Table 54-8 (Sheet 2 of 2)

REVISED CCF BASIC EVENT PROBABILITIES

IRWST EVs			1/4 needed for success; group size is 6; three are out of service			
Random Failure Probability =			5.80E-04			
			N		Original used	
		Q	# of Comb.	Q*N	# of Comb.	Q*N
2/6	1.00E-02	5.800E-06	1	5.800E-06	0	0.000E+00
3/6	5.00E-04	2.900E-07	4	1.160E-06	0	0.000E+00
4/6	4.50E-02	2.610E-05	1	2.610E-05	1	2.610E-05
Calc 3		**IWX-EV4-SA**		**3.3E-05**		**2.6E-05**
		replace IWX-EV4SA with the new value				

Table 54-9

CONTRIBUTION OF INITIATING EVENTS TO PLANT CDF – SHUTDOWN SENSITIVITY CASE 1

	Plant CDF from drained events =				1.95E-06	
	Total Plant CDF (drained + non-drained) =				2.19E-06	
	Initiating Event	**Percentage Contribution**	**IEV Frequency a**	**IEV CDF b**	**CDP b/a**	
1	IEV-CCWD	69.2	7.16E-04	1.51E-06	2.11E-03	Drained events
2	IEV-RNSD	9.2	9.69E-05	2.01E-07	2.08E-03	Drained events
3	IEV-LOSPD	8.8	5.28E-03	1.93E-07	3.66E-05	Drained events
4	IEV-RCSOD	1.1	5.28E-06	2.49E-08	4.72E-03	Drained events
5	IEV-LOCA24D	0.9	1.15E-05	1.97E-08	1.71E-03	Drained events
	IEV-LOSPND	8.2	1.82E-02	1.79E-07	9.82E-06	Non-drained events
	IEV-CCWND	1.9	3.99E-03	4.09E-08	1.02E-05	Non-drained events
	IEV-RNSND	0.5	1.02E-03	1.04E-08	1.02E-05	Non-drained events
	IEV-LOCA24ND	0.1	1.73E-05	2.46E-09	1.42E-04	Non-drained events
	IEV-LOCAPRND	0.0	1.61E-05	2.84E-10	1.76E-05	Non-drained events

Note:
Non-drained cases are the same as the base case.

Table 54-10 (Sheet 1 of 5)

AP1000 SHUTDOWN PRA SENSITIVITY CASE 2 CDF CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
1	1.19E-07	9.67	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS FILLED	1.82E-02	IEV-LOSPND
			OFFSITE AC POWER RECOVERED IN 2 HOURS	7.60E-01	SUC-R2S
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
2	1.04E-07	8.46	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
3	9.19E-08	7.47	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF ADS 4TH S AGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
4	7.96E-08	6.47	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF 6 OUT OF 6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
5	7.96E-08	6.47	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF 2 OUT OF 2 LOW PRESSURE RECIRCULATION SQUIB VALVES	2.60E-05	IWX-EV4-SA
6	6.65E-08	5.41	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF ADS 4TH S AGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
7	5.77E-08	4.69	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF 6 OUT OF 6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
8	5.77E-08	4.69	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF 2 OUT OF 2 LOW PRESSURE RECIRCULATION SQUIB VALVES	2.60E-05	IWX-EV4-SA
9	5.32E-08	4.33	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
10	3.77E-08	3.07	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS FILLED	1.82E-02	IEV-LOSPND
			FAILURE TO RECOVER AC POWER IN 2 HOURS	2.40E-01	OTH-R2
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM

Table 54-10 (Sheet 2 of 5)

AP1000 SHUTDOWN PRA SENSITIVITY CASE 2 CDF CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
11	3.67E-08	2.98	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
12	3.67E-08	2.98	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF PLUGGING OF BOTH RECIRC LINES DUE TO SUMP SCREENS	1.20E-05	REX-FL-GP
13	3.44E-08	2.80	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
14	2.66E-08	2.16	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF PLUGGING OF BOTH RECIRC LINES DUE TO SUMP SCREENS	1.20E-05	REX-FL-GP
15	2.66E-08	2.16	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
16	2.64E-08	2.15	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
17	2.15E-08	1.75	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF ADS 4TH S AGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
18	1.91E-08	1.55	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
19	1.86E-08	1.51	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF 6 OUT OF 6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
20	1.86E-08	1.51	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF 2 OUT OF 2 LOW PRESSURE RECIRCULATION SQUIB VALVES	2.60E-05	IWX-EV4-SA
21	1.66E-08	1.35	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS FILLED	1.82E-02	IEV-LOSPND
			OFFSITE AC POWER RECOVERED IN 2 HOURS	7.60E-01	SUC-R2S
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW

Table 54-10 (Sheet 3 of 5)

AP1000 SHUTDOWN PRA SENSITIVITY CASE 2 CDF CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
22	1.11E-08	.90	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF ORIFICES	3.63E-06	CCX-ORY-SPX
23	1.02E-08	.83	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S
24	8.79E-09	.71	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS	1.02E-03	IEV-RNSND
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
25	8.59E-09	.70	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
26	8.59E-09	.70	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF PLUGGING OF BOTH RECIRC LINES DUE TO SUMP SCREENS	1.20E-05	REX-FL-GP
27	8.05E-09	.65	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF PRESSURE TRANSMITTERS	2.63E-06	CCX-XMTRX
28	8.05E-09	.65	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF ORIFICES	3.63E-06	CCX-ORY-SPX
29	7.42E-09	.60	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	1.60E-03	RHN-MAN05
30	6.17E-09	.50	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
31	6.16E-09	.50	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF IRWST LEVEL TRANSMITTERS	2.01E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE	1.00E-02	REN-MAN04

Table 54-10 (Sheet 4 of 5)

AP1000 SHUTDOWN PRA SENSITIVITY CASE 2 CDF CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
32	5.83E-09	.47	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED FAILURE TO RECOVER AC POWER IN 1 HOUR CCF OF PRESSURE TRANSMITTERS	5.28E-03 4.20E-01 2.63E-06	IEV-LOSPD OTH-R1 CCX-XMTRX
33	5.69E-09	.46	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED FAILURE TO RECOVER AC POWER IN 1 HOUR FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	5.28E-03 4.20E-01 1.16E-03 2.21E-03	IEV-LOSPD OTH-R1 PMA0301ASA RN23MOD5S
34	5.69E-09	.46	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED FAILURE TO RECOVER AC POWER IN 1 HOUR FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	5.28E-03 4.20E-01 1.16E-03 2.21E-03	IEV-LOSPD OTH-R1 PMA0301BSA RN23MOD5S
35	5.24E-09	.43	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS FILLED FAILURE TO RECOVER AC POWER IN 2 HOURS SOFTWARE CCF OF ALL CARDS	1.82E-02 2.40E-01 1.20E-06	IEV-LOSPND OTH-R2 CCX-SFTW
36	4.79E-09	.39	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS	3.99E-03 1.20E-06	IEV-CCWND CCX-SFTW
37	4.46E-09	.36	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED FAILURE TO RECOVER AC POWER IN 1 HOUR CCF OF IRWST LEVEL TRANSMITTERS OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE	5.28E-03 4.20E-01 2.01E-04 1.00E-02	IEV-LOSPD OTH-R1 IWX-XMTR REN-MAN04
38	4.12E-09	.33	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED FAILURE TO RECOVER AC POWER IN 1 HOUR FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.28E-03 4.20E-01 1.16E-03 1.60E-03	IEV-LOSPD OTH-R1 PMA0301ASA RHN-MAN05
39	4.12E-09	.33	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED FAILURE TO RECOVER AC POWER IN 1 HOUR FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.28E-03 4.20E-01 1.16E-03 1.60E-03	IEV-LOSPD OTH-R1 PMA0301BSA RHN-MAN05
40	3.67E-09	.30	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED OFFSITE AC POWER RECOVERED IN 1 HOUR SOFTWARE CCF OF ALL CARDS	5.28E-03 5.80E-01 1.20E-06	IEV-LOSPD SUC-R1S CCX-SFTW

Table 54-10 (Sheet 5 of 5)

AP1000 SHUTDOWN PRA SENSITIVITY CASE 2 CDF CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
41	2.91E-09	.24	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF ADS 4TH S AGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
42	2.66E-09	.22	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
43	2.60E-09	.21	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF ORIFICES	3.63E-06	CCX-ORY-SPX
44	2.53E-09	.21	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF INV., STATIC SWITCH AND ASSOC. BREAKERS	5.16E-04	IDAMOD05
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S
45	2.52E-09	.20	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF 6 OUT OF 6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
46	2.52E-09	.20	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF 2 OUT OF 2 LOW PRESSURE RECIRCULATION SQUIB VALVES	2.60E-05	IWX-EV4-SA
47	2.20E-09	.18	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			MECHANICAL FAILURE CAUSES MOV 121A TO FAIL-TO-OPEN	3.00E-03	IRWMOD05S
			IRWST DISCHARGE LINE "B" STRAINER PLUGGED	2.40E-04	IWB-PLUG
48	2.18E-09	.18	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EVENT	5.28E-06	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.50E-02	RHN-MAN04
			COND. PROB. OF IWN-MAN00 (OP. F ILS TO ACTUATE I WST INJ)	5.00E-02	IWN-MAN00C
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	1.50E-01	RHN-MAN05C
49	1.88E-09	.15	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF PRESSURE TRANSMITTERS	2.63E-06	CCX-XMTRX
50	1.83E-09	.15	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF INV., STATIC SWITCH AND ASSOC. BREAKERS	5.16E-04	IDAMOD05
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	1.60E-03	RHN-MAN05

Table 54-11

LIST OF BASIC EVENTS "DROPPED" TO MAKE THE SENSITIVITY CASE 2

```
; SENDATA 1 1
; 04/09/03, 12:46:39

h:\ap1000~2\38-1\case-2r1\cmtot.wlk

Case 1
h:\ap1000~2\38-1\case-2r1\cmtot.wl1

DG1-LOGIC R
MDAS R
REC-MANDAS R
REC-MANDASC R
RHN-MAN03 R
RNAEPRNPSA R
RNAMOD06S R
RNBEPRNPSA R
RNBMOD07S R
RNX-CV-GO R
RNX-KV-GO R
RNX-PM-ER R
RNX-PM-FS R
ZO1DG001TM R
ZO1MOD01 R
ZO1MOD03 R
ZO1MOD04 R
ZO2DG002TM R
ZO2MOD01 R
ZO2MOD03 R
ZO2MOD04 R
ZOX-BL-ER R
ZOX-BL-ES R
ZOX-DG-DR R
ZOX-DG-DS R
ZOX-FL-GP R
ZOX-PD-ER R
ZOX-PD-ES R
DAS R
ZON-MAN01 R
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Table 54-12

CONTRIBUTION OF INITIATING EVENTS TO PLANT CDF – SHUTDOWN SENSITIVITY CASE 2

Plant CDF =		1.23E-06				
Number of Initiating Events =		10				
	Initiating Event	**Percentage Contribution**	**IEV Frequency a**	**IEV CDF b**	**CDP b/a**	
1	IEV-LOSPD	72.31	5.28E-03	8.89E-07	1.68E-04	drained
2	IEV-LOSPND	14.53	1.82E-02	1.79E-07	9.82E-06	
3	IEV-CCWD	7.35	7.16E-04	9.04E-08	1.26E-04	drained
4	IEV-CCWND	3.32	3.99E-03	4.09E-08	1.02E-05	
5	IEV-RNSD	0.99	9.69E-05	1.22E-08	1.26E-04	drained
6	IEV-RNSND	0.85	1.02E-03	1.04E-08	1.02E-05	
7	IEV-RCSOD	0.31	5.28E-06	3.79E-09	7.19E-04	drained
8	IEV-LOCA24ND	0.2	1.73E-05	2.46E-09	1.42E-04	
9	IEV-LOCA24D	0.12	1.15E-05	1.45E-09	1.26E-04	drained
10	IEV-LOCAPRND	0.02	1.61E-05	2.84E-10	1.76E-05	
	Sum =	100	2.94E-02	1.23E-06	4.19E-05	

Table 54-13 (Sheet 1 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
1	2.66E-05	48.08	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	5.00E-01	RHN-MAN05C
2	2.66E-05	48.08	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			COND. PROB. OF IWN-MAN00 (OP. FAILS TO ACTUATE IRWST INJ)	5.00E-01	IWN-MAN00C
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	5.00E-01	RHN-MAN05C
3	2.80E-07	0.51	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			CCF OF ORIFICES	2.77E-04	CCX-ORY-SP
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZAT	5.00E-01	LPM-MAN05
4	2.03E-07	0.37	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			CCF OF PRESSURE TRANSMITTERS	2.01E-04	CCX-XMTR195
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZAT	5.00E-01	LPM-MAN05
5	1.40E-07	0.25	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			CCF OF ORIFICES	2.77E-04	CCX-ORY-SP
			OPER. FAILS TO ALIGN PRHR	5.00E-01	PRN-MAN01
			OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	5.00E-01	AND-MAN01
6	1.18E-07	0.21	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S
7	1.18E-07	0.21	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			COND. PROB. OF IWN-MAN00 (OP. FAILS TO ACTUATE IRWST INJ)	5.00E-01	IWN-MAN00C
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S

Table 54-13 (Sheet 2 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
8	1.04E-07	0.19	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			COMMON MODE FAILURE OF INPUT LOGIC GROUPS	1.03E-04	CCX-INPUT-LOGIC
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZAT	5.00E-01	LPM-MAN05
9	1.01E-07	0.18	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			CCF OF PRESSURE TRANSMITTERS	2.01E-04	CCX-XMTR195
			OPER. FAILS TO ALIGN PRHR	5.00E-01	PRN-MAN01
			OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	5.00E-01	AND-MAN01
10	7.20E-08	0.13	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF IRWST LEVEL TRANSMITTERS	2.01E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE	5.00E-01	REN-MAN04
11	7.15E-08	0.13	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS	1.02E-03	IEV-RNSND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			CCF OF ORIFICES	2.77E-04	CCX-ORY-SP
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZAT	5.00E-01	LPM-MAN05
12	5.19E-08	0.09	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS	1.02E-03	IEV-RNSND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			CCF OF PRESSURE TRANSMITTERS	2.01E-04	CCX-XMTR195
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZAT	5.00E-01	LPM-MAN05
13	2.66E-08	0.05	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS	1.02E-03	IEV-RNSND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			COMMON MODE FAILURE OF INPUT LOGIC GROUPS	1.03E-04	CCX-INPUT-LOGIC
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZAT	5.00E-01	LPM-MAN05
14	2.15E-08	0.04	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
15	1.87E-08	0.03	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			COMMON MODE FAILURE OF INPUT LOGIC GROUPS	1.03E-04	CCX-INPUT-LOGIC
			OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	5.00E-01	AND-MAN01

Table 54-13 (Sheet 3 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
16	1.86E-08	0.03	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF 6 OUT OF 6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
17	1.86E-08	0.03	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF 2 OUT OF 2 LOW PRESSURE RECIRCULATION SQUIB VALVES	2.60E-05	IWX-EV4-SA
18	1.72E-08	0.03	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			FAILURE OF MANUAL DAS ACTUATION	5.00E-01	REC-MANDAS
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
19	1.71E-08	0.03	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			ORIFICE FAILURE DUE TO PLUGGING	9.46E-05	IW1OR170SPX
			OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	5.00E-01	ADN-MAN01
20	1.71E-08	0.03	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			ORIFICE FAILURE DUE TO PLUGGING	9.46E-05	IW2OR160SPX
			OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	5.00E-01	ADN-MAN01
21	1.69E-08	0.03	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			ORIFICE FAILURE DUE TO PLUGGING	9.46E-05	IW2OR160SPX
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	5.00E-01	RHN-MAN05C
22	1.69E-08	0.03	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			ORIFICE FAILURE DUE TO PLUGGING	9.46E-05	IW1OR170SPX
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	5.00E-01	RHN-MAN05C
23	1.66E-08	0.03	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF ACTUATION LOGIC GROUPS	4.63E-05	CCX-PMAMOD1X
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
24	1.60E-08	0.03	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDDBSDD1TM

Table 54-13 (Sheet 4 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
25	1.60E-08	0.03	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			COND. PROB. OF IWN-MAN00 (OP. FAILS TO ACTUATE IRWST INJ)	5.00E-01	IWN-MAN00C
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDDBSDS1TM
26	1.60E-08	0.03	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			COND. PROB. OF IWN-MAN00 (OP. FAILS TO ACTUATE IRWST INJ)	5.00E-01	IWN-MAN00C
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDDBSDK1TM
27	1.60E-08	0.03	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDDBSDK1TM
28	1.60E-08	0.03	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			COND. PROB. OF IWN-MAN00 (OP. FAILS TO ACTUATE IRWST INJ)	5.00E-01	IWN-MAN00C
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDDBSDD1TM
29	1.60E-08	0.03	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDDBSDS1TM
30	1.54E-08	0.03	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF ACTUATION LOGIC GROUPS	8.58E-05	CCX-PMAMOD2X
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	5.00E-01	RHN-MAN05C
31	1.28E-08	0.02	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			IRWST DISCHARGE LINE "B" STRAINER PLUGGED	2.40E-04	IWB-PLUG

Table 54-13 (Sheet 5 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
32	1.28E-08	0.02	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			COND. PROB. OF IWN-MAN00 (OP. FAILS TO ACTUATE IRWST INJ)	5.00E-01	IWN-MAN00C
			IRWST DISCHARGE LINE "B" STRAINER PLUGGED	2.40E-04	IWB-PLUG
33	1.24E-08	0.02	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			LEVEL TRANSMITTER FAILURE	6.84E-05	IW2TL160UFX
			OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	5.00E-01	AND-MAN01
34	1.24E-08	0.02	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			LEVEL TRANSMITTER FAILURE	6.84E-05	IW1TL170UFX
			OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	5.00E-01	AND-MAN01
35	1.22E-08	0.02	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			LEVEL TRANSMITTER FAILURE	6.84E-05	IW2TL160UFX
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	5.00E-01	RHN-MAN05C
36	1.22E-08	0.02	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			LEVEL TRANSMITTER FAILURE	6.84E-05	IW1TL170UFX
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	5.00E-01	RHN-MAN05C
37	1.07E-08	0.02	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF GRAVITY INJECTION CHECK VALVES TO OPEN	3.00E-05	IWX-CV-AO
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
38	1.07E-08	0.02	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			CCF OF IRWST LEVEL TRANSMITTERS	2.01E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE	5.00E-01	REN-MAN04

Table 54-13 (Sheet 6 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
39	1.07E-08	0.02	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			CCF OF IRWST LEVEL TRANSMITTERS	2.01E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE	5.00E-01	REN-MAN04
40	9.74E-09	0.02	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF IRWST LEVEL TRANSMITTERS	2.01E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE	5.00E-01	REN-MAN04
41	9.11E-09	0.02	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			COND. PROB. OF IWN-MAN00 (OP. FAILS TO ACTUATE IRWST INJ)	5.00E-01	IWN-MAN00C
			FAILURE OF OUTPUT DRIVER	1.71E-04	RNDEP023SA
42	9.11E-09	0.02	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			FAILURE OF OUTPUT DRIVER	1.71E-04	RNDEP023SA
43	8.59E-09	0.02	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF PLUGGING OF BOTH RECIRC LINES DUE TO SUMP SCREENS	1.20E-05	REX-FL-GP
44	8.59E-09	0.02	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
45	8.30E-09	0.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS FILL	1.82E-02	IEV-LOSPND
			OFFSITE AC POWER RECOVERED IN 2 HOURS	7.60E-01	SUC-R2S
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
			FAILURE OF MANUAL DAS ACTUATION	5.00E-01	REC-MANDAS
46	7.51E-09	0.01	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			CMF OF OUTPUT LOGIC I/Os	1.41E-04	CCX-PMDMOD1

Table 54-13 (Sheet 7 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
47	7.51E-09	0.01	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			COND. PROB. OF IWN-MAN00 (OP. FAILS TO ACTUATE IRWST INJ)	5.00E-01	IWN-MAN00C
			CMF OF OUTPUT LOGIC I/Os	1.41E-04	CCX-PMDMOD1
48	6.26E-09	0.01	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
49	5.53E-09	0.01	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			CCF OF ORIFICES	2.77E-04	CCX-ORY-SP
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZAT	5.00E-01	LPM-MAN05
50	5.16E-09	0.01	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			CMF OF OUTPUT LOGIC GROUPS	9.69E-05	CCX-PMD030
51	5.16E-09	0.01	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			COND. PROB. OF IWN-MAN00 (OP. FAILS TO ACTUATE IRWST INJ)	5.00E-01	IWN-MAN00C
			CMF OF OUTPUT LOGIC GROUPS	9.69E-05	CCX-PMD030
52	4.94E-09	0.01	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF LOGIC GROUP PROCESSING	1.38E-05	CCX-PMA030X
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
53	4.64E-09	0.01	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF INPUT LOGIC GROUPS	2.59E-05	CCX-INPUT-LOGICX
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	5.00E-01	RHN-MAN05C

Table 54-13 (Sheet 8 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
54	4.63E-09	0.01	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
55	4.40E-09	0.01	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS	1.02E-03	IEV-RNSND
			FAILURE OF MANUAL DAS ACTUATION	5.00E-01	REC-MANDAS
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
56	4.01E-09	0.01	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			CCF OF PRESSURE TRANSMITTERS	2.01E-04	CCX-XMTR195
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZAT	5.00E-01	LPM-MAN05
57	3.94E-09	0.01	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			SOFTWARE CCF OF OUTPUT LOGIC I/Os	1.10E-05	CCX-PMAMOD1-SW
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
58	3.67E-09	0.01	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
59	3.47E-09	0.01	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING	1.16E-03	PMA0301ASA
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
60	3.47E-09	0.01	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING	1.16E-03	PMA0301BSA
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05

Table 54-13 (Sheet 9 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
61	3.20E-09	0.01	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
62	3.20E-09	0.01	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
63	3.09E-09	0.01	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			FAILURE OF MANUAL DAS ACTUATION	5.00E-01	REC-MANDAS
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
64	2.91E-09	0.01	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
65	2.78E-09	0.01	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN	1.20E-03	ECX-CB-GO
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
66	2.78E-09	0.01	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			COMMON MODE FAILURE OF INPUT LOGIC GROUPS	1.03E-04	CCX-INPUT-LOGIC
			OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	5.00E-01	AND-MAN01
67	2.77E-09	0.01	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			CCF OF 6 OUT OF 6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
68	2.77E-09	0.01	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			CCF OF 2 OUT OF 2 LOW PRESSURE RECIRCULATION SQUIB VALVES	2.60E-05	IWX-EV4-SA
69	2.77E-09	0.01	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			CCF OF 2 OUT OF 2 LOW PRESSURE RECIRCULATION SQUIB VALVES	2.60E-05	IWX-EV4-SA

Table 54-13 (Sheet 10 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
70	2.77E-09	0.01	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			CCF OF 6 OUT OF 6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
71	2.76E-09	0	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			CCF OF ORIFICES	2.77E-04	CCX-ORY-SP
			OPER. FAILS TO ALIGN PRHR	5.00E-01	PRN-MAN01
			OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	5.00E-01	ADN-MAN01
72	2.66E-09	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
73	2.65E-09	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			CCF OF MUX LOGIC GROUPS	4.98E-05	CCX-PMAMOD4
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
74	2.65E-09	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			CCF OF MUX LOGIC GROUPS	4.98E-05	CCX-PMAMOD4
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
75	2.65E-09	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			COND. PROB. OF IWN-MAN00 (OP. FAILS TO ACTUATE IRWST INJ)	5.00E-01	IWN-MAN00C
			CMF OF MUX LOGIC GROUPS	4.98E-05	CCX-PMDMOD4
76	2.65E-09	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			CMF OF MUX LOGIC GROUPS	4.98E-05	CCX-PMDMOD4
77	2.62E-09	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS FILL	1.82E-02	IEV-LOSPND
			FAILURE TO RECOVER AC POWER IN 2 HOURS	2.40E-01	OTH-R2
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
			FAILURE OF MANUAL DAS ACTUATION	5.00E-01	REC-MANDAS

Table 54-13 (Sheet 11 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
78	2.60E-09	0	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF ORIFICES	3.63E-06	CCX-ORY-SPX
79	2.57E-09	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING	1.16E-03	PMA0301ASA
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
80	2.57E-09	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING	1.16E-03	PMA0301BSA
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
81	2.55E-09	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			ORIFICE FAILURE DUE TO PLUGGING	9.46E-05	IW2OR160SPX
			OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	5.00E-01	AND-MAN01
82	2.55E-09	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			ORIFICE FAILURE DUE TO PLUGGING	9.46E-05	IW1OR170SPX
			OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	5.00E-01	AND-MAN01
83	2.53E-09	0	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			COMMON MODE FAILURE OF INPUT LOGIC GROUPS	1.03E-04	CCX-INPUT-LOGIC
			OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	5.00E-01	AND-MAN01
84	2.52E-09	0	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF 6 OUT OF 6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
85	2.52E-09	0	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF 2 OUT OF 2 LOW PRESSURE RECIRCULATION SQUIB VALVES	2.60E-05	IWX-EV4-SA

Table 54-13 (Sheet 12 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
86	2.47E-09	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE CCF OF ACTUATION LOGIC GROUPS OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	2.13E-04 5.00E-01 4.63E-05 5.00E-01	IEV-RCSOD RHN-MAN04-SUCC CCX-PMAMOD1X RHN-MAN05
87	2.47E-09	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE CCF OF ACTUATION LOGIC GROUPS OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	2.13E-04 5.00E-01 4.63E-05 5.00E-01	IEV-RCSOD RHN-MAN04 CCX-PMAMOD1X RHN-MAN05
88	2.39E-09	0	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS FAILURE OF MANUAL DAS ACTUATION	3.99E-03 1.20E-06 5.00E-01	IEV-CCWND CCX-SFTW REC-MANDAS
89	2.32E-09	0	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI ORIFICE FAILURE DUE TO PLUGGING OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	9.69E-05 5.06E-01 9.46E-05 5.00E-01	IEV-RNSD REC-MANDASC IW2OR160SPX ADN-MAN01
90	2.32E-09	0	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI ORIFICE FAILURE DUE TO PLUGGING OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	9.69E-05 5.06E-01 9.46E-05 5.00E-01	IEV-RNSD REC-MANDASC IW1OR170SPX ADN-MAN01
91	2.29E-09	0	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS ORIFICE FAILURE DUE TO PLUGGING OPERATOR FAILS TO ACTUATE IRWST INJECTION COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	9.69E-05 9.46E-05 5.00E-01 5.00E-01	IEV-RNSD IW2OR160SPX IWN-MAN00 RHN-MAN05C
92	2.29E-09	0	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS ORIFICE FAILURE DUE TO PLUGGING OPERATOR FAILS TO ACTUATE IRWST INJECTION COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	9.69E-05 9.46E-05 5.00E-01 5.00E-01	IEV-RNSD IW1OR170SPX IWN-MAN00 RHN-MAN05C
93	2.24E-09	0	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS CCF OF ACTUATION LOGIC GROUPS OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	9.69E-05 4.63E-05 5.00E-01	IEV-RNSD CCX-PMAMOD1X RHN-MAN05

Table 54-13 (Sheet 13 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
94	2.08E-09	0	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF ACTUATION LOGIC GROUPS	8.58E-05	CCX-PMAMOD2X
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	5.00E-01	RHN-MAN05C
95	2.05E-09	0	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			COMMON MODE FAILURE OF INPUT LOGIC GROUPS	1.03E-04	CCX-INPUT-LOGIC
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZAT	5.00E-01	LPM-MAN05
96	2.00E-09	0	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS	3.99E-03	IEV-CCWND
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			CCF OF PRESSURE TRANSMITTERS	2.01E-04	CCX-XMTR195
			OPER. FAILS TO ALIGN PRHR	5.00E-01	PRN-MAN01
			OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	5.00E-01	AND-MAN01
97	1.97E-09	0	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF SOFTWARE FOR INPUT LOGIC GROUPS	1.10E-05	CCX-IN-LOGIC-SW
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	5.00E-01	RHN-MAN05C
98	1.97E-09	0	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF SOFTWARE FOR ACTUATION LOGIC GROUPS	1.10E-05	CCX-PMAMOD2-SW
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	5.00E-01	RHN-MAN05C
99	1.88E-09	0	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF PRESSURE TRANSMITTERS	2.63E-06	CCX-XMTRX
100	1.84E-09	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			LEVEL TRANSMITTER FAILURE	6.84E-05	IW2TL160UFX
			OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	5.00E-01	AND-MAN01

Table 54-13 (Sheet 14 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
101	1.84E-09	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			LEVEL TRANSMITTER FAILURE	6.84E-05	IW1TL170UFX
			OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	5.00E-01	ADN-MAN01
102	1.74E-09	0	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILL	1.73E-05	IEV-LOCA24ND
			CCF OF IRWST LEVEL TRANSMITTERS	2.01E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE	5.00E-01	REN-MAN04
103	1.69E-09	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKER TO CLOSE	7.30E-04	ECX-CB-GC
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
104	1.68E-09	0	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			LEVEL TRANSMITTER FAILURE	6.84E-05	IW1TL170UFX
			OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	5.00E-01	ADN-MAN01
105	1.68E-09	0	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			LEVEL TRANSMITTER FAILURE	6.84E-05	IW2TL160UFX
			OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	5.00E-01	ADN-MAN01
106	1.66E-09	0	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			LEVEL TRANSMITTER FAILURE	6.84E-05	IW2TL160UFX
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	5.00E-01	RHN-MAN05C
107	1.66E-09	0	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			LEVEL TRANSMITTER FAILURE	6.84E-05	IW1TL170UFX
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	5.00E-01	RHN-MAN05C

Table 54-13 (Sheet 15 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
108	1.60E-09	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			CCF OF GRAVITY INJECTION CHECK VALVES TO OPEN	3.00E-05	IWX-CV-AO
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
109	1.60E-09	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			CCF OF GRAVITY INJECTION CHECK VALVES TO OPEN	3.00E-05	IWX-CV-AO
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
110	1.54E-09	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			FAILURE OF INV., STATIC SWITCH AND ASSOC. BREAKERS	5.16E-04	IDAMOD05
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
111	1.54E-09	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN	1.20E-03	ECX-CB-GO
			FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING	1.16E-03	PMA0301ASA
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
112	1.54E-09	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN	1.20E-03	ECX-CB-GO
			FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING	1.16E-03	PMA0301BSA
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
113	1.45E-09	0	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF GRAVITY INJECTION CHECK VALVES TO OPEN	3.00E-05	IWX-CV-AO
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
114	1.41E-09	0	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS	1.02E-03	IEV-RNSND
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			CCF OF ORIFICES	2.77E-04	CCX-ORY-SP
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZAT	5.00E-01	LPM-MAN05

Table 54-13 (Sheet 16 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
115	1.28E-09	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
116	1.28E-09	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			CCF PLUGGING OF BOTH RECIRC LINES DUE TO SUMP SCREENS	1.20E-05	REX-FL-GP
117	1.28E-09	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			CCF PLUGGING OF BOTH RECIRC LINES DUE TO SUMP SCREENS	1.20E-05	REX-FL-GP
118	1.28E-09	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
119	1.21E-09	0	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILL	1.73E-05	IEV-LOCA24ND
			CCF OF ORIFICES	2.77E-04	CCX-ORY-SP
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	5.00E-01	AND-MAN01
120	1.21E-09	0	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILL	1.73E-05	IEV-LOCA24ND
			CCF OF ORIFICES	2.77E-04	CCX-ORY-SP
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZAT	5.00E-01	LPM-MAN05
121	1.16E-09	0	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF PLUGGING OF BOTH RECIRC LINES DUE TO SUMP SCREENS	1.20E-05	REX-FL-GP
122	1.16E-09	0	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
123	1.16E-09	0	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS DRAI	1.15E-05	IEV-LOCA24D
			CCF OF IRWST LEVEL TRANSMITTERS	2.01E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE	5.00E-01	REN-MAN04

Table 54-13 (Sheet 17 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
124	1.14E-09	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			FAILURE OF INV., STATIC SWITCH AND ASSOC. BREAKERS	5.16E-04	IDAMOD05
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
125	1.14E-09	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP MP 01B SEGMENT HARDWARE FAILURE OR DIVERTED FLOW	2.44E-02	SWBMOD02
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
126	1.13E-09	0	LOCA/RNS PIPE RUPTURE WITH RCS FILLED INIT. EVENT OCCURS	1.61E-05	IEV-LOCAPRND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			CCF OF ORIFICES	2.77E-04	CCX-ORY-SP
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZAT	5.00E-01	LPM-MAN05
127	1.05E-09	0	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	2.94E-06	CCX-EP-SAMX
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
128	1.03E-09	0	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS	1.02E-03	IEV-RNSND
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			CCF OF PRESSURE TRANSMITTERS	2.01E-04	CCX-XMTR195
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZAT	5.00E-01	LPM-MAN05
129	1.02E-09	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE STANDBY DG TO RUN	4.40E-04	ZOX-DG-DR
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05

Table 54-13 (Sheet 18 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
130	9.49E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			LOSS OF DIST. PANEL OR BREAKER A07 SPURIOUSLY OPENS	3.17E-04	IDAMOD04
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
131	9.46E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			D/G FAILS TO START & RUN OR BKR 202 FAILS TO CLOSE	2.02E-02	ZO2MOD01
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
132	9.39E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKER TO CLOSE	7.30E-04	ECX-CB-GC
			FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING	1.16E-03	PMA0301ASA
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
133	9.39E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKER TO CLOSE	7.30E-04	ECX-CB-GC
			FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING	1.16E-03	PMA0301BSA
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
134	8.98E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDABSDS1TM
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
135	8.80E-10	0	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILL	1.73E-05	IEV-LOCA24ND
			CCF OF PRESSURE TRANSMITTERS	2.01E-04	CCX-XMTR195
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	5.00E-01	AND-MAN01

Table 54-13 (Sheet 19 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
136	8.80E-10	0	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILL	1.73E-05	IEV-LOCA24ND
			CCF OF PRESSURE TRANSMITTERS	2.01E-04	CCX-XMTR195
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZAT	5.00E-01	LPM-MAN05
137	8.59E-10	0	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
138	8.19E-10	0	LOCA/RNS PIPE RUPTURE WITH RCS FILLED INIT. EVENT OCCURS	1.61E-05	IEV-LOCAPRND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			CCF OF PRESSURE TRANSMITTERS	2.01E-04	CCX-XMTR195
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZAT	5.00E-01	LPM-MAN05
139	8.09E-10	0	LOCA/RNS PIPE RUPTURE WITH RCS FILLED INIT. EVENT OCCURS	1.61E-05	IEV-LOCAPRND
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			CCF OF IRWST LEVEL TRANSMITTERS	2.01E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE	5.00E-01	REN-MAN04
140	7.35E-10	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			CCF OF LOGIC GROUP PROCESSING	1.38E-05	CCX-PMA030X
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
141	7.35E-10	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			CCF OF LOGIC GROUP PROCESSING	1.38E-05	CCX-PMA030X
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
142	7.35E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENTS FAILURE	3.17E-04	ED1MOD113
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05

Table 54-13 (Sheet 20 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
143	7.35E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FIXED COMPONENTS FAILURE	3.17E-04	ED1MOD11
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
144	7.16E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP 01B FAILS & ST CK V007B & C B FTC & RE FTC & CB ECS221 SPO	1.53E-02	RNBMOD07S
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
145	7.03E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			LOSS OF DIST. PANEL OR BREAKER A07 SPURIOUSLY OPENS	3.17E-04	IDAMOD04
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
146	6.95E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP MP 01B SEGMENT HARDWARE FAILURE OR DIVERTED FLOW	2.44E-02	SWBMOD02
			BREAKER 100 FAILS TO OPEN [#3	1.23E-02	EC1CB100VO
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
147	6.87E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN	1.20E-03	ECX-CB-GO
			FAILURE OF INV., STATIC SWITCH AND ASSOC. BREAKERS	5.16E-04	IDAMOD05
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
148	6.69E-10	0	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF LOGIC GROUP PROCESSING	1.38E-05	CCX-PMA030X
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05

Table 54-13 (Sheet 21 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
149	6.65E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDABSDS1TM
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
150	6.49E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE STANDBY DG TO START	2.80E-04	ZOX-DG-DS
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
151	6.39E-10	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			COND. PROB. OF IWN-MAN00 (OP. FAILS TO ACTUATE IRWST INJ)	5.00E-01	IWN-MAN00C
			FUSE DISCONNECT SWITCH (FD19) SPURIOUSLY OPENS	1.20E-05	IDDFD019RQ
152	6.39E-10	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			COND. PROB. OF IWN-MAN00 (OP. FAILS TO ACTUATE IRWST INJ)	5.00E-01	IWN-MAN00C
			FUSE DISCONNECT SWITCH (FD20) SPURIOUSLY OPENS	1.20E-05	IDDFD020RQ
153	6.39E-10	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			FUSE DISCONNECT SWITCH (FD19) SPURIOUSLY OPENS	1.20E-05	IDDFD019RQ
154	6.39E-10	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			FUSE DISCONNECT SWITCH (FD20) SPURIOUSLY OPENS	1.20E-05	IDDFD020RQ
155	6.34E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP MP 01B SEGMENT HARDWARE FAILURE OR DIVERTED FLOW	2.44E-02	SWBMOD02
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING	1.16E-03	PMA0301ASA
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05

Table 54-13 (Sheet 22 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
156	6.34E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP MP 01B SEGMENT HARDWARE FAILURE OR DIVERTED FLOW	2.44E-02	SWBMOD02
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING	1.16E-03	PMA0301BSA
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
157	6.31E-10	0	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			FAILURE OF PMS OUTPUT LOGIC I/Os	6.53E-04	PMAMOD11X
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS121TM
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
158	6.31E-10	0	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			FAILURE OF PMS OUTPUT LOGIC I/Os	6.53E-04	PMAMOD11X
			UNAVAILABILITY OF BUS ECS ES 1 DUE TO UNSCHEDUL MAINTENANCE	2.70E-03	EC1BS001TM
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
159	6.31E-10	0	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			FAILURE OF PMS OUTPUT LOGIC I/Os	6.53E-04	PMAMOD11X
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS012TM
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
160	6.27E-10	0	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF INPUT LOGIC GROUPS	2.59E-05	CCX-INPUT-LOGICX
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	5.00E-01	RHN-MAN05C
161	6.12E-10	0	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS	1.02E-03	IEV-RNSND
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
			FAILURE OF MANUAL DAS ACTUATION	5.00E-01	REC-MANDAS
162	6.02E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			CCF OF IRWST LEVEL TRANSMITTERS	2.01E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE	5.00E-01	REN-MAN04

Table 54-13 (Sheet 23 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
163	5.86E-10	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			SOFTWARE CCF OF OUTPUT LOGIC I/Os	1.10E-05	CCX-PMAMOD1-SW
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
164	5.86E-10	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			COND. PROB. OF IWN-MAN00 (OP. FAILS TO ACTUATE IRWST INJ)	5.00E-01	IWN-MAN00C
			SOFTWARE CCF OF MUX LOGIC GROUPS (CCX-P##MOD4-SW)	1.10E-05	CCX-PMDMOD4-SW
165	5.86E-10	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			SOFTWARE CCF OF MUX LOGIC GROUPS (CCX-P##MOD4-SW)	1.10E-05	CCX-PMDMOD4-SW
166	5.86E-10	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			CCF OF SOFTWARE FOR MUX LOGIC GROUPS	1.10E-05	CCX-PMAMOD4-SW
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
167	5.86E-10	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			COND. PROB. OF IWN-MAN00 (OP. FAILS TO ACTUATE IRWST INJ)	5.00E-01	IWN-MAN00C
			SOFTWARE CCF OF OUTPUT LOGIC I/Os (CCX-P##MOD1)	1.10E-05	CCX-PMDMOD1-SW
168	5.86E-10	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			CCF OF SOFTWARE FOR MUX LOGIC GROUPS	1.10E-05	CCX-PMAMOD4-SW
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
169	5.86E-10	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			SOFTWARE CCF OF OUTPUT LOGIC I/Os	1.10E-05	CCX-PMAMOD1-SW
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
170	5.86E-10	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			SOFTWARE CCF OF OUTPUT LOGIC I/Os (CCX-P##MOD1)	1.10E-05	CCX-PMDMOD1-SW

Table 54-13 (Sheet 24 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
171	5.76E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BREAKER 100 FAILS TO OPEN [#3	1.23E-02	EC1CB100VO
			D/G FAILS TO START & RUN OR BKR 202 FAILS TO CLOSE	2.02E-02	ZO2MOD01
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
172	5.76E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			BREAKER 200 FAILS TO OPEN [#5	1.23E-02	EC2CB200VO
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
173	5.66E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE STANDBY DG TO RUN	4.40E-04	ZOX-DG-DR
			FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING	1.16E-03	PMA0301BSA
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
174	5.66E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE STANDBY DG TO RUN	4.40E-04	ZOX-DG-DR
			FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING	1.16E-03	PMA0301ASA
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
175	5.64E-10	0	LOCA/RNS PIPE RUPTURE WITH RCS FILLED INIT. EVENT OCCURS	1.61E-05	IEV-LOCAPRND
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			CCF OF ORIFICES	2.77E-04	CCX-ORY-SP
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			COND. PROB. OF ADN-MAN01 (OPER. FAILS TO ACT. ADS)	5.00E-01	ADN-MAN01C

Table 54-13 (Sheet 25 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
176	5.61E-10	0	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			FAILURE OF PMS OUTPUT LOGIC I/Os	1.16E-03	PMAMOD21X
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS012TM
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	5.00E-01	RHN-MAN05C
177	5.61E-10	0	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			FAILURE OF PMS OUTPUT LOGIC I/Os	1.16E-03	PMAMOD21X
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS121TM
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	5.00E-01	RHN-MAN05C
178	5.61E-10	0	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			FAILURE OF PMS OUTPUT LOGIC I/Os	1.16E-03	PMAMOD21X
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			UNAVAILABILITY OF BUS ECS ES 1 DUE TO UNSCHEDUL MAINTENANCE	2.70E-03	EC1BS001TM
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	5.00E-01	RHN-MAN05C
179	5.33E-10	0	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			SOFTWARE CCF OF OUTPUT LOGIC I/Os	1.10E-05	CCX-PMAMOD1-SW
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
180	5.25E-10	0	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS	1.02E-03	IEV-RNSND
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			COMMON MODE FAILURE OF INPUT LOGIC GROUPS	1.03E-04	CCX-INPUT-LOGIC
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZAT	5.00E-01	LPM-MAN05
181	5.25E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			D/G FAILS TO START & RUN OR BKR 202 FAILS TO CLOSE	2.02E-02	ZO2MOD01
			FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING	1.16E-03	PMA0301BSA
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05

Table 54-13 (Sheet 26 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
182	5.25E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			D/G FAILS TO START & RUN OR BKR 202 FAILS TO CLOSE	2.02E-02	ZO2MOD01
			FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING	1.16E-03	PMA0301ASA
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
183	5.19E-10	0	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILL	1.73E-05	IEV-LOCA24ND
			CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
184	5.19E-10	0	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILL	1.73E-05	IEV-LOCA24ND
			CCF OF GRAVITY INJECTION CHECK VALVES TO OPEN	3.00E-05	IWX-CV-AO
185	5.16E-10	0	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			MECHANICAL FAILURE CAUSES MOV 121A TO FAIL-TO-OPEN	3.00E-03	IRWMOD05S
			IRWST DISCHARGE LINE "B" STRAINER PLUGGED	2.40E-04	IWB-PLUG
186	4.99E-10	0	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			FAILURE OF INV., STATIC SWITCH AND ASSOC. BREAKERS	5.16E-04	IDAMOD05
			UNAVAILABILITY OF BUS ECS ES 1 DUE TO UNSCHEDUL MAINTENANCE	2.70E-03	EC1BS001TM
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
187	4.99E-10	0	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			FAILURE OF INV., STATIC SWITCH AND ASSOC. BREAKERS	5.16E-04	IDAMOD05
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS121TM
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
188	4.99E-10	0	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			FAILURE OF INV., STATIC SWITCH AND ASSOC. BREAKERS	5.16E-04	IDAMOD05
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS012TM
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
189	4.87E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP SUBLOOP B HARDWARE FAILURE OR DIVERTED FLOW	1.04E-02	CCBMOD01S
			D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE	2.02E-02	ZO1MOD01
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05

Table 54-13 (Sheet 27 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
190	4.66E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PLS OUTPUT LOGIC I/Os	2.09E-03	PL5MOD11
			CCF OF IRWST LEVEL TRANSMITTERS	2.01E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE	5.00E-01	REN-MAN04
191	4.59E-10	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			COND. PROB. OF IWN-MAN00 (OP. FAILS TO ACTUATE IRWST INJ)	5.00E-01	IWN-MAN00C
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
192	4.59E-10	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.00E-01	RHN-MAN04
			FAILURE OF MANUAL DAS ACTUATION	5.00E-01	REC-MANDAS
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
193	4.59E-10	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			FAILURE OF MANUAL DAS ACTUATION	5.00E-01	REC-MANDAS
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
194	4.59E-10	0	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EV	2.13E-04	IEV-RCSOD
			OPERATOR ACTUATES SUMP RECIRC. GIVEN IRWST LEVEL SIGNAL FAILURE	5.00E-01	RHN-MAN04-SUCC
			OPERATOR FAILS TO ACTUATE IRWST INJECTION	5.00E-01	IWN-MAN00
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
195	4.51E-10	0	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILL	1.73E-05	IEV-LOCA24ND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			COMMON MODE FAILURE OF INPUT LOGIC GROUPS	1.03E-04	CCX-INPUT-LOGIC
			OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE	5.00E-01	ADN-MAN01
196	4.51E-10	0	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILL	1.73E-05	IEV-LOCA24ND
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATI	5.06E-01	REC-MANDASC
			COMMON MODE FAILURE OF INPUT LOGIC GROUPS	1.03E-04	CCX-INPUT-LOGIC
			OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZAT	5.00E-01	LPM-MAN05

Table 54-13 (Sheet 28 of 28)

SHUTDOWN PRA SENSITIVITY CASE 3

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
197	4.50E-10	0	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILL	1.73E-05	IEV-LOCA24ND
			CCF OF 2 OUT OF 2 LOW PRESSURE RECIRCULATION SQUIB VALVES	2.60E-05	IWX-EV4-SA
198	4.46E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	2.00E-03	ZOX-PD-ES
			CCF OF IRWST LEVEL TRANSMITTERS	2.01E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE	5.00E-01	REN-MAN04
199	4.36E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			PUMP 01B FAILS & ST CK V007B & C B FTC & RE FTC & CB ECS221 SPO	1.53E-02	RNBMOD07S
			BREAKER 100 FAILS TO OPEN [#3	1.23E-02	EC1CB100VO
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05
200	4.22E-10	0	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAI	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BATTERY DB1 UNAVAILABLE	2.70E-03	ED1MOD03
			CCF OF OUTPUT LOGIC I/O BOARDS	1.41E-04	CCX-PMAMOD1
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	5.00E-01	RHN-MAN05

Table 54-14

BASIC EVENTS WHOSE PROBABILITIES ARE CHANGED IN CASE 3

		Base	Changed	
17	ADN-MAN01	4.93E-04	5.00E-01	
18	ADN-MAN01C	5.00E-02	5.00E-01	
26	CCB-MAN01	1.07E-03	5.00E-01	
206	IWN-MAN00	1.15E-03	5.00E-01	
207	IWN-MAN00C	5.00E-02	5.00E-01	
215	LPM-MAN05	6.83E-04	5.00E-01	
285	PRN-MAN01	4.08E-04	5.00E-01	
296	REC-MANDAS	1.16E-02	5.00E-01	
297	REC-MANDASC	5.06E-01	5.06E-01	
298	REN-MAN04	1.00E-02	5.00E-01	
300	RHN-MAN03	2.26E-03	5.00E-01	
301	RHN-MAN04	5.50E-02	5.00E-01	
302	RHN-MAN04-SUCC	9.45E-01	5.00E-01	
303	RHN-MAN05	1.60E-03	5.00E-01	
304	RHN-MAN05C	1.50E-01	5.00E-01	
323	SWB-MAN02	1.60E-03	5.00E-01	
337	ZON-MAN01	2.67E-03	5.00E-01	
176	IEV-RCSOD	5.28E-06	2.13E-04	
	RCS-MANODS1	4.04E-04	0.5	
	RCS-MANODS2	1.39E-02	0.5	

These two HEPs are used in calculation of IEV-RCSOD Frequency.

IEV-RCSOD (AP1000) = (1.07/0.9) * IEV-RCSOD(AP600)

	Base Case	HEP = 0.5
IEV-RCSOD(AP600) = 0.9*(SC-1 + SC-2)		
SC -1 = 2.91E-04 * RCS-MANOD1S =	1.18E-07	1.46E-04
SC -2 = 3.43E-06 + 1.0E-04 * RCS-MANOD2S =	4.82E-06	5.34E-05
IEV-RCSOD(AP600) =	4.44E-06	1.79E-04
IEV-RCSOD (AP1000) =	5.28E-06	2.13E-04

Table 54-15 (Sheet 1 of 7)

AP1000 SHUTDOWN PRA SENSITIVITY CASE 4 CDF CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
1	1.04E-07	10.69	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
2	9.19E-08	9.44	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF ADS 4TH S AGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
3	7.96E-08	8.18	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF 2 OUT OF 2 LOW PRESSURE RECIRCULATION SQUIB VALVES	2.60E-05	IWX-EV4-SA
4	7.96E-08	8.18	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF 6 OUT OF 6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
5	6.65E-08	6.83	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF ADS 4TH S AGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
6	5.77E-08	5.93	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF 6 OUT OF 6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
7	5.77E-08	5.93	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF 2 OUT OF 2 LOW PRESSURE RECIRCULATION SQUIB VALVES	2.60E-05	IWX-EV4-SA
8	5.32E-08	5.47	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			COMMON CAUSE FAILURE OF THE INVERTER	2.40E-05	CCX-IV-XR
9	3.67E-08	3.77	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF PLUGGING OF BOTH RECIRC LINES DUE TO SUMP SCREENS	1.20E-05	REX-FL-GP

Table 54-15 (Sheet 2 of 7)

AP1000 SHUTDOWN PRA SENSITIVITY CASE 4 CDF CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
10	3.67E-08	3.77	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
11	2.66E-08	2.73	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF PLUGGING OF BOTH RECIRC LINES DUE TO SUMP SCREENS	1.20E-05	REX-FL-GP
12	2.66E-08	2.73	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
13	2.15E-08	2.21	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF ADS 4TH S AGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
14	1.91E-08	1.96	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM
15	1.86E-08	1.91	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF 6 OUT OF 6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
16	1.86E-08	1.91	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF 2 OUT OF 2 LOW PRESSURE RECIRCULATION SQUIB VALVES	2.60E-05	IWX-EV4-SA
17	1.11E-08	1.14	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF ORIFICES	3.63E-06	CCX-ORY-SPX
18	1.02E-08	1.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S

Table 54-15 (Sheet 3 of 7)

AP1000 SHUTDOWN PRA SENSITIVITY CASE 4 CDF CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
19	8.59E-09	0.88	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
20	8.59E-09	0.88	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF PLUGGING OF BOTH RECIRC LINES DUE TO SUMP SCREENS	1.20E-05	REX-FL-GP
21	8.05E-09	0.83	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF PRESSURE TRANSMITTERS	2.63E-06	CCX-XMTRX
22	8.05E-09	0.83	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF ORIFICES	3.63E-06	CCX-ORY-SPX
23	7.42E-09	0.76	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	1.60E-03	RHN-MAN05
24	6.16E-09	0.63	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			CCF OF IRWST LEVEL TRANSMITTERS	2.01E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE	1.00E-02	REN-MAN04
25	5.83E-09	0.6	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF PRESSURE TRANSMITTERS	2.63E-06	CCX-XMTRX
26	5.69E-09	0.58	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING	1.16E-03	PMA0301ASA
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S

Table 54-15 (Sheet 4 of 7)

AP1000 SHUTDOWN PRA SENSITIVITY CASE 4 CDF CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
27	5.69E-09	0.58	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING	1.16E-03	PMA0301BSA
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S
28	4.46E-09	0.46	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			CCF OF IRWST LEVEL TRANSMITTERS	2.01E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE	1.00E-02	REN-MAN04
29	4.12E-09	0.42	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING	1.16E-03	PMA0301BSA
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	1.60E-03	RHN-MAN05
30	4.12E-09	0.42	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING	1.16E-03	PMA0301ASA
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	1.60E-03	RHN-MAN05
31	3.67E-09	0.38	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
32	2.91E-09	0.3	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF ADS 4TH S AGE SQUIB VALVES TO OPEN	3.00E-05	ADX-EV-SA
33	2.66E-09	0.27	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
34	2.60E-09	0.27	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF ORIFICES	3.63E-06	CCX-ORY-SPX

Table 54-15 (Sheet 5 of 7)

AP1000 SHUTDOWN PRA SENSITIVITY CASE 4 CDF CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
35	2.53E-09	0.26	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF INV., STATIC SWITCH AND ASSOC. BREAKERS	5.16E-04	IDAMOD05
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S
36	2.52E-09	0.26	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF 2 OUT OF 2 LOW PRESSURE RECIRCULATION SQUIB VALVES	2.60E-05	IWX-EV4-SA
37	2.52E-09	0.26	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS	9.69E-05	IEV-RNSD
			CCF OF 6 OUT OF 6 IRWST HP SQUIB VALVES TO OPEN	2.60E-05	IWX-EV-SA
38	2.20E-09	0.23	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			OFFSITE AC POWER RECOVERED IN 1 HOUR	5.80E-01	SUC-R1S
			MECHANICAL FAILURE CAUSES MOV 121A TO FAIL-TO-OPEN	3.00E-03	IRWMOD05S
			IRWST DISCHARGE LINE "B" STRAINER PLUGGED	2.40E-04	IWB-PLUG
39	2.18E-09	0.22	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EVENT	5.28E-06	IEV-RCSOD
			OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE	5.50E-02	RHN-MAN04
			COND. PROB. OF IWN-MAN00 (OP. F ILS TO ACTUATE I WST INJ)	5.00E-02	IWN-MAN00C
			COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)	1.50E-01	RHN-MAN05C
40	1.88E-09	0.19	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF PRESSURE TRANSMITTERS	2.63E-06	CCX-XMTRX
41	1.83E-09	0.19	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF INV., STATIC SWITCH AND ASSOC. BREAKERS	5.16E-04	IDAMOD05
			OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023	1.60E-03	RHN-MAN05
42	1.60E-09	0.16	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			MECHANICAL FAILURE CAUSES MOV 121A TO FAIL-TO-OPEN	3.00E-03	IRWMOD05S
			IRWST DISCHARGE LINE "B" STRAINER PLUGGED	2.40E-04	IWB-PLUG

Table 54-15 (Sheet 6 of 7)

AP1000 SHUTDOWN PRA SENSITIVITY CASE 4 CDF CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
43	1.55E-09	0.16	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			LOSS OF DIST. PANEL OR BREAKER A07 SPURIOUSLY OPENS	3.17E-04	IDAMOD04
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S
44	1.47E-09	0.15	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDABSDS1TM
			MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN	2.21E-03	RN23MOD5S
45	1.44E-09	0.15	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS	7.16E-04	IEV-CCWD
			CCF OF IRWST LEVEL TRANSMITTERS	2.01E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE	1.00E-02	REN-MAN04
46	1.39E-09	0.14	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDDBSDK1TM
47	1.39E-09	0.14	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDDBSDD1TM
48	1.39E-09	0.14	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED	5.28E-03	IEV-LOSPD
			FAILURE TO RECOVER AC POWER IN 1 HOUR	4.20E-01	OTH-R1
			FAILURE OF PMS OUTPUT LOGIC I/Os	2.09E-03	PMAMOD11
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDDBSDS1TM
49	1.38E-09	0.14	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS FILLED	1.82E-02	IEV-LOSPND
			OFFSITE AC POWER RECOVERED IN 2 HOURS	7.60E-01	SUC-R2S
			FAILURE OF MANUAL DAS ACTUATION	1.16E-02	REC-MANDAS
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM

Table 54-15 (Sheet 7 of 7)

AP1000 SHUTDOWN PRA SENSITIVITY CASE 4 CDF CUTSETS

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
50	1.19E-09	0.12	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS FILLED	1.82E-02	IEV-LOSPND
			OFFSITE AC POWER RECOVERED IN 2 HOURS	7.60E-01	SUC-R2S
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS	8.62E-06	CCX-EP-SAM

Table 54-16

LIST OF BASIC EVENTS "DROPPED" TO MAKE THE SENSITIVITY CASE 4

; SENDATA 1 1
; 04/10/03, 11:00:10

h:\ap1000~2\38-1\case-3r1\cmtot.wlk

Case 1
h:\ap1000~2\38-1\case-3r1\cmtot.wl1

DG1-LOGIC R
RHN-MAN03 R
RNAEPRNPSA R
RNAMOD06S R
RNBEPRNPSA R
RNBMOD07S R
RNX-CV-GO R
RNX-KV-GO R
RNX-PM-ER R
RNX-PM-FS R
ZO1DG001TM R
ZO1MOD01 R
ZO1MOD03 R
ZO1MOD04 R
ZO2DG002TM R
ZO2MOD01 R
ZO2MOD03 R
ZO2MOD04 R
ZOX-BL-ER R
ZOX-BL-ES R
ZOX-DG-DR R
ZOX-DG-DS R
ZOX-FL-GP R
ZOX-PD-ER R
ZOX-PD-ES R
DAS R
ZON-MAN01 R

Table 54-17

CONTRIBUTION OF INITIATING EVENTS TO PLANT CDF – SHUTDOWN SENSITIVITY CASE 4

Plant CDF = 9.73E-07

Number of Initiating Events = 10

	Initiating Event	Percentage Contribution	IEV Frequency a	IEV CDF b	CDP b/a	
1	IEV-LOSPD	88.76	5.28E-03	8.63E-07	1.68E-04	drained
2	IEV-CCWD	8.67	7.16E-04	8.43E-08	9.82E-06	drained
3	IEV-RNSD	1.17	9.69E-05	1.14E-08	1.26E-04	drained
4	IEV-LOSPND	0.42	1.82E-02	4.13E-09	1.02E-05	
5	IEV-RCSOD	0.39	5.28E-06	3.75E-09	1.26E-04	drained
6	IEV-LOCA24ND	0.22	1.73E-05	2.10E-09	1.02E-05	
7	IEV-CCWND	0.18	3.99E-03	1.77E-09	7.19E-04	
8	IEV-LOCA24D	0.14	1.15E-05	1.35E-09	1.42E-04	drained
9	IEV-RNSND	0.05	1.02E-03	4.52E-10	1.26E-04	
10	IEV-LOCAPRND	0.01	1.61E-05	1.17E-10	1.76E-05	
	Sum =	100	2.94E-02	9.73E-07	1.45E-03	

Table 54-18 (Sheet 1 of 8)

AP1000 SHUTDOWN PRA BASIC EVENT RISK IMPORTANCES – RAW

	Basic Event ID	Cutsets	BEV Prob.	RAW	
1	CCX-SFTW	32	1.20E-06	5.37E+04	SOFTWARE CCF OF ALL CARDS
2	ADX-EV-SA	244	3.00E-05	7.35E+03	CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN
3	IWX-EV4-SA	227	2.60E-05	7.34E+03	CCF OF 2 OUT 2 LOW PRESSURE RECIRCULATION SQUIB VALVES
4	REX-FL-GP	168	1.20E-05	7.34E+03	CCF PLUGGING OF BOTH RECIRC LINES DUE TO SUMP SCREENS
5	IWX-FL-GP	168	1.20E-05	7.34E+03	CCF OF STRAINERS IN IRWST TANK
6	IWX-EV-SA	266	2.60E-05	7.19E+03	CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN
7	CCX-ORY-SPX	112	3.63E-06	7.18E+03	CCF OF ORIFICES
8	CCX-XMTRX	97	2.63E-06	7.17E+03	CCF OF PRESSURE TRANSMITTERS
9	IEV-RCSOD	523	5.28E-06	5.77E+03	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EVENT
10	CCX-EP-SAM	232	8.62E-06	1.47E+03	CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS
11	IEV-RNSD	1075	9.69E-05	9.58E+02	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS
12	IEV-LOCA24D	488	1.15E-05	9.57E+02	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS DRAINED
13	IEV-CCWD	2182	7.16E-04	9.57E+02	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS
14	IEV-LOCA24ND	718	1.73E-05	9.54E+02	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILLED
15	CCX-BY-PN	376	4.70E-05	4.03E+02	COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B
16	CCX-IV-XR	290	2.40E-05	3.99E+02	COMMON CAUSE FAILURE OF THE INVERTER
17	IWX-CV-AO	398	3.00E-05	1.96E+02	CCF OF GRAVITY INJECTION CHECK VALVES TO OPEN

Table 54-18 (Sheet 2 of 8)

AP1000 SHUTDOWN PRA BASIC EVENT RISK IMPORTANCES – RAW

	Basic Event ID	Cutsets	BEV Prob.	RAW	
18	IWX-XMTR	123	2.01E-04	7.47E+01	CCF OF IRWST LEVEL TRANSMITTERS
19	ALL-IND-FAIL	31	1.00E-06	7.05E+01	INDICATION FAILURE
20	IEV-LOCAPRND	187	1.61E-05	5.98E+01	LOCA/RNS PIPE RUPTURE WITH RCS FILLED INIT. EVENT OCCURS
21	CCX-PMAMOD1-SW	134	1.10E-05	3.88E+01	SOFTWARE CCF OF OUTPUT LOGIC I/Os
22	CCX-PMAMOD1X	195	4.63E-05	3.86E+01	CCF OF ACTUATION LOGIC GROUPS
23	CCX-PMA030X	130	1.38E-05	3.84E+01	CCF OF LOGIC GROUP PROCESSING
24	CCX-EP-SAMX	87	2.94E-06	3.83E+01	CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS
25	IWB-PLUG	443	2.40E-04	3.53E+01	IRWST DISCHARGE LINE "B" STRAINER PLUGGED
26	IEV-LOSPD	3154	5.28E-03	2.76E+01	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED
27	CCX-INPUT-LOGIC	29	1.03E-04	1.73E+01	COMMON MODE FAILURE OF INPUT LOGIC GROUPS
28	CCX-ORY-SP	19	2.77E-04	1.57E+01	CCF OF ORIFICES
29	CCX-XMTR195	16	2.01E-04	1.55E+01	CCF OF PRESSURE TRANSMITTERS
30	LPM-MAN05	37	6.83E-04	1.33E+01	OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZATION
31	IWN-MAN00	189	1.15E-03	7.72E+00	OPERATOR FAILS TO ACTUATE IRWST INJECTION
32	RNX-PM-FS	59	7.70E-04	7.45E+00	CCF TO START OF THE PUMPS
33	RNX-KV-GO	52	6.10E-04	7.45E+00	CCF TO OPEN OF THE STOP CHECK VALVES

Table 54-18 (Sheet 3 of 8)

AP1000 SHUTDOWN PRA BASIC EVENT RISK IMPORTANCES – RAW

	Basic Event ID	Cutsets	BEV Prob.	RAW	
34	CCX-PL4MOD1	27	1.41E-04	7.40E+00	CMF OF OUTPUT LOGIC I/Os
35	CCX-PL403	22	9.69E-05	7.37E+00	CMF OF OUTPUT LOGIC GROUPS
36	RNX-CV-GO	20	5.10E-05	7.35E+00	CCF TO OPEN OF THE CHECK VALVES
37	RNX-PM-ER	17	1.60E-05	7.25E+00	CCF TO RUN OF THE PUMPS
38	SWX-PM-ER	16	1.40E-05	7.20E+00	CCF TO RUN OF THE MOTOR PUMPS
39	CCX-PM-ER	16	1.40E-05	7.20E+00	DUE TO CCF OF CCS PUMPS TO RUN
40	CCX-PL4MOD1-SW	14	1.10E-05	7.07E+00	SOFTWARE CCF OF OUTPUT LOGIC I /Os (CCX-P##MOD1)
41	CCX-EP-SA	14	8.62E-06	7.07E+00	CCF OF THE POWER INTERFACE OUTPUT BOARD (CCX-EP-SA)
42	PXX-AV-LA	190	1.92E-04	5.82E+00	FAILURE OF PRHR DUE TO COMMON CAUSE OF AOVs
43	IWNTK001AF	20	2.40E-06	5.60E+00	FAILURE OF THE PRHR DUE TO IRWS TANK FAILURE
44	PRX-HR-ML	10	1.20E-07	5.48E+00	CCF PLUG/LEAK OF PRHR HEAT EXCHANGERS
45	ED1MOD03	123	2.70E-03	5.09E+00	BATTERY DB1 UNAVAILABLE
46	ECX-CB-GO	93	1.20E-03	5.08E+00	COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN
47	ZOX-PD-ES	112	2.00E-03	5.08E+00	CCF TO START OF ENGINE-DRIVEN FUEL PUMPS
48	ED1MOD113	59	3.17E-04	5.08E+00	FIXED COMPONENTS FAILURE
49	ED1MOD11	59	3.17E-04	5.08E+00	FIXED COMPONENTS FAILURE
50	ECX-CB-GC	74	7.30E-04	5.07E+00	COMMON CAUSE FAILURE 4KV BREAKER TO CLOSE

Table 54-18 (Sheet 4 of 8)

AP1000 SHUTDOWN PRA BASIC EVENT RISK IMPORTANCES – RAW

	Basic Event ID	Cutsets	BEV Prob.	RAW	
51	ZOX-DG-DR	59	4.40E-04	5.05E+00	COMMON CAUSE FAILURE STANDBY DG TO RUN
52	ZOX-DG-DS	54	2.80E-04	5.03E+00	COMMON CAUSE FAILURE STANDBY DG TO START
53	ZOX-PD-ER	36	1.30E-04	4.97E+00	CCF TO RUN OF ENGINE-DRIVEN FUEL PUMPS
54	CCX-BY-PN1	20	5.70E-05	4.85E+00	COMMON CAUSE FAILURE OF THE BATTERY
55	ZOX-BL-ES	20	6.00E-05	4.84E+00	CCF TO START DG ROOM VENT FANS
56	IEV-RNSND	127	1.02E-03	4.60E+00	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS
57	IEV-CCWND	164	3.99E-03	4.59E+00	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS
58	PL5MOD11	76	2.09E-03	4.58E+00	FAILURE OF PLS OUTPUT LOGIC I/Os
59	PL50301BSA	52	1.16E-03	4.57E+00	PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND
60	PL50301ASA	52	1.16E-03	4.57E+00	PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND
61	ED1MOD01	29	5.04E-04	4.55E+00	FIXED COMPONENT FAILURES
62	ED1MOD13	22	3.17E-04	4.53E+00	FIXED COMPONENTS FAILURE
63	ED1MOD07	22	3.05E-04	4.53E+00	EDS1 EA 1 DISTR. PNL FAILURE OR T&M
64	CCX-PL7MOD1	14	1.41E-04	4.51E+00	CMF OF OUTPUT LOGIC I/Os
65	CCX-PL1MOD1	14	1.41E-04	4.51E+00	CMF OF OUTPUT LOGIC I/Os
66	EC5EPMGB1SA	14	1.71E-04	4.51E+00	FAILURE OF OUTPUT DRIVER
67	CCX-PL703	12	9.69E-05	4.51E+00	CMF OF OUTPUT LOGIC GROUPS

Table 54-18 (Sheet 5 of 8)

AP1000 SHUTDOWN PRA BASIC EVENT RISK IMPORTANCES – RAW

	Basic Event ID	Cutsets	BEV Prob.	RAW	
68	CCX-PL103	12	9.69E-05	4.51E+00	CMF OF OUTPUT LOGIC GROUPS
69	PL5XS00ASA	12	8.00E-05	4.51E+00	FAILURE OF OUTPUT LOGIC GROUP SELECTOR
70	CCX-IV-XR1	11	2.40E-05	4.49E+00	COMMON CAUSE FAILURE INVERTER
71	CCX-HE-AF	5	1.20E-06	4.35E+00	DUE TO CCF OF CCS H/X (PLUG OR LEAK)
72	CCX-PL1MOD1-SW	8	1.10E-05	4.35E+00	SOFTWARE CCF OF OUTPUT LOGIC I /Os (CCX-P##MOD1)
73	CCX-PL7MOD1-SW	8	1.10E-05	4.35E+00	SOFTWARE CCF OF OUTPUT LOGIC I /Os (CCX-P##MOD1)
74	ED1BSDS1LF	7	4.80E-06	4.19E+00	EDS1 DS 1 SWITCHGEAR FAILURE
75	ADX-EV2-SA	70	6.00E-05	4.12E+00	OPERATOR FAILS TO ACTUATE ADS AFTER CORE DAMAGE
76	CCX-LS-FA	32	5.37E-06	4.12E+00	CCF OF LIMIT SWITCHES
77	IW1OR170SPX	34	9.46E-05	3.94E+00	ORIFICE FAILURE DUE TO PLUGGING
78	IW2OR160SPX	34	9.46E-05	3.94E+00	ORIFICE FAILURE DUE TO PLUGGING
79	IW1TL170UFX	33	6.84E-05	3.93E+00	LEVEL TRANSMITTER FAILURE
80	IW2TL160UFX	33	6.84E-05	3.93E+00	LEVEL TRANSMITTER FAILURE
81	RN23MOD5S	912	2.21E-03	3.36E+00	MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN
82	IDDBSDS1TM	411	3.00E-04	3.25E+00	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE
83	IDDBSDD1TM	411	3.00E-04	3.25E+00	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE
84	REB-PLUG	121	2.40E-04	3.20E+00	SUMP SCREEN B PLUGS AND PREVENTS FLOW

Table 54-18 (Sheet 6 of 8)

AP1000 SHUTDOWN PRA BASIC EVENT RISK IMPORTANCES – RAW

	Basic Event ID	Cutsets	BEV Prob.	RAW	
85	REA-PLUG	121	2.40E-04	3.20E+00	SUMP SCREEN A PLUGS AND PREVENTS FLOW
86	RHN-MAN05	781	1.60E-03	3.18E+00	OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023
87	IDDBSDK1TM	388	3.00E-04	3.13E+00	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE
88	RNDEP023SA	291	1.71E-04	3.03E+00	FAILURE OF OUTPUT DRIVER
89	CCX-PMDMOD1	278	1.41E-04	2.98E+00	CMF OF OUTPUT LOGIC I/Os
90	CCX-PMD030	190	9.69E-05	2.86E+00	CMF OF OUTPUT LOGIC GROUPS
91	IDBBSDS1TM	165	3.00E-04	2.83E+00	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE
92	IDBBSDD1TM	165	3.00E-04	2.83E+00	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE
93	IWA-PLUG	136	2.40E-04	2.80E+00	IRWST DISCHARGE LINE "A" STRAINER PLUGGED
94	IRWMOD05S	380	3.00E-03	2.76E+00	MECHANICAL FAILURE CAUSES MOV 121A TO FAIL-TO-OPEN
95	IDBBSDK1TM	151	3.00E-04	2.73E+00	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE
96	IDBFD013RQ	15	1.20E-05	2.73E+00	FUSE DISCONNECT SWITCH (FD13) SPURIOUSLY OPENS
97	IDBBSDD1LF	11	4.80E-06	2.72E+00	BUS IDSB-DD-1 FAILS (ALL MODES)
98	IDBBSDS1LF	11	4.80E-06	2.72E+00	BUS IDSB-DS-1 FAILS (ALL MODES)
99	IRAEP121ASAX	42	5.83E-05	2.65E+00	FAILURE OF POWER INTERFACE OUTPUT BOARD
100	CCX-PMDMOD4	133	4.98E-05	2.64E+00	CMF OF MUX LOGIC GROUPS
101	IDBFD014RQ	10	1.20E-05	2.64E+00	FUSE DISCONNECT SWITCH (FD14) SPURIOUSLY OPENS

Table 54-18 (Sheet 7 of 8)

AP1000 SHUTDOWN PRA BASIC EVENT RISK IMPORTANCES – RAW

	Basic Event ID	Cutsets	BEV Prob.	RAW	
102	IDBBSDK1LF	7	4.80E-06	2.63E+00	BUS IDSB-DK-1 FAILS (ALL MODES)
103	ADN-MAN01	56	4.93E-04	2.55E+00	OPERATOR FAILS TO ACTUATE ADS BEFORE CORE DAMAGE
104	CCX-PMAMOD1	126	1.41E-04	2.55E+00	CCF OF OUTPUT LOGIC I/O BOARDS
105	REN-MAN04	104	1.00E-02	2.46E+00	OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE
106	CCX-VS-FA	8	3.84E-05	2.39E+00	CCF OF CMT LEVEL SWITCHES (CMX -VS-FA)
107	CCX-PMA030	92	9.69E-05	2.37E+00	CCF OF LOGIC GROUP PROCESSING
108	IDABSDS1TM	295	3.00E-04	2.35E+00	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE
109	IDAMOD05	354	5.16E-04	2.34E+00	FAILURE OF INV., STATIC SWITCH AND ASSOC. BREAKERS
110	ZOX-BL-ER	2	1.36E-06	2.32E+00	CCF TO RUN DG ROOM VENT FANS
111	ZOX-FL-GP	2	1.30E-06	2.31E+00	COMMON CAUSE FAILURE - PLUGGING OF FUEL FILTERS
112	IDAMOD04	340	3.17E-04	2.29E+00	LOSS OF DIST. PANEL OR BREAKER A07 SPURIOUSLY OPENS
113	IDDFD019RQ	63	1.20E-05	2.27E+00	FUSE DISCONNECT SWITCH (FD19) SPURIOUSLY OPENS
114	IWX-XMTRLW	2	9.20E-09	2.22E+00	CCF OF MOVS ON RECIRC LINES TO OPEN
115	CCX-PMAMOD2X	22	8.58E-05	2.19E+00	CCF OF ACTUATION LOGIC GROUPS
116	IDDFD020RQ	58	1.20E-05	2.18E+00	FUSE DISCONNECT SWITCH (FD20) SPURIOUSLY OPENS
117	CCX-PMDMOD1-SW	56	1.10E-05	2.18E+00	SOFTWARE CCF OF OUTPUT LOGIC I /Os (CCX-P##MOD1)
118	CCX-PMDMOD4-SW	56	1.10E-05	2.18E+00	SOFTWARE CCF OF MUX LOGIC GROUPS (CCX-P##MOD4-SW)

Table 54-18 (Sheet 8 of 8)

AP1000 SHUTDOWN PRA BASIC EVENT RISK IMPORTANCES – RAW

	Basic Event ID	Cutsets	BEV Prob.	RAW	
119	CCX-INPUT-LOGICX	12	2.59E-05	2.17E+00	CCF OF INPUT LOGIC GROUPS
120	CCX-IN-LOGIC-SW	8	1.10E-05	2.17E+00	CCF OF SOFTWARE FOR INPUT LOGIC GROUPS
121	CCX-PMAMOD2-SW	8	1.10E-05	2.17E+00	CCF OF SOFTWARE FOR ACTUATION LOGIC GROUPS
122	PMAMOD11	326	2.09E-03	2.16E+00	FAILURE OF PMS OUTPUT LOGIC I/Os
123	PMA0301BSA	227	1.16E-03	2.13E+00	FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING
124	PMA0301ASA	227	1.16E-03	2.13E+00	FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING
125	IDDBSDD1LF	35	4.80E-06	2.05E+00	BUS IDSD-DD-1 FAILS (ALL MODES)
126	IDDBSDS1LF	35	4.80E-06	2.05E+00	BUS IDSD-DS-1 FAILS (ALL MODES)
127	IDDBSDK1LF	31	4.80E-06	1.96E+00	BUS IDSD-DK-1 FAILS (ALL MODES)
128	CCX-PMDEH0	29	4.03E-06	1.96E+00	CCF OF MUX TRANSMITTERS (CCX-# ##EH0)
129	ED3MOD07	40	3.05E-04	1.77E+00	EDS3 EA 1 DISTR. PNL FAILURE OR T&M

Table 54-19 (Sheet 1 of 3)

AP1000 SHUTDOWN PRA BASIC EVENT RISK IMPORTANCES – RRW

	Basic Event ID	Cutsets	BEV Prob.	RRW	
1	IEV-CCWD	2182	7.16E-04	3.174	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS
2	ADX-EV-SA	244	3.00E-05	1.283	CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN
3	IWX-EV4-SA	227	2.60E-05	1.236	CCF OF 2 OUT 2 LOW PRESSURE RECIRCULATION SQUIB VALVES
4	IWX-EV-SA	266	2.60E-05	1.230	CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN
5	IEV-LOSPD	3154	5.28E-03	1.164	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED
6	OTH-R1	2934	4.20E-01	1.118	FAILURE TO RECOVER AC POWER IN 1 HOUR
7	IEV-RNSD	1075	9.69E-05	1.102	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS
8	IWX-FL-GP	168	1.20E-05	1.097	CCF OF STRAINERS IN IRWST TANK
9	REX-FL-GP	168	1.20E-05	1.097	CCF PLUGGING OF BOTH RECIRC LINES DUE TO SUMP SCREENS
10	CCX-SFTW	32	1.20E-06	1.069	SOFTWARE CCF OF ALL CARDS
11	SUC-R1S	220	5.80E-01	1.037	OFFSITE AC POWER RECOVERED IN 1 HOUR
12	IEV-RCSOD	523	5.28E-06	1.031	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EVENT
13	CCX-ORY-SPX	112	3.63E-06	1.027	CCF OF ORIFICES
14	RHN-MAN05C	27	1.50E-01	1.026	COND. PROB. OF RHN-MAN05 (OP. FAILS TO OPEN RNS MOV V023)
15	RHN-MAN04	255	5.50E-02	1.020	OPERATOR FAILS TO ISOLATE RNS PIPE RUPTURE
16	CCX-BY-PN	376	4.70E-05	1.019	COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B
17	CCX-XMTRX	97	2.63E-06	1.019	CCF OF PRESSURE TRANSMITTERS
18	IWN-MAN00C	23	5.00E-02	1.019	COND. PROB. OF IWN-MAN00 (OP. FAILS TO ACTUATE IRWST INJ)

Table 54-19 (Sheet 2 of 3)

AP1000 SHUTDOWN PRA BASIC EVENT RISK IMPORTANCES – RRW

	Basic Event ID	Cutsets	BEV Prob.	RRW	
19	IEV-LOCA24ND	718	1.73E-05	1.017	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILLED
20	IWX-XMTR	123	2.01E-04	1.015	CCF OF IRWST LEVEL TRANSMITTERS
21	REN-MAN04	104	1.00E-02	1.015	OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE
22	IEV-CCWND	164	3.99E-03	1.015	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS
23	CCX-EP-SAM	232	8.62E-06	1.013	CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS
24	RHN-MAN04-SUCC	429	9.45E-01	1.012	SUCCESS OF OPERATOR TO ALIGN AND ACTUATE THE RNS
25	ED1MOD03	123	2.70E-03	1.011	BATTERY DB1 UNAVAILABLE
26	IEV-LOCA24D	488	1.15E-05	1.011	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS DRAINED
27	CCX-IV-XR	290	2.40E-05	1.010	COMMON CAUSE FAILURE OF THE INVERTER
28	REC-MANDASC	46	5.06E-01	1.009	COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTUATION)
29	ZO1MOD01	628	2.02E-02	1.009	D/G FAILS TO START & RUN OR BKR 102 FAILS TO CLOSE
30	LPM-MAN05	37	6.83E-04	1.008	OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZATION
31	IWB-PLUG	443	2.40E-04	1.008	IRWST DISCHARGE LINE "B" STRAINER PLUGGED
32	ZOX-PD-ES	112	2.00E-03	1.008	CCF TO START OF ENGINE-DRIVEN FUEL PUMPS
33	IWN-MAN00	189	1.15E-03	1.008	OPERATOR FAILS TO ACTUATE IRWST INJECTION
34	PL5MOD11	76	2.09E-03	1.008	FAILURE OF PLS OUTPUT LOGIC I/Os
35	REC-MANDAS	181	1.16E-02	1.008	FAILURE OF MANUAL DAS ACTUATION
36	MDAS	184	1.00E-02	1.007	FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE

Table 54-19 (Sheet 3 of 3)

AP1000 SHUTDOWN PRA BASIC EVENT RISK IMPORTANCES – RRW

	Basic Event ID	Cutsets	BEV Prob.	RRW	
37	IWX-CV-AO	398	3.00E-05	1.006	CCF OF GRAVITY INJECTION CHECK VALVES TO OPEN
38	EC1CB100VO	483	1.23E-02	1.005	BREAKER 100 FAILS TO OPEN [#3,5]
39	ZO2MOD01	233	2.02E-02	1.005	D/G FAILS TO START & RUN OR BKR 202 FAILS TO CLOSE
40	IRWMOD05S	380	3.00E-03	1.005	MECHANICAL FAILURE CAUSES MOV 121A TO FAIL-TO-OPEN
41	RN23MOD5S	912	2.21E-03	1.005	MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN
42	RNX-PM-FS	59	7.70E-04	1.005	CCF TO START OF THE PUMPS
43	ECX-CB-GO	93	1.20E-03	1.005	COMMON CAUSE FAILURE 4KV BREAKERS TO OPEN
44	IEV-LOSPND	56	1.82E-02	1.004	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS FILLED
45	PL50301BSA	52	1.16E-03	1.004	PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND
46	PL50301ASA	52	1.16E-03	1.004	PLS LOGIC GROUP PROCESSING FAILURE UPON DEMAND
47	CCX-ORY-SP	19	2.77E-04	1.004	CCF OF ORIFICES
48	SWBMOD02	176	2.44E-02	1.004	PUMP MP 01B SEGMENT HARDWARE FAILURE OR DIVERTED FLOW
49	RNX-KV-GO	52	6.10E-04	1.004	CCF TO OPEN OF THE STOP CHECK VALVES
50	RNBMOD07S	184	1.53E-02	1.004	PUMP 01B FAILS & ST CK V007B & C B FTC & RE FTC & CB ECS221 SPO
51	RNAMOD06S	134	1.53E-02	1.004	PUMP 01A FAILS; STOP CK V007A, CB & RELAY FTC; CB ECS122 SPO
52	IEV-RNSND	127	1.02E-03	1.004	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS
53	RHN-MAN05	781	1.60E-03	1.004	OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023

Table 54-20 (Sheet 1 of 4)

AP1000 SHUTDOWN PRA CASE 2 BASIC EVENT RISK IMPORTANCES – RAW

	Basic Event ID	Cutsets	BEV Prob.	RAW	
1	CCX-SFTW	13	1.20E-06	23610.000	SOFTWARE CCF OF ALL CARDS
2	CCX-EP-SAM	13	8.62E-06	23600.000	CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS
3	ADX-EV-SA	25	3.00E-05	4975.000	CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN
4	IWX-EV4-SA	24	2.60E-05	4975.000	CCF OF 2 OUT 2 LOW PRESSURE RECIRCULATION SQUIB VALVES
5	REX-FL-GP	24	1.20E-05	4971.000	CCF PLUGGING OF BOTH RECIRC LINES DUE TO SUMP SCREENS
6	IWX-FL-GP	24	1.20E-05	4971.000	CCF OF STRAINERS IN IRWST TANK
7	IWX-EV-SA	7	2.60E-05	4960.000	CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN
8	CCX-XMTRX	7	2.63E-06	4957.000	CCF OF PRESSURE TRANSMITTERS
9	CCX-ORY-SPX	7	3.63E-06	4956.000	CCF OF ORIFICES
10	CCX-IV-XR	110	2.40E-05	1804.000	COMMON CAUSE FAILURE OF THE INVERTER
11	CCX-BY-PN	165	4.70E-05	1800.000	COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B
12	IEV-RCSOD	509	5.28E-06	585.200	OVERDRAINING OF RCS DURING DRAIN DOWN TO MID-LOOP INITIATING EVENT
13	IEV-LOSPD	140	5.28E-03	137.200	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED
14	IEV-LOCA24ND	595	1.73E-05	116.500	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS FILLED
15	IEV-RNSD	1059	9.69E-05	103.700	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS
16	IEV-LOCA24D	476	1.15E-05	103.700	LOCA/RNS-V024 OPENS INITIATING EVENT OCCURS WITH RCS DRAINED
17	IEV-CCWD	2146	7.16E-04	103.600	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS

Table 54-20 (Sheet 2 of 4)

AP1000 SHUTDOWN PRA CASE 2 BASIC EVENT RISK IMPORTANCES – RAW

	Basic Event ID	Cutsets	BEV Prob.	RAW	
18	IWX-XMTR	33	2.01E-04	50.880	CCF OF IRWST LEVEL TRANSMITTERS
19	IWX-CV-AO	299	3.00E-05	44.390	CCF OF GRAVITY INJECTION CHECK VALVES TO OPEN
20	IWB-PLUG	286	2.40E-04	32.410	IRWST DISCHARGE LINE "B" STRAINER PLUGGED
21	IEV-LOCAPRND	166	1.61E-05	15.350	LOCA/RNS PIPE RUPTURE WITH RCS FILLED INIT. EVENT OCCURS
22	CCX-PMAMOD1X	189	4.63E-05	14.220	CCF OF ACTUATION LOGIC GROUPS
23	RN23MOD5S	542	2.21E-03	11.900	MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN
24	RHN-MAN05	457	1.60E-03	11.880	OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023
25	IDDBSDS1TM	323	3.00E-04	11.810	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE
26	IDDBSDD1TM	323	3.00E-04	11.810	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE
27	IDDBSDK1TM	300	3.00E-04	11.800	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE
28	RNDEP023SA	235	1.71E-04	11.410	FAILURE OF OUTPUT DRIVER
29	CCX-PMDMOD1	227	1.41E-04	11.160	CMF OF OUTPUT LOGIC I/Os
30	CCX-PMD030	158	9.69E-05	11.100	CMF OF OUTPUT LOGIC GROUPS
31	PMAMOD11	29	2.09E-03	10.800	FAILURE OF PMS OUTPUT LOGIC I/Os
32	IDAMOD05	243	5.16E-04	10.780	FAILURE OF INV., STATIC SWITCH AND ASSOC. BREAKERS
33	PMA0301ASA	19	1.16E-03	10.750	FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING
34	PMA0301BSA	19	1.16E-03	10.750	FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING
35	IDABSDS1TM	232	3.00E-04	10.690	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE

Table 54-20 (Sheet 3 of 4)

AP1000 SHUTDOWN PRA CASE 2 BASIC EVENT RISK IMPORTANCES – RAW

	Basic Event ID	Cutsets	BEV Prob.	RAW	
36	IDAMOD04	277	3.17E-04	10.670	LOSS OF DIST. PANEL OR BREAKER A07 SPURIOUSLY OPENS
37	CCX-PMAMOD1	26	1.41E-04	10.390	CCF OF OUTPUT LOGIC I/O BOARDS
38	CCX-PMA030	25	9.69E-05	10.090	CCF OF LOGIC GROUP PROCESSING
39	CCX-PMDMOD4	122	4.98E-05	9.986	CMF OF MUX LOGIC GROUPS
40	PMAXS00ASA	6	8.00E-05	9.493	FAILURE OF MIMIC BUS SELECTOR BOARD
41	IEV-RNSND	120	1.02E-03	9.313	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS
42	IEV-CCWND	155	3.99E-03	9.295	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS
43	CCX-PMAMOD1-SW	126	1.10E-05	8.854	SOFTWARE CCF OF OUTPUT LOGIC I/Os
44	IEV-LOSPND	5	1.82E-02	8.836	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS FILLED
45	ALL-IND-FAIL	31	1.00E-06	7.955	INDICATION FAILURE
46	IDDFD019RQ	62	1.20E-05	4.877	FUSE DISCONNECT SWITCH (FD19) SPURIOUSLY OPENS
47	CCX-PMDMOD1-SW	55	1.10E-05	4.870	SOFTWARE CCF OF OUTPUT LOGIC I /Os (CCX-P##MOD1)
48	CCX-PMDMOD4-SW	55	1.10E-05	4.870	SOFTWARE CCF OF MUX LOGIC GROUPS (CCX-P##MOD4-SW)
49	IDDFD020RQ	57	1.20E-05	4.868	FUSE DISCONNECT SWITCH (FD20) SPURIOUSLY OPENS
50	CCX-PMA030X	127	1.38E-05	4.733	CCF OF LOGIC GROUP PROCESSING
51	CCX-EP-SAMX	85	2.94E-06	4.730	CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS
52	CCX-INPUT-LOGIC	20	1.03E-04	4.151	COMMON MODE FAILURE OF INPUT LOGIC GROUPS

Table 54-20 (Sheet 4 of 4)

AP1000 SHUTDOWN PRA CASE 2 BASIC EVENT RISK IMPORTANCES – RAW

	Basic Event ID	Cutsets	BEV Prob.	RAW	
53	CCX-ORY-SP	11	2.77E-04	3.848	CCF OF ORIFICES
54	CCX-XMTR195	10	2.01E-04	3.813	CCF OF PRESSURE TRANSMITTERS
55	LPM-MAN05	18	6.83E-04	3.559	OPERATOR FAILS TO RECOGNIZE THE NEED FOR RCS DEPRESSURIZATION
56	REA-PLUG	114	2.40E-04	2.244	SUMP SCREEN A PLUGS AND PREVENTS FLOW
57	REB-PLUG	114	2.40E-04	2.244	SUMP SCREEN B PLUGS AND PREVENTS FLOW
58	IDBBSDS1TM	156	3.00E-04	2.206	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE
59	IDBBSDD1TM	156	3.00E-04	2.206	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE
60	IWA-PLUG	129	2.40E-04	2.204	IRWST DISCHARGE LINE "A" STRAINER PLUGGED
61	IDBBSDK1TM	142	3.00E-04	2.197	BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE
62	IRWMOD05S	323	3.00E-03	2.193	MECHANICAL FAILURE CAUSES MOV 121A TO FAIL-TO-OPEN
63	REN-MAN04	21	1.00E-02	1.992	OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE
64	PXX-AV-LA	185	1.92E-04	1.919	FAILURE OF PRHR DUE TO COMMON CAUSE OF AOVs
65	IWN-MAN00	188	1.15E-03	1.672	OPERATOR FAILS TO ACTUATE IRWST INJECTION

Table 54-21 (Sheet 1 of 2)

AP1000 SHUTDOWN PRA CASE 2 BASIC EVENT RISK IMPORTANCES – RRW

	Basic Event ID	Cutsets	BEV Prob.	RRW	
1	IEV-LOSPD	140	5.28E-03	3.611	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS DRAINED
2	OTH-R1	117	4.20E-01	1.697	FAILURE TO RECOVER AC POWER IN 1 HOUR
3	SUC-R1S	23	5.80E-01	1.454	OFFSITE AC POWER RECOVERED IN 1 HOUR
4	CCX-EP-SAM	13	8.62E-06	1.259	CCF OF THE POWER INTERFACE OUTPUT BOARDS IN PMS
5	ADX-EV-SA	25	3.00E-05	1.176	CCF OF ADS 4TH STAGE SQUIB VALVES TO OPEN
6	IEV-LOSPND	5	1.82E-02	1.170	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS WITH RCS FILLED
7	IWX-EV4-SA	24	2.60E-05	1.149	CCF OF 2 OUT 2 LOW PRESSURE RECIRCULATION SQUIB VALVES
8	IWX-EV-SA	7	2.60E-05	1.148	CCF OF 6/6 IRWST HP SQUIB VALVES TO OPEN
9	SUC-R2S	2	7.60E-01	1.124	OFFSITE AC POWER RECOVERED IN 2 HOURS
10	CCX-BY-PN	165	4.70E-05	1.092	COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B
11	IEV-CCWD	2146	7.16E-04	1.079	LOSS OF CCS/SWS WITH RCS DRAINED INITIATING EVENT OCCURS
12	IWX-FL-GP	24	1.20E-05	1.064	CCF OF STRAINERS IN IRWST TANK
13	REX-FL-GP	24	1.20E-05	1.064	CCF PLUGGING OF BOTH RECIRC LINES DUE TO SUMP SCREENS
14	CCX-IV-XR	110	2.40E-05	1.045	COMMON CAUSE FAILURE OF THE INVERTER
15	OTH-R2	2	2.40E-01	1.036	FAILURE TO RECOVER AC POWER IN 2 HOURS
16	IEV-CCWND	155	3.99E-03	1.034	LOSS OF CCS/SWS WITH RCS FILLED INITIATING EVENT OCCURS
17	CCX-SFTW	13	1.20E-06	1.029	SOFTWARE CCF OF ALL CARDS

Table 54-21 (Sheet 2 of 2)

AP1000 SHUTDOWN PRA CASE 2 BASIC EVENT RISK IMPORTANCES – RRW

	Basic Event ID	Cutsets	BEV Prob.	RRW	
18	RN23MOD5S	542	2.21E-03	1.025	MECHANICAL FAILURE CAUSES MOV 023 TO FAIL-TO-OPEN
19	PMAMOD11	29	2.09E-03	1.021	FAILURE OF PMS OUTPUT LOGIC I/Os
20	CCX-ORY-SPX	7	3.63E-06	1.018	CCF OF ORIFICES
21	RHN-MAN05	457	1.60E-03	1.018	OPERATOR FAILS TO RECOGNIZE NEED AND TO OPEN RNS MOV V023
22	CCX-XMTRX	7	2.63E-06	1.013	CCF OF PRESSURE TRANSMITTERS
23	PMA0301ASA	19	1.16E-03	1.011	FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING
24	PMA0301BSA	19	1.16E-03	1.011	FAILURE UPON DEMAND OF LOGIC GROUP PROCESSING
25	IWX-XMTR	33	2.01E-04	1.010	CCF OF IRWST LEVEL TRANSMITTERS
26	REN-MAN04	21	1.00E-02	1.010	OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE
27	IEV-RNSD	1059	9.69E-05	1.010	LOSS OF RNS WITH RCS DRAINED INITIATING EVENT OCCURS
28	IEV-RNSND	120	1.02E-03	1.009	LOSS OF RNS WITH RCS FILLED INITIATING EVENT OCCURS
29	IWB-PLUG	286	2.40E-04	1.008	IRWST DISCHARGE LINE "B" STRAINER PLUGGED
30	IDAMOD05	243	5.16E-04	1.005	FAILURE OF INV., STATIC SWITCH AND ASSOC. BREAKERS
31	IRWMOD05S	323	3.00E-03	1.004	MECHANICAL FAILURE CAUSES MOV 121A TO FAIL-TO-OPEN

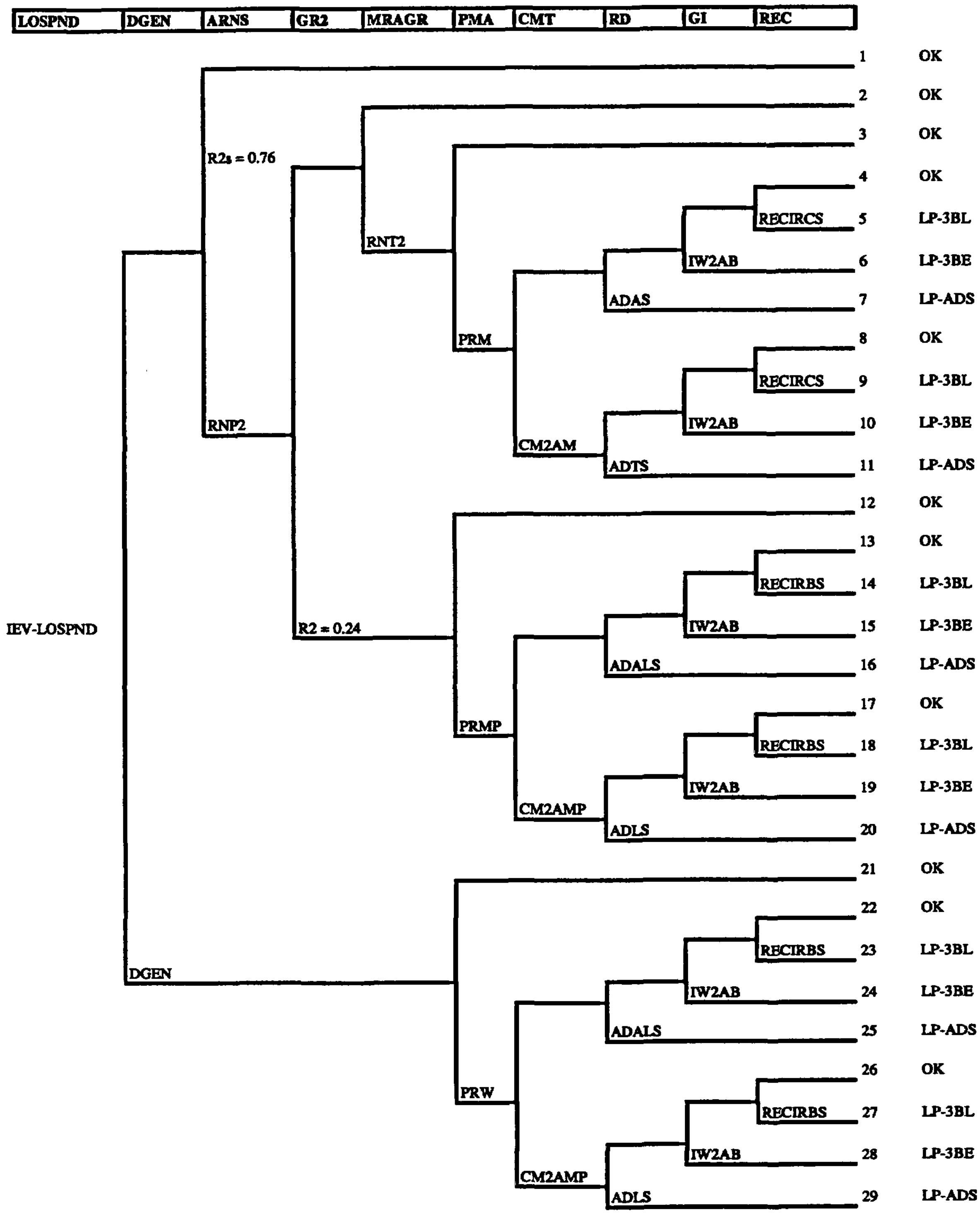


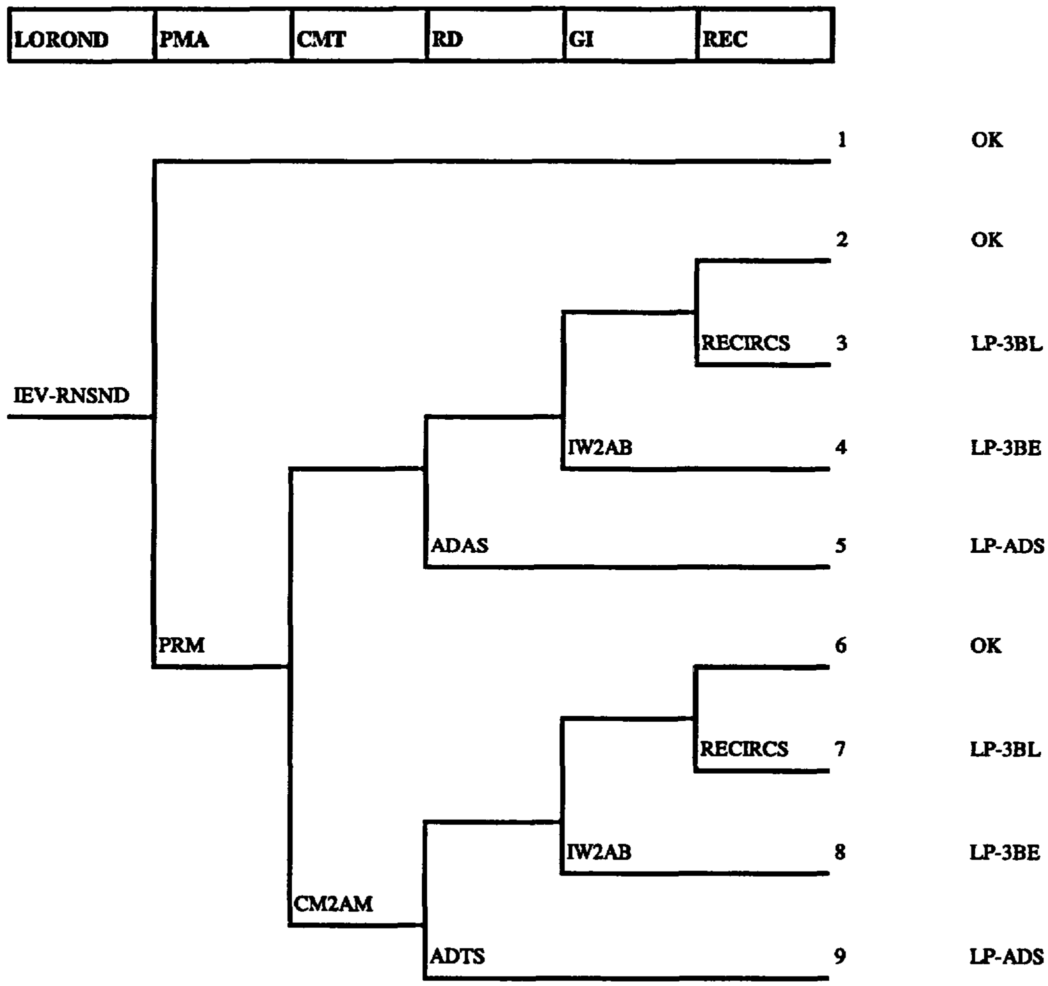
Figure 54-1 (Sheet 1 of 2)

Loss of Offsite Power During Hot/Cold Shutdown (RCS Filled) Event Tree

Event	Description
LOSPND	Loss of Offsite Power during Hot/Cold Shutdown (Non-drained RCS)
DGEN	Onsite AC Power available through Diesel Generators
ARNS	Automatic RNS Restart
GR2	Grid Recovery within 2 hours
MRAGR	Manual RNS Restart after Grid Recovery
PMA	PRHR Manual Actuation
CMT	Core Makeup Tanks Actuation
RD	RCS Depressurization
GI	Gravity Injection
REC	Containment Sump Recirculation

Figure 54-1 (Sheet 2 of 2)

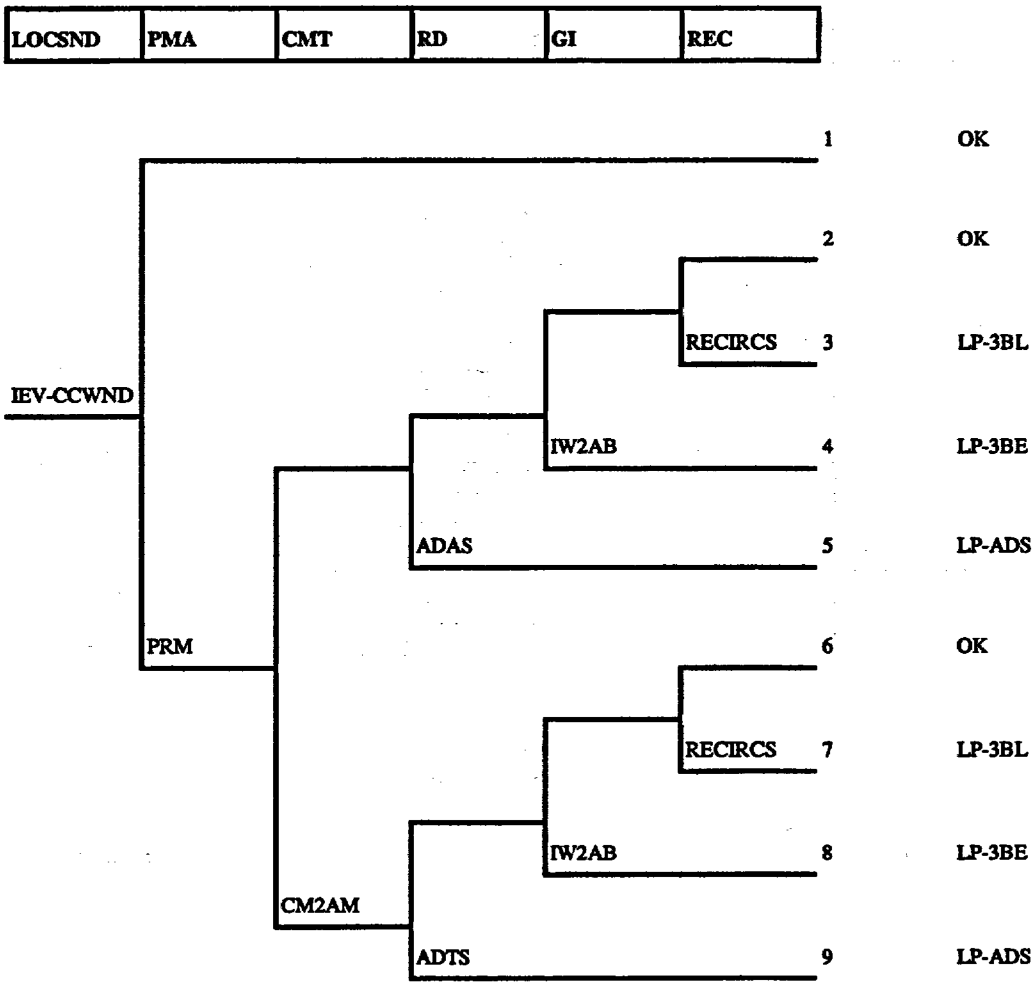
Loss of Offsite Power During Hot/Cold Shutdown (RCS Filled) Event Tree



Event	Description
LOROND	Loss of RNS operation during Hot/Cold Shutdown (Non-drained RCS)
PMA	PRHR Manual Actuation
CMT	Core Makeup Tanks Actuation
RD	RCS Depressurization
GI	Gravity Injection
REC	Containment Sump Recirculation

Figure 54-2

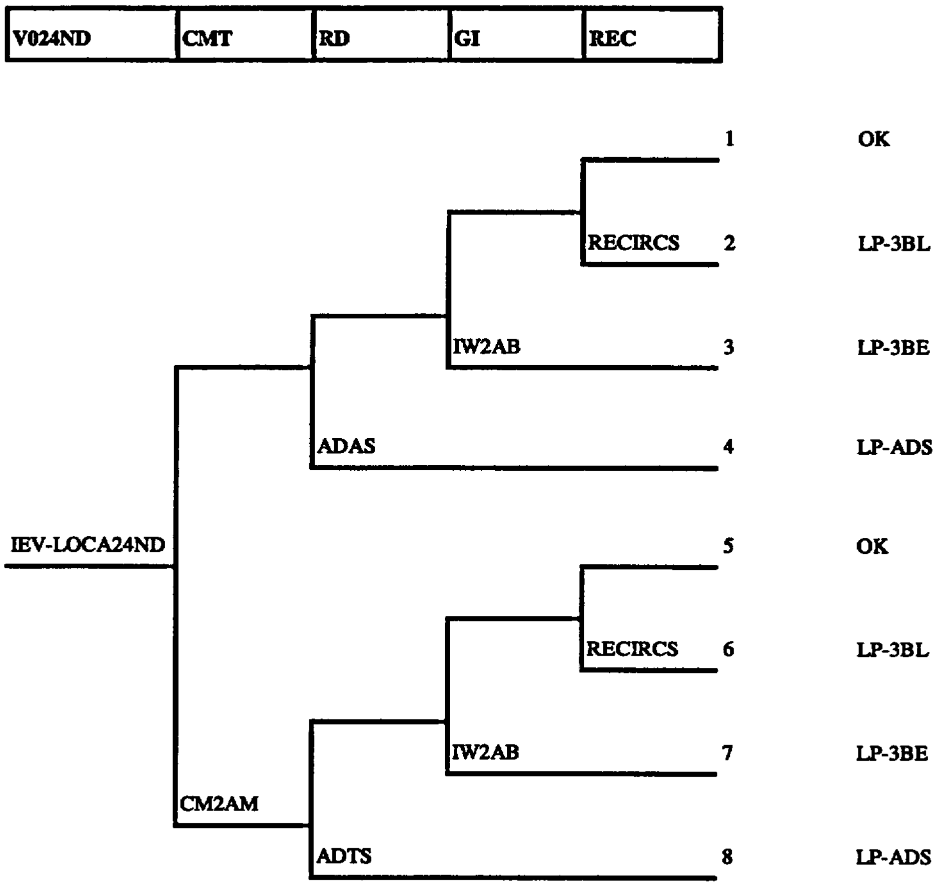
Loss of RNS During Hot/Cold Shutdown (RCS Filled) Event Tree



Event	Description
LOCSND	Loss of CCW/SW during Hot/Cold Shutdown (Non-drained RCS)
PMA	PRHR Manual Actuation
CMT	Core Makeup Tanks Actuation
RD	RCS Depressurization
GI	Gravity Injection
REC	Containment Sump Recirculation

Figure 54-3

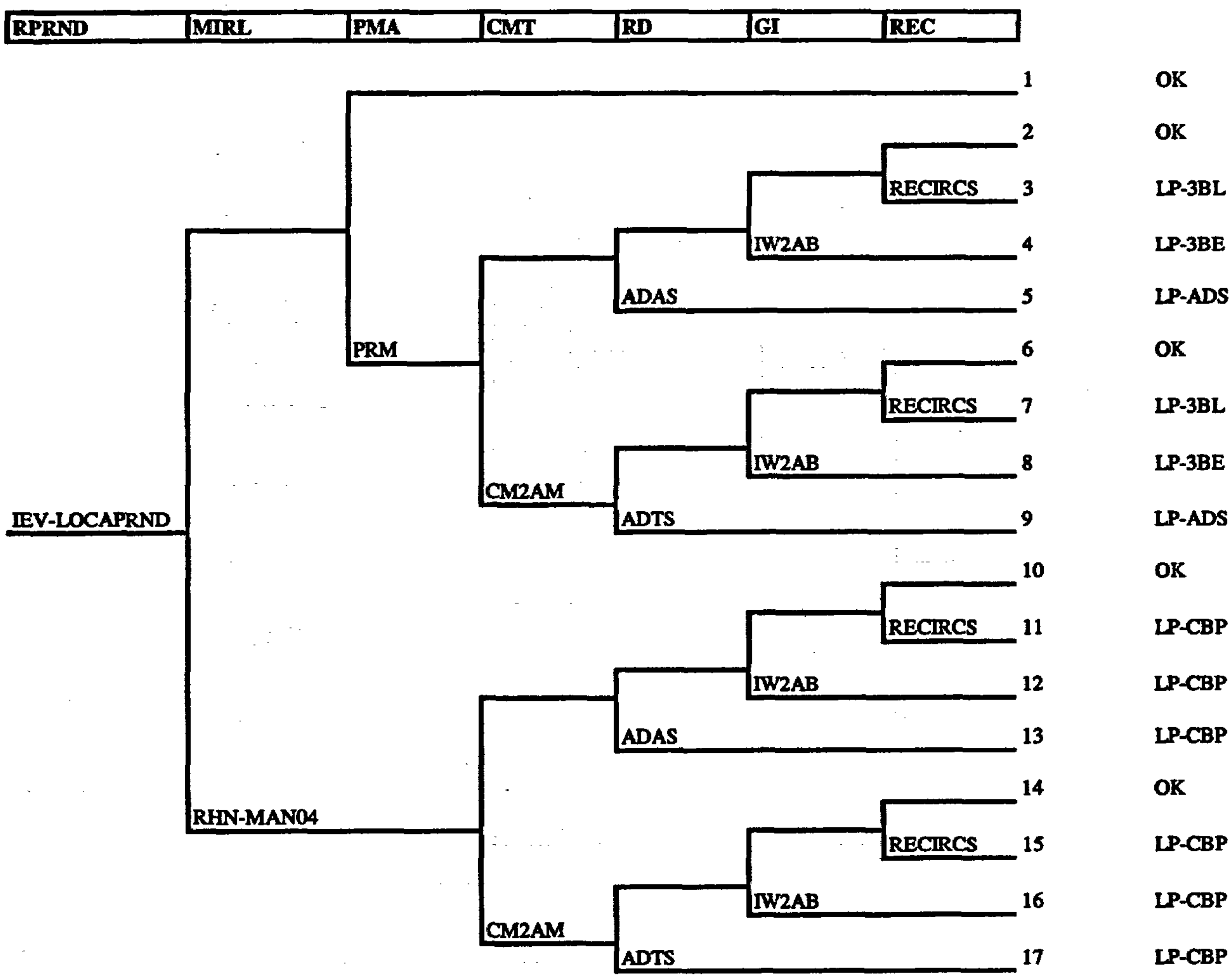
Loss of CCW/SW During Hot/Cold Shutdown (RCS Filled) Event Tree



Event	Description
V024ND	LOCA through RNS-V024 during Hot/Cold Shutdown (Non-drained RCS)
CMT	Core Makeup Tanks Actuation
RD	RCS Depressurization
GI	Gravity Injection
REC	Containment Sump Recirculation

Figure 54-4

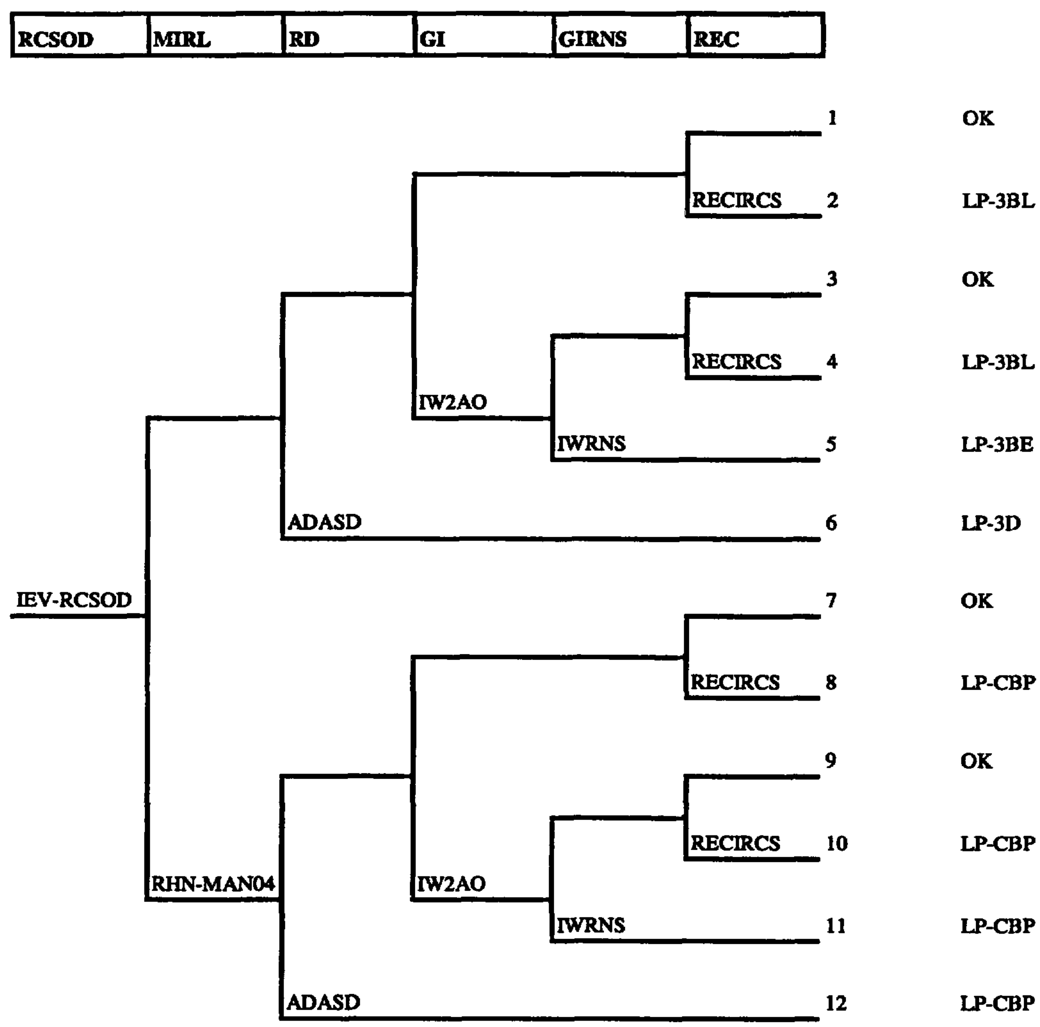
LOCA/RNS-V024 Opens During Hot/Cold Shutdown (RCS Filled) Event Tree



Event	Description
RPRND	RNS Pipe Rupture during Hot/Cold Shutdown (Non-drained RCS)
MIRL	Manually Isolate RNS Leak
PMA	PRHR Manual Actuation
CMT	Core Makeup Tanks Actuation
RD	RCS Depressurization
GI	Gravity Injection
REC	Containment Sump Recirculation

Figure 54-5

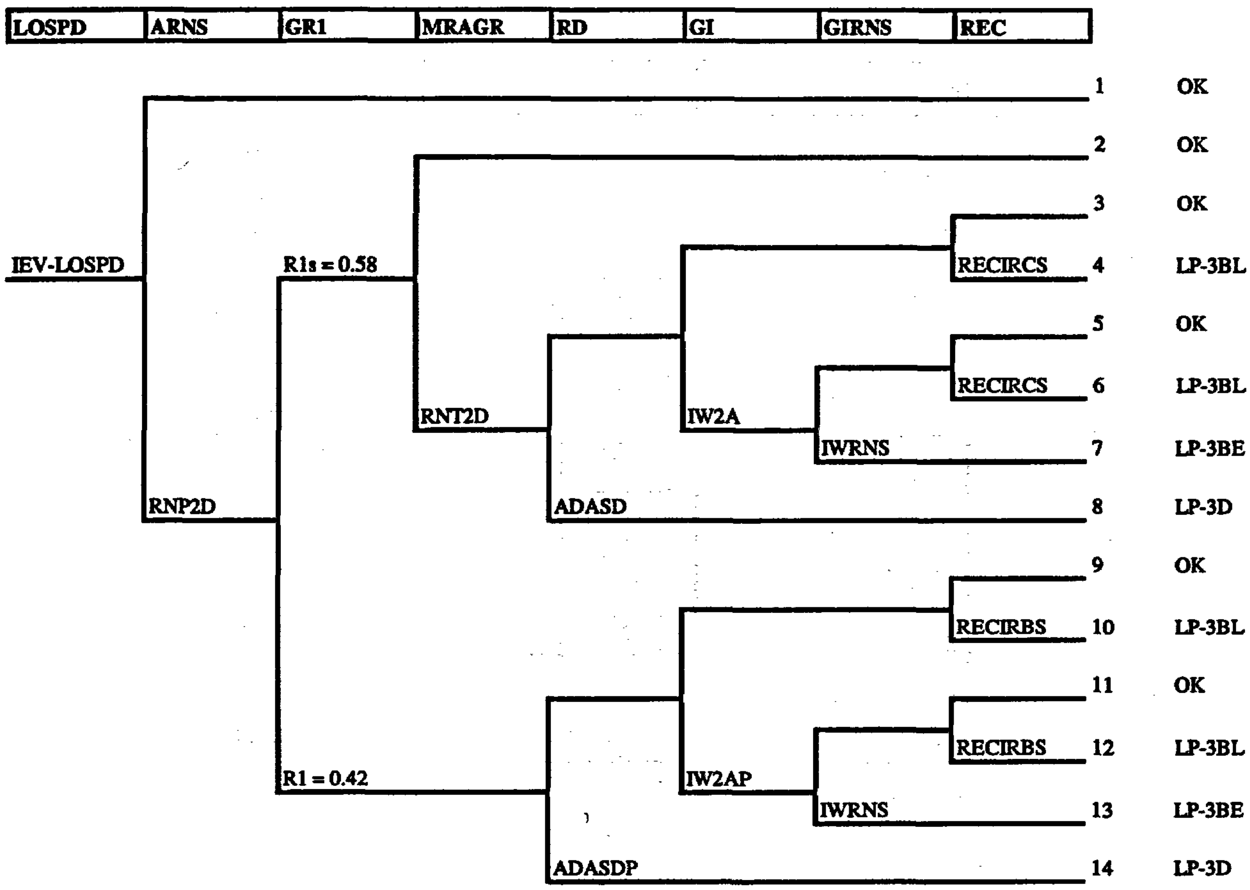
LOCA/RNS Pipe Rupture During Hot/Cold Shutdown (RCS Filled) Event Tree



Event	Description
RCSOD	RCS Overdraining during draindown to Mid-loop
MIRL	Manually Isolate RNS Leak
RD	RCS Depressurization (4th stage)
GI	Gravity Injection
GIRNS	Gravity Injection via RNS
REC	Containment Sump Recirculation

Figure 54-6

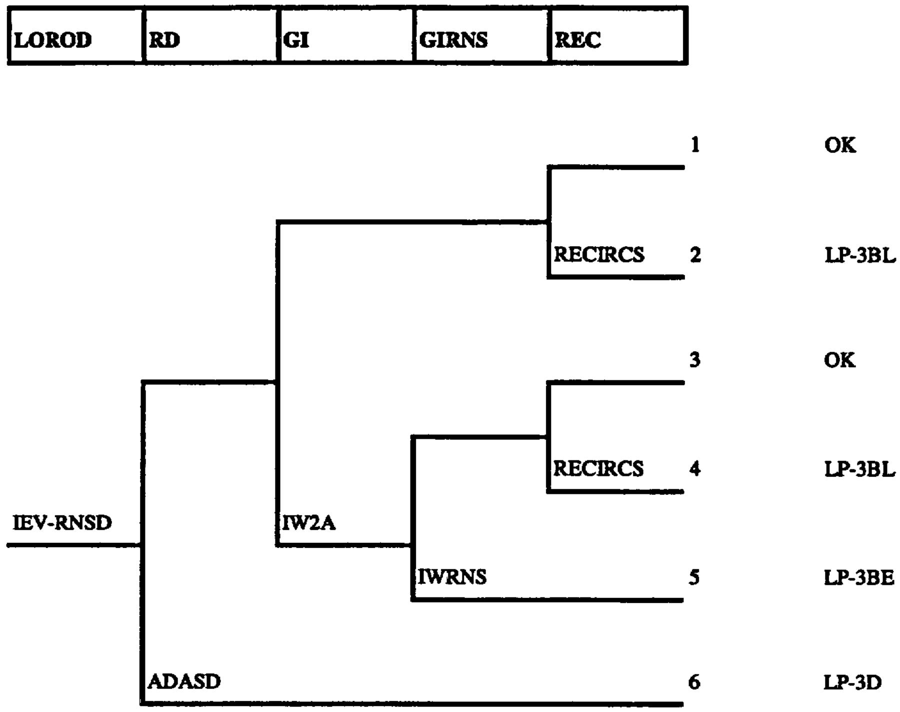
Overdraining of Reactor Coolant System During Draindown to Mid-loop Event Tree



Event	Description
LOSPD	Loss of Offsite Power during drained condition (mid-loop/vessel flange)
ARNS	Automatic RNS Restart
GR1	Grid Recovery within 1 hour
MRAGR	Manual RNS Restart after Grid Recovery
RD	RCS Depressurization (4th stage)
GI	Gravity Injection
GIRNS	Gravity Injection via RNS
REC	Containment Sump Recirculation

Figure 54-7

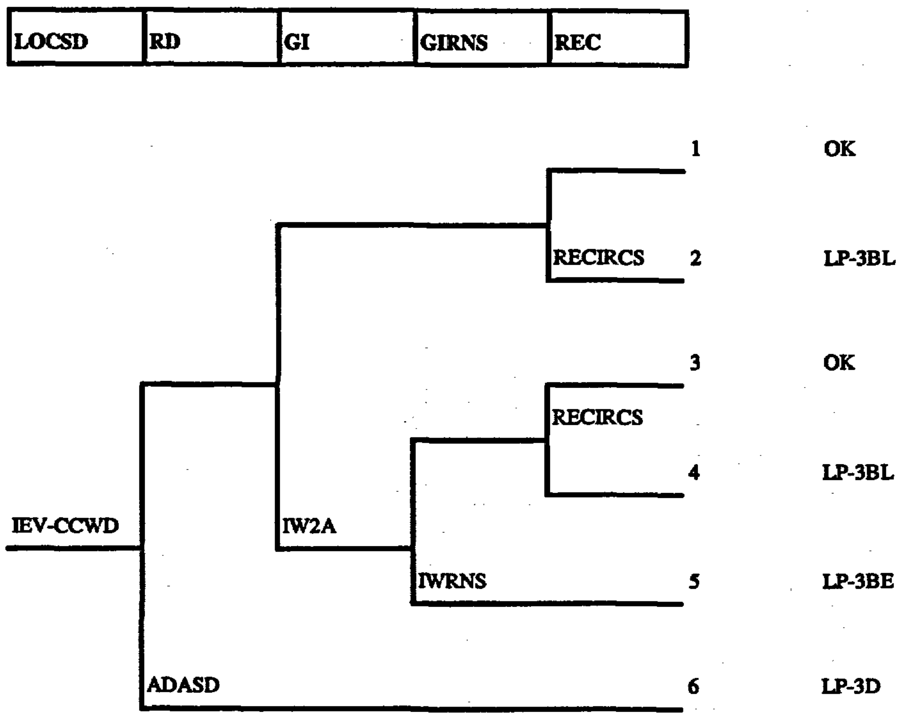
Loss of Offsite Power During RCS Drained Condition Event Tree



Event	Description
LOROD	Loss of RNS Operation during drained condition (mid-loop/vessel flange)
RD	RCS Depressurization (4th stage)
GI	Gravity Injection
GIRNS	Gravity Injection via RNS
REC	Containment Sump Recirculation

Figure 54-8

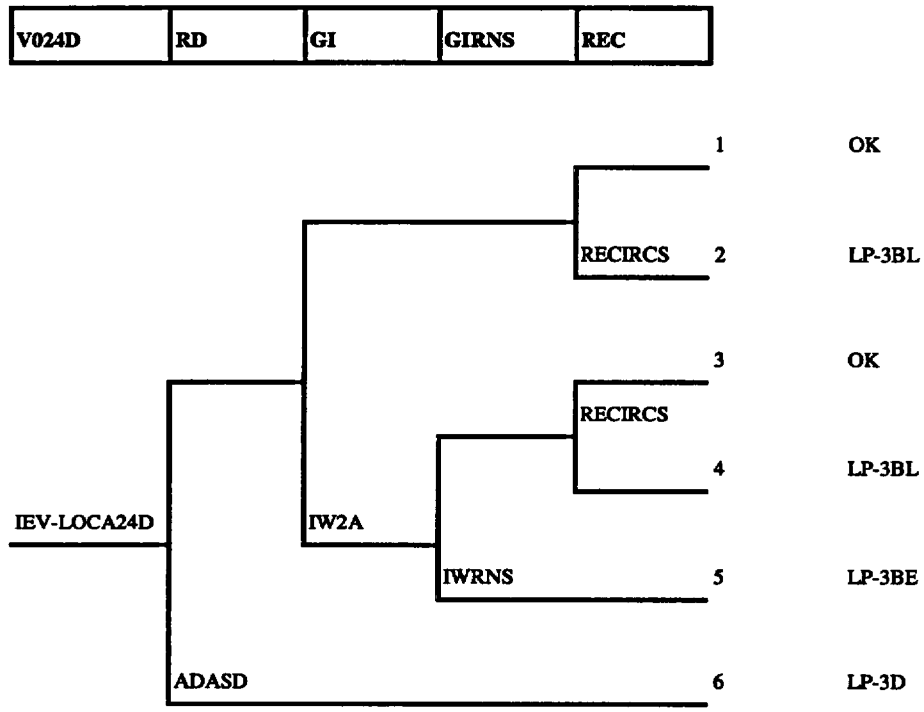
Loss of RNS During RCS Drained Condition Event Tree



Event	Description
LOCSD	Loss of CCW/SW during drained condition (mid-loop/vessel flange
RD	RCS Depressurization (4th stage)
GI	Gravity Injection
GIRNS	Gravity Injection via RNS
REC	Containment Sump Recirculation

Figure 54-9

Loss of CCW/SW During RCS Drained Condition Event Tree



Event	Description
V024D	LOCA through RNS-V024 during drained condition (mid-loop/vessel flange)
RD	RCS Depressurization (4th stage)
GI	Gravity Injection
GIRNS	Gravity Injection via RNS
REC	Containment Sump Recirculation

Figure 54-10

LOCA/RNS-V024 Opens During RCS Drained Condition Event Tree

CHAPTER 55

AP1000 SEISMIC MARGINS EVALUATION

55.1 Seismic Margin HCLPF Methodology

In accordance with Section II.N, Site-Specific Probabilistic Risk Assessments and Analysis of External Events, of SECY-93-087 (Reference 55-1), the U.S. Nuclear Regulatory Commission (NRC) approved the following staff recommendation:

> "PRA insights will be used to support a margins-type assessment of seismic events. A PRA-based seismic margin analysis will consider sequence-level High Confidence, Low Probability of Failures (HCLPFs) and fragilities for all sequences leading to core damage or containment failures up to approximately one and two-thirds the ground motion acceleration of the Design Basis SSE."

The risk-based seismic margin analysis (SMA) and the methodology described in this chapter satisfy this recommendation of SECY-93-087.

For this risk-based seismic margin analysis, HCLPFs are calculated and reported for systems at the sequence level. This is accomplished by calculating HCLPFs for each seismic event tree top event that represents a safety-related system or function. Once HCLPFs for the necessary systems are calculated, HCLPF values are calculated for each event tree core damage sequence. In addition, insights related to random and/or human failures are reported, as deemed appropriate, for each sequence.

Seismic margins methodology is employed to identify potential vulnerabilities and demonstrate seismic margin beyond the design-level safe shutdown earthquake (SSE). The capacity of those components required to bring the plant to a safe, stable condition is assessed. The structures, systems, and components identified as important to seismic risk are addressed.

55.2 Calculation of HCLPF Values

55.2.1 Seismic Margin HCLPF Methodology

The seismic margin analysis is made based on established criteria, design specifications, existing qualification test reports, established basic design characteristics and configurations, and public domain generic data.

A review level earthquake equal to 0.5g has been established for the seismic margin assessment, and is used to demonstrate margin over the safe shutdown earthquake of 0.3g. This review level earthquake was chosen to be consistent with the upper (0.5g) bin level established in Reference 55-2.

The seismic margin earthquake that is used is based on the AP1000 design response spectra anchored to 0.5g-peak ground acceleration (pga). The AP1000 seismic response spectra are included in the *AP1000 Design Control Document* (DCD). It will be necessary for a

COL (combined operating license) applicant to demonstrate that the seismic response is equal to or less than that used in the calculation of the HCLPF values, and to evaluate the potential for soil liquefaction using the site specific conditions. This will ensure a reserve margin that exceeds a 0.5g seismic level.

As part of a COL action, a qualification seismic review of the design will be performed with the purpose of identifying vulnerabilities and confirming the basis of the seismic margin evaluation. For each plant, a verification walkdown will be performed with the purpose of identifying differences in the as built from design and ensuring vulnerabilities were not created.

55.2.2 Calculation of HCLPF Values

A seismic margins analysis is made up of two major tasks:

1. A risk-based model to determine the plant HCLPF
2. Determination of the plant structure and component HCLPFs

The second task, determination of HCLPF seismic acceleration values for plant structures and components is discussed in this section; the risk-based model is presented in a companion calculation. The HCLPFs are summarized in Table 55-1.

55.2.2.1 Review of Plant Information

The assessment uses the following plant information:

- Structural and seismic design criteria and procedures
- Structural design calculations
- Layout and design drawings
- Test reports
- Piping and instrumentation diagrams
- Equipment design specifications
- Generic fragility data
- AP1000 plant response spectra.

55.2.2.2 System Analysis

Section 7.4 of the AP1000 Design Control Document provides a discussion of the systems required for safe shutdown. The structures and components associated with these systems are considered in the seismic margin assessment. It is noted that the same success criteria as in the AP600 Focused PRA, where no credit is taken for non-safety related systems, is used as the starting point for the AP1000 risk-based seismic margins analysis. This success criterion is not necessarily defined in terms of reaching specific plant modes, but rather on reaching a sustainable safe plant state. The bases for these success criteria are given in the AP1000 PRA report.

Paragraph 3.2.1.2 of the AP1000 Design Control Document explains that, in most cases, safety-related items are also seismic Category I items. The paragraph also states that when

portions of systems are identified as seismic Category I, the boundaries of seismic Category I portions of the system are shown on the piping and instrumentation drawing of that system.

Table 3.2-3 of the AP1000 DCD, AP1000 Classification of Components, Equipment and Systems, provides the seismic categories of the non-piping items in the plant (valves, pumps, etc.). The design code shown in the table includes the ASME Section III Class, along with the NRC Quality Group. The comparison of the AP1000 Equipment Classes, ASME Section III Classes, NRC Quality Groups, and Seismic Categories with one another is shown in the following table:

AP1000 Equipment Classes	ASME Section III Classes	NRC Quality Groups	Seismic Categories
A	1	A	I
B	2	B	I
C	3	C	I

55.2.2.3 Analysis of Structure Response

The purpose of a seismic fragility analysis is to define the maximum limit, seismic capacity, of functional capability or operability with the associated uncertainty for plant components and structures that could have an effect on safe shutdown of the plant following a seismic event. Capacity in the seismic margin assessment, expressed in terms of the free field peak ground level acceleration, is the level of the seismic event that results in failure of a given component or structure to perform its safety-related function. Failures leading to loss of safety function could result from such things as: loss of a pressure boundary; significant inelastic deformation; partial collapse; loss of support functions; or a combination of failure modes. In the calculation of the HCLPF value for a system, structure, or component, the governing failure mode is established by examining the different potential failure modes possible. Each failure mode has different reserve margin. As an example, ductility may be very large for tension failure, whereas, for buckling ductility generally does not contribute to reserve margin.

A fragility evaluation is made for the key structures and components. The HCLPF for the equipment and structures is established using one of the following:

- Probabilistic fragility analysis
- Conservative deterministic failure margin method
- Test results
- Deterministic approach
- Generic fragility data

These methods are discussed below.

Probabilistic Fragility Analysis

This method is used to define HCLPF values for the following structures:

- Steam generator supports
- Reactor pressure vessel supports
- Pressurizer supports
- Inner containment structure & in-containment refueling water storage (IRWST) modules
- Containment vessel

There are many sources of conservatism and variability in the estimation of seismic peak ground acceleration capacity for seismic margin assessment. HCLPF values reflective of the seismic capacity are derived from median capacity using formulas based on the log-normal distribution. The HCLPF values reflect a 95-percent confidence (probability) of not exceeding a 5-percent probability of failure (Reference 55-2).

The HCLPF is defined by a lognormal probability distribution that is a function of median seismic capacity and composite standard deviation, β_c:

$$\text{HCLPF} = \text{Median Capacity} \times e^{[-2.3 \times \beta c]}$$

The median seismic capacity is related to the mean seismic capacity by the expression:

$$\text{Median Capacity} = \text{Mean Capacity} \times e^{[-(\beta c\hat{\ }2)/2]}$$

The mean peak seismic ground capacity, A_m, is related to the stress and strength design margin factors by the following expression:

$$A_m = (\Pi_i\,[X_i]\,)A_o$$

where,

A_m = Mean peak seismic ground capacity
X_i = ith design mean margin factor
Π_i = Product notation
A_o = Nominal seismic peak ground capacity

It is noted that the composite standard deviation is equal to the root mean square of the composite standard deviation associated with each of the margin factors. That is:

$$\beta_c = \sqrt{[\Sigma_i\,(\beta_c)_i^2]}$$

The conservatisms and variability identified and considered in this assessment are associated with stress and strength margin factors. The basic grouping of margin factors are: deterministic strength factor; variable strength factors; material; damping; inelastic energy

absorption, ductility; and analysis or modeling error. These margin factors are discussed below.

Deterministic Strength Factors

Margin factors that have no variability exist in designs. They must be considered in the seismic fragility analysis so that the median capacity can be properly established. Two types of factors are considered:

- Margin to code allowable
- Factors of safety applied to code allowable

The code related factors of safety that are reflected in the margin analysis are dependent on the controlling load combinations and associated allowables. Examples of these types of factors of safety are:

- Margin to yield stress, or ultimate strength
- Margin to critical buckling
- Minimum factors of safety as given in design criteria documents

Variable Strength Factors

Variability exists in the reserve strength of a structural component, and is a function of the failure mode. Variability exists due to actual strength versus theoretical or code strength. Different margin factors are given for the different failure modes with variability and composite standard deviation (References 55-3 and 55-4).

Material

The code allowable that the strength margin factor is based uses the minimum material allowable. Actual material properties will be higher. Properties of steel as well as the compressive strength of concrete have variability. The statistical estimates of the mean and standard deviation of the material properties are available in the public domain. For example, References 55-3, 55-4, and 55-5 provide statistical material data for steel and reinforced concrete. No increase in material properties due to the application of dynamic loads was considered in the seismic margin assessment.

Damping

Conservative damping values were used in design. The safe shutdown earthquake damping values associated with the components whose HCLPF values were determined using probabilistic fragility analysis methods are:

- Primary component supports

Primary coolant loop (uniform envelope response spectra analysis)	5%
Primary coolant loop (time history analysis)	4%

- Inner containment structure & IRWST modules

  Concrete filled steel plate structures — 5%

- Containment Vessel

  Welded steel structures — 4%

Damping values of 7 percent and higher for these components are realistic depending on deformations beyond yield.

Inelastic Energy Absorption, Ductility

A large amount of energy is absorbed by inelastic structural response. The structure or system is capable of performing its function even though it is responding in an inelastic range. The following statements are made in Reference 55-6, page 34, concerning this phenomenon:

> "Numerous observations of the actual performance of structures subjected to seismic motions have demonstrated the capacity of structures to absorb and dissipate much energy when strained in inelastic response. The energy absorption obtained from a linear elastic analysis performed to the design or yield level is only a fraction of the total energy absorption capability of a structure. Unless corrected for inelastic-response capability, a linear elastic-response analysis can not account for the inelastic energy absorption capacity of a structure."

For those structures whose HCLPF values were determined by probabilistic fragility methods, only the inner containment structures and IRWST modules considered ductility. These structures are of shear wall type construction. The associated ductility margin factor and variability used are given in Reference 55-7: median margin factor equal to 2.25; and composite standard deviation equal to 0.25. Local inelastic energy absorption was not considered.

Analysis and Modeling Error

Reference 55-7, pages 143 to 145, discusses modeling errors and how they relate to analysis results. It is stated, "assuming that the analyst does his best job of modeling, modeling accuracy could be median-centered, with variability in each of the modeling parameters amounting to variability in calculated mode shapes and frequencies." Imperfections are another source of error in the analysis.

Mode Shapes

To reflect modeling errors in the dynamic model where mode shapes are used in the analytical method to calculate seismic loads, the following standard deviations are used:

- Multi-degree of freedom system model: $(\beta_c)_m = 0.15$
- System that responds predominantly in one mode: $(\beta_c)_m = 0.10$

Modal Frequency Variability

Shifts in the frequency affect spectral acceleration levels and introduce error. For steel structures, this is reflected in the seismic margin analysis by using a log-normal standard deviation calculated as the ratio of the spectral acceleration value associated with a one-sigma variation in frequency, and the spectral acceleration value at the median centered frequency:

$$(\beta_c)_f = \ln\{S_\beta/S_f\}$$

where,

S_β = Spectral acceleration value at the 84 percent exceedance probability frequency estimate, f_β
S_f = Spectral acceleration value at median centered frequency
f = median centered frequency
f_β = 84 percent exceedance probability frequency estimate = $f \times e^{[(+/-)0.14]}$

This is equivalent to a variation of ±15 percent on the peak frequency of the steel structures. For concrete structures, a variation on the structural frequency is -20 percent to +15 percent on the peak frequency of the concrete structures.

Imperfections

Imperfections in the containment vessel affect the buckling capacity. This is discussed in Reference 55-8. The critical buckling load is a function of the square of the wavelength. The standard deviation associated with the wavelength is equal to 0.32 per Reference 55-8. Therefore, the standard deviation for imperfection as it relates to critical buckling load is equal to 0.64.

<u>Conservative Deterministic Failure Margin Method</u>

The HCLPF value for the shield building roof was calculated using the conservative deterministic failure margin approach. A finite element analysis was performed of this structure that considered cracking of the concrete and redistribution of the loads. Deterministic margin factors were defined for three items: strength; inelastic energy absorption; and damping. They are discussed below.

Strength

This margin factor is defined from the finite element analysis based on the increase in seismic acceleration to failure based on ultimate stress criteria. ACI 349 provisions have been used to define ultimate strength for axial and flexure loads. For shear loads, the concrete and rebar capacities have been evaluated. The total section shear strength is calculated with contributions of concrete and reinforcement together. The total in-plane shear strength, including the contributions of the concrete and reinforcement, uses Reference 55-12, Appendix L, "Shear Strength of Concrete Walls." The total out-of-plane shear strength is based on beam action behavior taking into account the axial compression.

Inelastic Energy Absorption

The increased capacity due to inelastic energy absorption is defined using recognized deterministic methods. It is only applied to the column structural elements that act as shear walls in the shield building roof. The formulation defining ductility margin follows the effective frequency/effective damping approach given in Reference 55-9. The formulation is summarized below.

$$F_\mu = [f_e / f_s]^2 \frac{S_A(f,\rho)}{S_A(f_e,\rho_e)}$$

The ratio of secant to elastic frequency is given in terms of ductility factor, μ.

$$\frac{f_s}{f} = \sqrt{\frac{1}{\mu}}$$

The effective frequency, f_e is:

$$\frac{f_e}{f} = [1 - A] + A\left[\frac{f_s}{f}\right]$$

where

$$A = 2.3\left[1 - \left(\frac{f_s}{f}\right)\right] \leq 0.85$$

The effective damping ρ_e is estimated by the formula:

$$\rho_e = [f_s / f_e]^2 [\rho + \rho_H]$$

The symbol ρ represents the elastic damping, and ρ_H is the pinched hysteretic damping that is approximated by:

$$\rho_H = 11\% \; [1 - (f_s / f)]$$

Damping

A margin factor associated with damping is defined recognizing that damping of reinforced concrete can increase from 7 to 10 percent when cracking is present. This margin factor is equal to the ratio of the spectral accelerations at 7 and 10 percent damping for the dominant building structure frequency.

Test Results

For the electrical equipment where documented test results are available, the HCLPF value is defined from comparison of required response spectra (RRS) and test response spectra (TRS).

The method employed follows a deterministic approach using existing test data for similar types of equipment.

The existing test data was reviewed to determine a lower bound seismic capacity.

When the natural frequency of the equipment is not known, it was assumed that the natural frequency coincided with the required response spectra peak acceleration so that the lowest HCLPF value was calculated. It is noted that where equipment frequencies are known, and are used for comparing the RRS and TRS, these frequencies will be included in the design specification for the equipment to assure that the dynamic characteristics are the same as those expected.

Relay Chatter

Solid-state switching devices and electro-mechanical relays will be used in the AP1000 protection and control systems. Solid-state switching devices are inherently immune to mechanical switching discontinuities such as contact chatter. Robust electro-mechanical relays will be selected for AP1000 applications such that inherent mechanical contact chatter is within the required system performance criteria. Therefore, contact chatter has no effect on system operation and was, therefore, not included in the seismic margin analysis. The COL must confirm the use of seismically robust electro-mechanical relays in the engineered safety features actuation and control systems.

Moreover, the loss of offsite power event has a very low HCLPF value (0.09g). The control rod motor generator sets are powered by AC load centers that are de-energized on loss of offsite power sources. When the control rod motor generated sets are de-energized, current to the magnetic jack mechanisms stops and the gripper coils open, allowing the rods to drop into the core. Therefore, relay chatter is not an issue for reactor trip.

Finally, passive residual heat removal (PRHR) and core makeup tank (CMT) system valves automatically fail open upon loss of instrument air due to loss of seismically induced loss of offsite power. Thus, relay chatter is not an issue for PRHR and CMT system functions.

Deterministic Approach

A lower bound estimate of the HCLPF is obtained for selected structures or equipment based on margin to design limit for the appropriate load combination defined by the fault tree logic. This approach was used for the primary components to verify that their supports would control the HCLPF value. It was also used for a few cases to define the HCLPF when it was apparent that its seismic capacity would not control the plant HCLPF value. This approach was used for: polar crane; baffle plate supports; heat exchanger (PRHR); core makeup tank; and valves.

Generic Fragility Data

Generic fragility data was used when insufficient information was available to define the HCLPF value using one of the methods described above. Those cases where this approach was use were:

- Reactor internals and core assembly that includes fuel
- Control rod drive mechanism (CRDM) and hydraulic drive units
- Reactor coolant pump including supports
- Accumulator tank
- Piping
- Cable trays
- Valves
- Main control room operation and switch stations
- Ceramic insulators
- Battery racks

The Utility Requirements Document for Advanced Light Water Reactor, Reference 55-10, was used for all of the components listed above except ceramic insulators, which used recognized industry low fragility data.

55.2.2.4 Evaluation of Seismic Capacities of Components and Plant

Table 55-1 provides the HCLPF values for the equipment, structures, and systems considered in the seismic margin evaluation. Also shown in this table is the approach used to define the HCLPF value, as described in subsection 55.2.2.3. All of the HCLPF values are above the review level earthquake (0.50g).

In the design of the AP1000, careful consideration is given to those areas that are recognized as important to plant seismic risk. In addition to paying special attention to those critical components that have HCLPF values close to the review level earthquake, the design process considers potential interaction with both safety-related and non-safety-related systems or structures, as well as adequate anchorage load transfer and structural ductility. The seismic margin evaluation provides a means of identifying specific equipment or structures that are vulnerable beyond design basis seismic events.

55.2.2.5 Verification of Equipment Fragility Data

The AP1000 safety-related equipment is designed to meet the safe shutdown earthquake requirements defined in Chapter 3 of the AP1000 DCD. This seismic margin evaluation has focused on demonstrating that the design of the nuclear island structures, safety-related equipment, and equipment supports can carry the loads induced by the review level earthquake discussed here. This evaluation incorporates as-specified equipment data. After the plant has been built, it will be necessary to perform a verification of the seismic margin assessment for the installed conditions.

55.2.2.6 Turbine Building Seismic Interaction

As part of the seismic margin assessment, the seismic interaction between the turbine building and the nuclear island was evaluated in Reference 55-11. It was determined that:

- The adjacent auxiliary building structural integrity will not be lost with the failure of the turbine building.
- It is not likely that the size and energy of debris from the turbine building will be large enough to result in penetration through the auxiliary building roof structure.

Even though it is not likely that penetration of turbine building debris could be large enough or have sufficient energy for penetration through the auxiliary building roof structure, this event was evaluated. The consequences of damage to the safety-related equipment in the auxiliary building was investigated. It was determined from this investigation that should an event occur that causes the failure of equipment in the upper elevations of the auxiliary building, the results of the seismic margin assessment analysis, the plant HCLPF value, and the insights derived from the seismic margin assessment are not affected. Moreover, the steam line break events, that would result from the damage of equipment in the upper elevations, are not dominant contributors to the core damage frequency. Further, the loss of equipment in the upper elevations will not affect the passive safety systems that would be used to put the plant in a safe shutdown condition should an event occur.

55.3 Seismic Margin Model

In this section, the AP1000 Risk-Based Seismic Margins Model is summarized and the plant HCLPF values for AP600 and AP1000 are compared. Based on this model and the comparison, the plant HCLPF for AP1000 is determined.

HCLPFs are calculated for the seismic Category I safety-related systems that are called upon via the seismic event trees to mitigate an accident caused by the initiating seismic event.

55.3.1 Major SMA Model Assumptions

In this section, the general characteristics and major assumptions of the AP1000 SMA model are discussed.

1. The seismic event is assumed to occur while the plant is operating at full power.
2. A review level earthquake equal to 0.5g is used for the seismic margin analysis.
3. It is assumed that the seismic event would result in loss of offsite power, since the AC power equipment is not seismic Category I. (The offsite insulators on the feed lines from the offsite power grid fail such that a loss of offsite power occurs.) No credit is taken for onsite emergency AC power (diesel generators).
4. No credit is taken for non-safety related systems. They are assumed to have failed or be non-functional due to the seismic event.

5. The seismically induced SMA initiating event categories and their event trees are taken from the AP600 PRA model. For each initiating event, the AP600 structures, systems, and components are taken and are deemed to be applicable to the AP1000 design. The min-max method is used on the initiating event HCLPFs to calculate the plant HCLPF value.

55.3.2 Seismic Initiating Events

The first step in Seismic Margins Model is to evaluate which initiating events could occur as a result of a seismic event. For this purpose, a Seismic Initiating Event Hierarchy Tree is constructed. This event tree is given in Figure 55-1 and discussed below. Based on this hierarchy event tree, seismic initiating event categories are defined and their event tree models are constructed (as discussed in subsection 55.3.3).

Given a seismic event occurs, the hierarchy event tree is constructed such that the seismically-induced initiating event with the most challenge to the plant safety systems is considered first: gross structure collapse. This category is labeled as EQ-STRUC and is the first initiating event category to be modeled and quantified.

If gross structure collapse does not occur, next the reactor coolant system (RCS) loss-of-coolant-accident (LOCA) category in excess of emergency core cooling system (ECCS) capacity (also termed as "Vessel Failure") is considered. This category is labeled as EQ-RVFA.

If vessel failure does not occur, then large RCS LOCAs are considered. This category is labeled as EQ-LLOCA.

If EQ-LLOCA does not occur, then small RCS LOCAs are considered. This category is labeled as EQ-SLOCA. Steam Generator Tube Rupture (SGTR) and Large Secondary Line Break (SLB) events are folded into the Small LOCA category, as discussed in subsection 55.3.3.

Next considered is the seismically induced anticipated transient without scram (ATWS) event. This event is labeled as EQ-ATWS.

Finally, all other transients are considered in the category labeled EQ-LOSP. The seismically induced LOSP event occurs at low HCLPF values (e.g., lower than the SSE at 0.30g) and does not affect the plant HCLPF, as discussed in subsection 55.4.4. The cutsets for this event are all "mixed cutsets," containing seismically induced initiating event coupled with random failures leading to core damage. This event is included in the model for additional insights and completeness.

Thus, the hierarchy tree defines six initiating event categories. Each of these are discussed and an event tree for each is constructed in subsection 55.3.3.

The risk-based seismic margins analysis does not consider seismic hazard curves. Therefore, initiating event frequencies are not calculated for each seismically generated initiating event category. Although seismically generated initiating event frequencies are not calculated, it is

important to evaluate the seismic vulnerability of the components and systems that contribute to the initiating event categories. This is done by estimating a HCLPF for each seismic initiating event category, as discussed in subsection 55.3.3.

55.3.3 Initiating Event Category HCLPFs

The six seismically induced initiating event categories defined by the hierarchy event tree model of subsection 55.3.2 are further discussed to model seismically induced failures that will determine the HCLPF for each of these initiating events. The six categories considered are:

1.	EQ-STRUC	Gross structural collapse
2.	EQ-RVFA	LOCA in excess of ECCS capacity
3.	EQ-LLOCA	Large LOCA
4.	EQ-SLOCA	Small LOCA
5.	EQ-ATWS	ATWS
6.	EQ-LOSP	Loss of offsite power

The small LOCA category also covers SGTR and SLB events. As discussed later in the success paths, the SLOCA success path used for SMA is also applicable (conservatively) to the SGTR and unisolated SLB events.

The first five events listed above are evaluated at a 0.5g level.

The last event, LOSP is evaluated at 0.09g. This event may also be viewed to represent a larger family of transients associated with loss of main feedwater, loss of compressed air, turbine trip, reactor trip, loss of service water/component cooling water, etc, following a seismic event and LOSP, since no credit is taken for these non-safety systems in the SMA models. Moreover, a seismically induced transient containing LOSP becomes a station blackout (SBO) event since no credit is taken for diesel generators which are not seismically qualified.

Each of the SMA events are further discussed below.

1. EQ-STRUC (Gross Structural Collapse)

   This event includes seismically induced failures of AP1000 structures that may result in core damage and large fission product release.

   The AP1000 structures are classified in 5 groups:

   1. Nuclear Island

      This consists of containment, shield building, and auxiliary building.

      Nuclear island is structurally designed to meet seismic Category I.

2. Turbine Building

   The turbine building is designed to meet the uniform building code (UBC). For the SMA model, it is assumed to have failed. Thus no credit is taken for systems in this building.

3. Annex Building

   The annex building is designed to meet seismic Category II. For the SMA model, it is assumed to have failed. Thus no credit is taken for systems in this building.

4. Diesel Generator Building

   The diesel generator building is designed to meet the UBC. For the SMA model, it is assumed to have failed. Thus no credit is taken for systems in this building.

5. Radwaste Building

   The radwaste building is designed to meet the UBC. For the SMA model, it is assumed to have failed. Thus no credit is taken for systems in this building.

Thus, only the nuclear island is considered for the SMA model; the interaction between the other buildings and the nuclear island is assumed to have no detrimental effect on the nuclear island structures. This assumption needs to be verified by a plant walkdown when an AP1000 plant is built.

The failures of the nuclear island structures are modeled in terms of the driving structures of the containment building, the shield building, and the auxiliary building.

The HCLPF value for EQ-STRUC is calculated in Section 55.4.

2. EQ-RVFA (LOCA in Excess of ECCS Capacity)

This event represents the "vessel failures" where the event leads to excessive loss of RCS inventory that can not be made up by the ECCS capacity. In this case, core damage is postulated. The following types of structural and component failures are considered in this category:

1. Seismically induced failures of the reactor vessel
2. Seismically induced failures of the steam generators
3. Seismically induced failures of the other RCS components
4. Seismically induced failures of two direct vessel injection (DVI) lines
5. Seismically induced failures of fuel.

This event is assumed to lead to a large fission product release.

The HCLPF value for EQ-RVFA is calculated in Section 55.4.

3. EQ-LLOCA (Large LOCA)

   Seismically induced large LOCA initiating event category, EQ-LLOCA, contains RCS breaks with break sizes greater than 9 inches. Since the seismic event failures assume that if one pipe breaks by a seismic event, all redundant similar pipes will break at the same time, all major RCS pipe breaks are conservatively included in this category; thus, no medium LOCA is defined in the initiating event hierarchy tree. Also included in this category are the failures of the passive RHR heat exchanger by a seismic event.

   The HCLPF value for EQ-LLOCA is calculated in Section 55.4.

4. EQ-SLOCA (Small LOCA)

   Seismically induced small LOCA initiating event category, EQ-SLOCA, contains RCS breaks with break sizes less than 2 inches of equivalent diameter. Since the seismic event failures assume that if one pipe breaks by a seismic event, all redundant similar pipes will break at the same time, all major RCS pipe breaks are conservatively included in the large LOCA category. For the small LOCA category, RCS leaks from instrument lines is used as the representative event. The small LOCA category also includes and bounds events such as

   - Steam Generator Tube Rupture (SGTR)
   - Large Steam Line Breaks (SLB) (due to generation of SI signal and RCS inventory shrinkage)

   For SGTR events, breaks of one or more (up to 5) tubes have been considered for the AP1000 design. An event with 5 steam generator tubes rupturing has an equivalent LOCA diameter of 1.46 inches. The rupture of more than 5 tubes by a seismic event is conservatively bounded by the structural failure of a steam generator, which is included in EQ-RVFA initiating event.

   The HCLPF value for EQ-SLOCA is calculated in Section 55.4.

5. EQ-ATWS (Anticipated Transients without Scram)

   The EQ-ATWS event addresses the seismically induced ATWS initiating event related to the failure of the core assembly or guide tubes or the control rod drive systems to remain functional so that the rods can not fall into the core. The fuel is still intact and can be cooled. The failure mode associated with seismically induced fuel failure has been already addressed in EQ-RVFA event.

   Because offsite power is postulated to have been lost, the control rod motor generator sets would be de-energized even if the reactor trip function failed. If the core assembly or the control rod system failed, the rods are postulated to fail to insert into the core.

   The HCLPF value for EQ-ATWS is calculated in Section 55.4.

6. EQ-LOSP (Loss of Offsite Power)

The EQ-LOSP event addresses the seismically induced loss of offsite power. This event occurs at relatively low intensity earthquakes. The driving failure for loss of offsite power is represented by failure of ceramic insulators in the switchyard. The HCLPF value for these insulators is 0.09g, which is lower than the review level earthquake of 0.5g, and the plant SSE of 0.3g. Such an earthquake does not challenge any of the safety-related systems that are built to withstand the SSE and have margin for higher g levels. Thus, this event does not lead to purely seismically driven failure combinations for a core damage sequence. This event model contains only "mixed cutsets" for core damage; these are failure combinations of seismically induced initiating event coupled with random failures of safety-related systems.

This event does not contribute to plant HCLPF.

55.4 Calculation of Plant HCLPF

This section presents the seismic margin analysis calculations based on the model developed in subsection 55.3.3.

The initiating event HCLPFs are calculated in subsection 55.4.2. The plant HCLPF is calculated in subsection 55.4.3.

The analysis demonstrates that all structures and components required to maintain the plant in a safe stable state are expected to function following a seismic event of 0.5g acceleration.

55.4.1 HCLPFs for Basic Events

The HCLPF values for various AP1000 structures and components are calculated and are given in Table 55-1. The basic events defined in the SMA model for seismic failures are assigned their own HCLPF values, as shown in Table 55-2. These HCLPF values are taken from Table 55-1.

The structures and components with the lowest HCLPF values from Table 55-1 are sorted below since they may be the candidates for the plant HCLPF:

0.09g	Failure of ceramic insulators	EQ-CER-INSULATOR
0.50g	Core assembly failure (not fuel)	EQ-CORE-ASSEMBLY
0.50g	Interior containment	EQ-CV-INTER
0.50g	IRWST failure	EQ-IRWST-TANK
0.50g	Fuel failure	EQ-RV-FUEL
0.51g	Aux. building exterior wall	EQ-AB-EXTWALL
0.51g	Aux. building floor	EQ-AB-FLOOR
0.51g	Aux. building interior wall	EQ-AB-INTWALL
0.51g	Passive containment cooling (PCC) tank failure	EQ-PCC-TANK
0.51g	Shield building roof	EQ-SHDBLD-ROOF
0.51g	Shield building wall	EQ-SHDBLD-WALL
0.54g	Cable trays – support controlled	EQ-CABLETRAY

0.54g	Tank PXS 2A/B (Core Makeup Tank)	EQ-CMT-TANKS
0.54g	Steam generator fails	EQ-SG-FAILS
0.54g	Steam generator piping (one or a few)	EQ-SGTR
0.55g	120 vac distribution panel	EQ-ACDISPANEL
0.55g	125 vdc switchboard	EQ-DC-SWBRD
0.55g	125 vdc distribution panel	EQ-DCDISPANEL
0.55g	Pressurizer fails	EQ-PRZR-FAILS
0.55g	Transfer switch	EQ-TRSFSWITCH
0.61g	Inverter	EQ-INVERTER

55.4.2 Calculation of Initiating Event HCLPFs

Initiating event HCLPFs are calculated by assigning the fragility values from Table 55-2 to the seismically induced failures modeled in subsection 55.3.3 for initiating events. The results of these calculations are given in Tables 55-3 through 55-7. EQ-IEV-LOSP is already assigned a HCLPF 0.09g, representing the failure of ceramic insulators but it does not contribute to plant HCLPF since it has only mixed cutsets (seismic and random failures combined in cutsets).

The initiating event HCLPFs are summarized below:

Initiating Event	HCLPF	Dominated by
EQ-IEV-STRUC	0.50g	IRWST tank and containment interior failures
EQ-IEV-RVFA	0.50g	Fuel failure
EQ-IEV-LLOCA	0.76g	PRHR heat exchanger failure
EQ-IEV-SLOCA	0.54g	Steam generator tube failure
EQ-IEV-ATWS	0.50g	Core assembly failures
EQ-IEV-LOSP	0.09g	Ceramic insulator failure

When the min-max method is used, the HCLPF of seismic sequences resulting from an initiating event can not be less than the initiating event HCLPF since it appears in every cutset. Thus, the plant HCLPF will be determined by the lowest of the HCLPF listed above. Since the EQ-RVFA event is postulated to lead to core damage and large release, plant HCLPF can be determined at this point to be 0.50g for both core damage frequency (CDF) and large, early release frequency (LERF) consequences.

55.5 Results and Insights

55.5.1 AP1000 SMA Results

The AP1000 risk-based SMA has demonstrated that for structures, systems, and components required for safe shutdown the HCLPF magnitudes are equal to or greater than 0.50g. This HCLPF is determined by various structures, systems, and components with an HCLPF value of 0.5g, as listed in Tables 55-3 through 55-7.

Thus, the AP1000 plant can meet or exceed a review level earthquake of 0.5g.

The success paths used for the SMA are taken conservatively in many cases, and credit for operator actions for events at 0.50g review level earthquake has been avoided. Thus, the results are valid without operator intervention, which indicates a strong point of the AP1000 design to mitigate seismically induced core damage and large release sequences.

All SMA sequences are evaluated with loss of offsite power and loss of onsite AC power leading to a station blackout event. The plant design is shown to be robust against seismic event sequences each of which contain station blackout coupled with other seismic or random failures.

The dominant structures, systems, and components for plant HCLPF are:

0.50g	Core assembly failure (not fuel)	EQ-CORE-ASSEMBLY
0.50g	Interior containment	EQ-CV-INTER
0.50g	IRWST failure	EQ-IRWST-TANK
0.50g	Fuel failure	EQ-RV-FUEL

55.5.2 AP1000 SMA Insights

The SMA results also point out the following insights:

1. Design Features

   The AP1000 design provides some aspects that make the plant more robust against the review level earthquakes. Namely:

   - Reactor trip is assured without the actuation signal due to the loss of offsite power occurring and rods inserting by gravity.
   - PRHR system valves fail open without actuation signal following loss of power/loss of instrument air. Thus, PRHR cooling is immediately available.
   - CMT system valves fail open without actuation signal following loss of power/loss of instrument air. Thus, CMT injection is immediately available.

   Thus, three key mitigating systems, reactor trip, PRHR cooling, and CMT injection are available with high confidence and low probability of failure, without dependence on actuation signals immediately after a review level seismic event.

   Moreover, the passive containment cooling system air operated valves also fail open in a review level earthquake, due to loss of offsite power/instrument air. As a result, the containment cooling system is automatically actuated and has enough inventory to last for 72 hours.

2. DC System Fragility

   Control rods, PRHR, CMT, and passive core cooling systems would be operational after potential loss of protection and safety monitoring system (PMS) or DC control power. Thus, the plant can successfully mitigate a transient event even with a failure of PMS or DC control power. However, the DC control power system HCLPF is very close to the plant HCLPF (0.55g). This HCLPF has the potential to become a driving failure, if it were to be coupled with a LOCA event with low HCLPF. However, no such low HCLPF LOCA events are identified in the current model.

3. Importance of Valve Room Fragilities

   Fragility of certain valve rooms where the passive core cooling system valves are concentrated becomes an important factor; the SMA model depends on the successful functioning of these valves to mitigate LOCA accidents. These rooms are labeled as 11206/11207 and contain CMT, accumulator, IRWST injection, and cavity recirculation valves. Since the HCLPF of these rooms is relatively high, compared to the plant HCLPF value, the seismic failure of many passive core cooling system valves does not become a contributor to plant HCLPF.

4. Operator Actions

   Operator actions are not credited in the SMA model for the 0.50g review level events. Inclusion of operator actions in the models would provide additional success paths, such as manual actuation of the automatic depressurization system (ADS) after failure of CMTs to inject. However, this inclusion would not affect the plant HCLPF or the major conclusions of the SMA. Thus, the AP1000 design is already robust with respect to its response to seismic events, even without taking credit for operator actions.

5. IRWST Failure

   The IRWST HCLPF is 0.50g. This failure is modeled to render PRHR, gravity injection, and recirculation systems inoperable. Thus, it becomes a single point failure that affects both the transient (e.g. LOSP events) and LOCA success paths. Failure of IRWST is modeled as a part of gross structural failure, as well as in PRHR and gravity injection system fault trees.

   An argument can be made that when the IRWST fails, its inventory would end up in the containment cavity and can be used to recirculate cavity water back into the RCS, leading to successful core cooling. Although this scenario is plausible and credible, such success sequences (e.g. sequences where gravity injection is skipped, directly going into cavity recirculation) are not analyzed in the AP1000 PRA. For this purpose, no credit for such a success path is taken in the present model.

6. Large Fission Product Release

   The large fission product release is driven by the same seismic sequences that dominate the plant core damage. This is due to either the nature of the initiating event (such as

gross structural failure initiating event, EQ-STRUC), or postulated containment failure following a reactor vessel failure (RVFA) (such as EQ-RVFA initiating event or some ATWS sequences leading the RVFA). Failure of containment isolation or containment cooling system due to their system components or system actuation failures does not dominate the plant large release HCLPF.

55.6 References

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Table 55-1 (Sheet 1 of 4)

SEISMIC MARGIN HCLPF VALUES

Description	Median pga [8]	βc	HCLPF Value [8]	Basis
Buildings/Structures				
Shield Building Roof – Tension Ring	-	-	0.51g	[5]
Shield Building Roof – at PCS Tank	-	-	0.63g	[5]
Shield Building Roof – PCS Tank Wall	-	-	1.30g	[5]
Shield Building Roof – Columns, Out of Plane Shear	-	-	0.74g	[5]
Shield Building Roof – Columns, In Plane Shear	-	-	0.57g	[5]
Containment Vessel – Buckling	3.24 g	0.69	0.66g	[3]
Containment Vessel – Overturning	4.6 g	0.62	1.11g	[3]
Containment Baffle Support Failure	-	-	1.3 g	[4]
Interior Containment Structure & IRWST Tank	1.3 g	0.42	0.50 g	[3]
Primary Components				
Reactor Pressure Vessel	-	-	0.64g	[4]
Reactor Pressure Vessel Supports	1.59g	0.36	0.70g	[3]
Reactor Internals and Core Assembly (includes fuel)	1.5g	0.51	0.5g	[1]
Control Rod Drive Mechanism (CRDM) and Hydraulic Drive Units	2.2g	0.51	0.7g	[1]
Pressurizer	-	-	0.58g	[4]
Pressurizer Support	1.30g	0.37	0.55g	[3]
Steam Generator	-	-	0.54g	[4]
Steam Generator Supports	0.98g	0.26	0.54g	[3]
Reactor Coolant Pump & Supports	2.2g	0.51	0.68g	[1]
Mechanical Equipment				
Polar Crane	-	-	0.77g	[4]
Piping – Support Controlled	3.3g	0.61	0.81g	[1]
Cable Trays – Support Controlled	2.2g	0.61	0.54g	[1]
Heat Exchanger (PRHR)	-	-	0.76g	[4]
Accumulator Tank	2.2g	0.46	0.76g	[1]
Core Makeup Tank	-	-	0.54g	[4]

Table 55-1 (Sheet 2 of 4)

SEISMIC MARGIN HCLPF VALUES

Description	Median pga [8]	βc	HCLPF Value [8]	Basis
Valves				
Room Number 11202	-	-	0.85g	[4]
Room Number 11206	-	-	0.85g	[4]
Room Number 11207	-	-	0.85g	[4]
Room Number 11208	-	-	0.85g	[4]
Room Number 11300	-	-	0.85g	[4]
Room Number 11301	-	-	0.73g	[4]
Room Number 11302	-	-	0.85g	[4]
Room Number 11304	-	-	0.73g	[4]
Room Number 11400	3.3g	0.61	0.81g	[1]
Room Number 11403	3.3g	0.61	0.81g	[1]
Room Number 11500	3.3g	0.61	0.81g	[1]
Room Number 11601	3.3g	0.61	0.81g	[1]
Room Number 11603	3.3g	0.61	0.81g	[1]
Room Number 11703	3.3g	0.61	0.81g	[1]
Room Number 12244	-	-	0.79g	[4]
Room Number 12254	-	-	0.79g	[4]
Room Number 12255	-	-	0.79g	[4]
Room Number 12256	-	-	0.79g	[4]
Room Number 12306	-	-	0.74g	[4]
Room Number 12362	3.3g	0.61	0.81g	[1]
Room Number 12401	3.3g	0.61	0.81g	[1]
Room Number 12404	3.3g	0.61	0.81g	[1]
Room Number 12405	3.3g	0.61	0.81g	[1]
Room Number 12406	3.3g	0.61	0.81g	[1]
Room Number 12452	3.3g	0.61	0.81g	[1]
Room Number 12454	3.3g	0.61	0.81g	[1]
Room Number 12555	3.3g	0.61	0.81g	[1]
Room Number 12701	3.3g	0.61	0.81g	[1]

Table 55-1 (Sheet 3 of 4)

SEISMIC MARGIN HCLPF VALUES

Description	Median pga [8]	βc	HCLPF Value [8]	Basis
Passive Containment Cooling System	-	-	0.51g	[5]
Electrical Equipment				
Battery	-	-	0.73g	[6]
Battery Racks	3.3g	0.46	1.14g	[1]
Battery Chargers	-	-	0.86	[6]
125 DC Distribution Panel	-	-	0.55	[6]
120 VAC Distribution Panel	-	-	0.55	[6]
Transfer Switches	-	-	0.55	[6]
125 VDC MCC	-	-	0.87	[6]
125 VDC Switchboard	-	-	0.55	[6]
Regulating Transformer	-	-	0.98	[6]
Inverter	-	-	0.61	[6]
4.16 KV Switchgear	-	-	0.71	[6]
Reactor Trip Switchgear	-	-	0.62	[6]
Hydrogen Monitor	-	-	1.24	[6]
CMT Level Switch	-	-	0.86	[6]
Neutron Detector	-	-	0.55	[6]
Radiation Monitor	-	-	0.67	[6]
RTD	-	-	4.46	[6]
Speed Sensors	-	-	2.98	[6]
Incore Thermocouple	-	-	4.69	[6]
RCP Bearing Water Temperature Thermocouple	-	-	5.42	[6]
PCS Water Flow Transmitter (el. 135.3')	-	-	0.58	[6]
PCS Water Flow Transmitter (el. 261')	-	-	0.53	[6]
PRHR HX Flow Transmitter	-	-	1.12	[6]
RCS Flow Transmitter	-	-	1.12	[6]
SG Start Up Flow Transmitter	-	-	0.77	[6]
IRWST Level Transmitter	-	-	0.91	[6]
PZR Level Transmitter	-	-	0.91	[6]

Table 55-1 (Sheet 4 of 4)

SEISMIC MARGIN HCLPF VALUES

Description	Median pga [8]	βc	HCLPF Value [8]	Basis
SG Narrow Range Transmitter	-	-	0.92	[6]
SG Wide Range Transmitter	-	-	0.92	[6]
Air Storage Tank Pressurizer Transmitter	-	-	0.63	[6]
Containment Pressurizer Sensor & Transmitter	-	-	0.95	[6]
RCS Wide Range Pressure Transmitter	-	-	0.91	[6]
PRZ Pressure Sensor	-	-	0.91	[6]
MSL Pressure Transmitter	-	-	0.63	[6]
ESFAC Cabinet	-	-	0.95	[6]
Protection Logic Cabinet	-	-	0.95	[6]
Integrated Protection Cabinet SWGR	-	-	0.95	[6]
Multiplex Cabinet	-	-	0.95	[6]
QDPS Cabinet	-	-	1.54	[6]
MCR Support Operation Station	2.8g	0.46	0.97g	[1]
MCR Switch Station	2.8g	0.46	0.97g	[1]
QDPS and MCR Display	-	-	1.38g	[6]
MCR Isolation Damper	-	-	0.78g	[6]
Hydrogen Recombiner	-	-	1.23g	[6]
Power and Control Panels	-	-	1.23g	[6]
Ceramic Insulators	0.2g	0.35	0.09g	[2]

Notes:
1. HCLPF based on URD recommended generic fragility data
2. HCLPF based on recognized generic fragility data
3. HCLPF based probabilistic fragility analysis
4. HCLPF based on deterministic approach
5. HCLPF based on conservative deterministic fragility margin approach
6. HCLPF based on design margin as defined from test data
7. Component support will control HCLPF value
8. pga is the free field peak ground acceleration level for the seismic event

Table 55-2 (Sheet 1 of 3)

BASIC EVENT HCLPF VALUES

Basic Event ID	Description	AP600 HCLPF	AP1000 HCLPF	Source (1)
EQ-CER-INSULATOR	Failure of Ceramic Insulators	0.09g	0.09g	
EQ-CORE-ASSEMBLY	Core Assembly Failure (not fuel)	0.50g	0.50g	
EQ-CV-INTER	Interior Containment	0.60g	0.50g	(same as IRWST)
EQ-IRWST-TANK	IRWST Failure	0.60g	0.50g	
EQ-RV-FUEL	Fuel Failure	0.50g	0.50g	
EQ-AB-EXTWALL	Aux. Building Exterior Wall	0.58g	0.51g	(same as shield building roof)
EQ-AB-FLOOR	Aux. Building Floor	0.58g	0.51g	(same as shield building roof)
EQ-AB-INTWALL	Aux. Building Interior Wall	0.58g	0.51g	(same as shield building roof)
EQ-PCC-TANK	PCC Tank Failure	0.58g	0.51g	(same as shield building roof)
EQ-SHDBLD-ROOF	Shield Building Roof	0.58g	0.51g	
EQ-SHDBLD-WALL	Shield Building Wall	0.58g	0.51g	(taken as the same as roof)
EQ-CABLETRAY	Cable Trays – Support Controlled	0.54g	0.54g	
EQ-CMT-TANKS	Tank PXS 2A/B (Core Makeup Tank)	0.63g	0.54g	(2)
EQ-SG-FAILS	Steam Generator Fails	0.65g	0.54g	
EQ-SGTR	Steam Generator Piping (one or a few)	0.65g	0.54g	same as steam generator
EQ-ACDISPANEL	120 vac Distribution Panel	0.51g	0.55g	
EQ-DC-SWBRD	125 vdc Switchboard	0.51g	0.55g	
EQ-DCDISPANEL	125 vdc Distribution Panel	0.51g	0.55g	
EQ-PRZR-FAILS	Pressurizer Fails	0.67g	0.55g	
EQ-TRSFSWITCH	Transfer Switch	0.51g	0.55g	
EQ-INVERTER	Inverter	0.65g	0.61g	
EQ-MSL-SENSOR	MSL Pressure Transmitter	0.99g	0.63g	
EQ-RV-FAILS	Reactor Pressure Vessel Failure	0.77g	0.64g	
EQ-CV-BUCKLE	Containment Vessel Buckling	0.70g	0.66g	
EQ-RCP-FAILS	Reactor Coolant Pump Fails	0.67g	0.68g	
EQ-CRDM	Control Rod Drive Mechanism	0.70g	0.70g	
EQ-RV-HDPK	RPV Integrated Head Package Failure	0.70g	0.70g	Hydraulic Drive Units

Table 55-2 (Sheet 2 of 3)

BASIC EVENT HCLPF VALUES

Basic Event ID	Description	AP600 HCLPF	AP1000 HCLPF	Source (1)
EQ-BATTERY	Battery	1.04g	0.73g	
EQ-ACC-TANKS	Tank PXS-MT 1A/B (Accumulator)	0.76g	0.76g	
EQ-PRHR-HX	Heat Exchanger (PRHR)	0.81g	0.76g	
EQ-POL-CRANE	Polar Crane Failure	0.89g	0.77g	
EQ-ADS-S1MOVS	RCS V001A/B/C/D	0.81g	0.81g	11603/11703
EQ-ADS-S2MOVS	RCS V002A/B/C/D	0.81g	0.81g	11603/11703
EQ-ADS-S3MOVS	RCS V003A/B/C/D	0.81g	0.81g	11603/11703
EQ-CAS-AOV14/15	CAS AOV14 and CAS CV 15	0.81g	0.81g	12405/11400
EQ-DVI-PIPES	Both DVI Lines Fail	0.81g	0.81g	same as RCS piping
EQ-INSTR-PIPES	Small Pipes for RCS Instrumentation (Leading to Small LOCA)	0.81g	0.81g	same as RCS piping
EQ-PRHR-MOV	PXS-PL-V101	0.81g	0.81g	11500
EQ-PRZR-SV	Pressurizer Safety Valves RCS-PL-V005A and V005B	0.81g	0.81g	11603/11703
EQ-RCS-PIPES	RCS Piping (support controlled)	0.81g	0.81g	
EQ-SLB	Feed and Steam Line Piping (Leading to "Steam Line Break" Event)	0.81g	0.81g	same as RCS piping
EQ-VFS-AOV03/04	VFS AOVs 03 and 04	0.81g	0.81g	12452/11400
EQ-VFS-AOV09/10	VFS-AOVs 09 and 10	0.81g	0.81g	11400/12454
EQ-ACC-CV28	PXS 28A/B	0.96g	0.85g	11206/11207
EQ-ACC-CV29	PXS 29A/B	0.96g	0.85g	11206/11207
EQ-ACC-MOV27	PXS 27A/B	0.96g	0.85g	11206/11207
EQ-ADS-S4VALVES	RCS V004A/B/C/D	0.96g	0.85g	11301/11302
EQ-CMT-AOV	PXS 14A/B, PXS15A/B	0.96g	0.85g	11206/11207
EQ-CMT-CV	PXS 16A/B, PXS17A/B	0.96g	0.85g	11206/11207
EQ-IRW-INJCV	PXS 122A/B, PXS124A/B	0.96g	0.85g	11206/11207
EQ-IRW-INJSQ	PXS 123A/B, PXS125A/B	0.96g	0.85g	11206/11207
EQ-IRW-RECCV	PXS 119A/B	0.96g	0.85g	11206/11207
EQ-IRW-RECMOV	PXS 117A/B	0.96g	0.85g	11206/11207
EQ-IRW-RECSQ	PXS 118A/B, PXS 120A/B	0.96g	0.85g	11206/11207
EQ-PRHR-AOV	PXS-PL-V108A/B	0.96g	0.85g	11300
EQ-PRHR-XV	PXS-PL-V109	0.96g	0.85g	11300

Table 55-2 (Sheet 3 of 3)

BASIC EVENT HCLPF VALUES

Basic Event ID	Description	AP600 HCLPF	AP1000 HCLPF	Source (1)
EQ-WLS-AOV55/57	WLS 55/57	0.92g	0.85g	11300/12244
EQ-CMT-LEVELSWT	CMT Level Switch	1.09g	0.86g	
EQ-DCMCC	125 vdc MCC	0.93g	0.87g	
EQ-IRW-LVTRANS	IRWST Level Transmitter	1.27g	0.91g	
EQ-PRZR-LVTRANS	PZR Level Transmitter	1.27g	0.91g	
EQ-PRZR-SENSOR	PRZ Pressure Sensor	1.27g	0.91g	
EQ-SG-NRLEVEL	SG Narrow Range Transmitter	0.85g	0.92g	
EQ-SG-WRLEVEL	SG Wide Range Level Transmitter	0.85g	0.92g	
EQ-CONTPR-SENSOR	Containment Pressure Sensor and Transmitter	1.27g	0.95g	
EQ-ESFAC-CAB	ESFAC Cabinet	0.74g	0.95g	
EQ-INTEG-CAB	Integrated Protection Cabinet Switchgear	0.74g	0.95g	
EQ-LOGIC-CAB	Protection Logic Cabinet	0.74g	0.95g	
EQ-MPLEX-CAB	Multiplexer Cabinet	0.74g	0.95g	
EQ-MCR-STATION	MCR Supervisory Operator Station	0.97g	0.97g	
EQ-MCR-SWITCH	MCR Switch Station	0.97g	0.97g	
EQ-CV-OVERT	Containment Vessel Overturning	0.98g	1.11g	
EQ-BAT-RACK	Battery Rack	1.14g	1.14g	
EQ-BAF-SUPP	Containment Baffle Support Failure	1.50g	1.30g	
EQ-QDPS-DISPLAY	QDPS and MCR Display	1.98g	1.38g	
EQ-QDPS-CAB	QDPS Cabinet Fails	1.94g	1.54g	

Notes:

1. When the source column is left blank, the HCLPF value is taken from the corresponding item in Table 55.2-1.

   The numbers such as 12306/11300 refer to the room numbers where the valves are. The HCLPFs for the rooms are taken from Table 55.2-1. When more than one valve is involved and they have different HCLFPs, the lowest HCLPF is quoted.

2. CMT HCLPF is driven by failures in the nozzle area leading to water leakage out of the tank. The HCLPF for the structural failure of the tank is much higher, at least as good as the piping support and valves which have HCLPF values equal to 0.81g.

Table 55-3

EQ-IEV-STRUC HCLPF

		AP600	AP1000
1	EQ-AB-FLOOR	0.58g	0.51g
2	EQ-AB-EXTWALL	0.58g	0.51g
3	EQ-AB-INTWALL	0.58g	0.51g
4	EQ-BAF-SUPP	1.50g	1.30g
5	EQ-PCC-TANK	0.58g	0.51g
6	EQ-SHDBLD-ROOF	0.58g	0.51g
7	EQ-SHDBLD-WALL	0.58g	0.51g
8	EQ-CV-INTER	0.60g	0.50g
9	EQ-CV-BUCKLE	0.70g	0.66g
10	EQ-CV-OVERT	0.98g	1.11g
11	EQ-IRWST-TANK	0.60g	0.50g
12	EQ-POL-CRANE	0.89g	0.77g
	HCLPF=	0.58g	0.5g

Table 55-4

EQ-IEV-RVFA HCLPF

		AP600	AP1000
1	EQ-DVI-PIPES	0.81g	0.81g
2	EQ-SG-FAILS	0.65g	0.54g
3	EQ-RCP-FAILS	0.70g	0.68g
4	EQ-PRZR-FAILS	0.67g	0.55g
5	EQ-RV-FUEL	0.50g	0.50g
6	EQ-RV-HDPK	0.70g	0.70g
7	EQ-RV-FAILS	0.77g	0.64g
	HCLPF =	0.50g	0.5g

Table 55-5

EQ-IEV-LLOCA HCLPF

		AP600	AP1000
1	EQ-PRHR-HX	0.81g	0.76g
2	EQ-RCS-PIPES	0.81g	0.81g
	HCLPF =	0.81g	0.76g

Table 55-6

EQ-IEV-SLOCA HCLPF

		AP600	AP1000
RCS Instrumentation Pipe Breaks	EQ-INSTR-PIPES	0.81g	0.81g
Secondary Line Breaks	EQ-SLB	0.81g	0.81g
SGTR	EQ-SGTR	0.65g	0.54g
	HCLPF =	0.65g	0.54g

Table 55-7

EQ-IEV-ATWS HCLPF

		AP600	AP1000
1	EQ-CORE-ASSEMBLY	0.50g	0.50g
2	EQ-CRDM	0.70g	0.70g
	HCLPF =	0.50g	0.5g

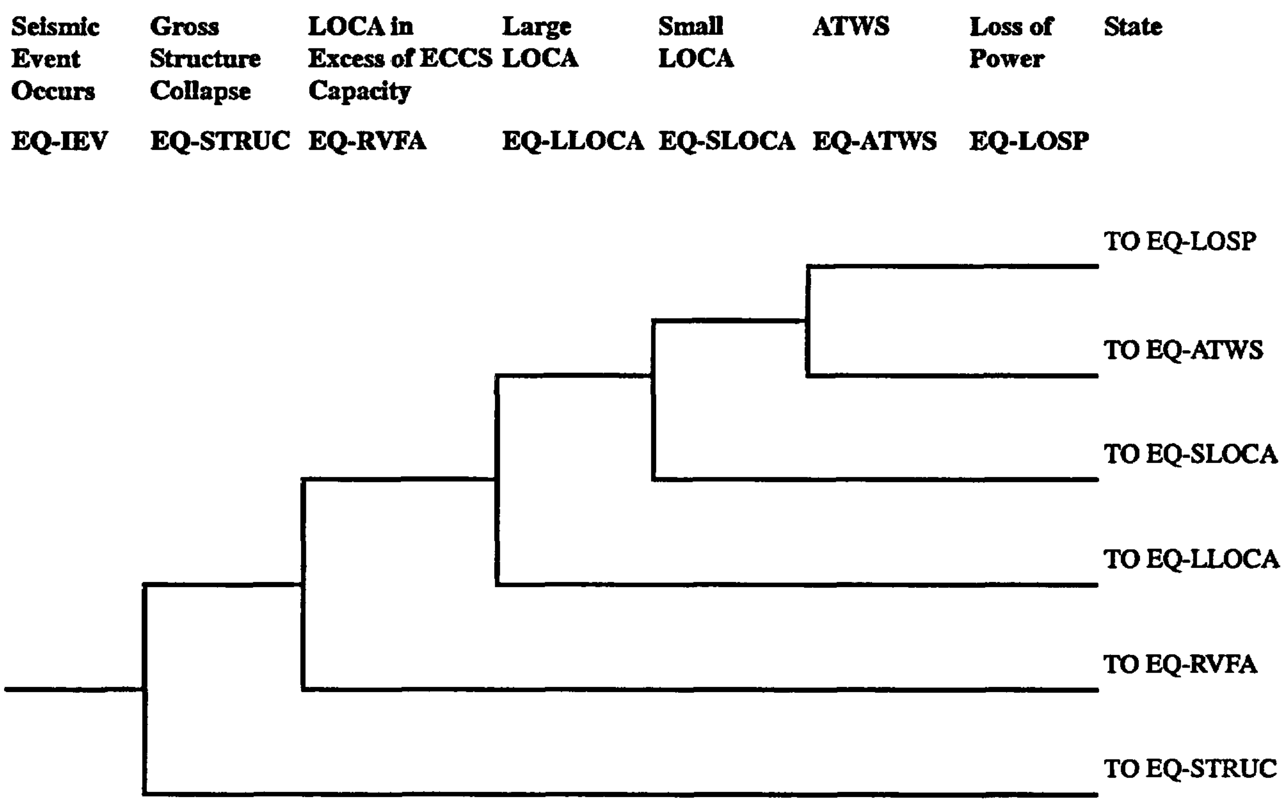

Figure 55-1

Seismic Initiating Event Hierarchy Tree

CHAPTER 56

INTERNAL FLOODING ANALYSIS

56.1 Introduction

As part of the AP1000 PRA, an internal flooding analysis is performed to identify, analyze, and quantify the core damage risk contribution as a result of internal flooding during at-power conditions. The internal flooding analysis models potential flood vulnerabilities, in conjunction with random failures modeled as part of the internal events PRA. Through this process, flood vulnerabilities that could jeopardize core integrity are identified.

An internal flooding PRA during low-power and shutdown conditions is also included.

The AP600 detailed design information was reviewed and then upgraded for the AP1000 analysis. Where detailed design information was not available, conservative assumptions were made to bound the flooding analysis.

56.1.1 Definitions

Safe shutdown components or systems are those components or systems used to reach a safe, stable state as determined in the internal event analysis. This includes power supplies, instrumentation and control systems, as well as support systems such as cooling water for components.

Flooding is the submergence of equipment by large volumes of water or the intrusion of water into equipment from water spray, dripping, or splashing.

56.2 Methodology

56.2.1 Summary of Methodology

In performing the internal flooding analysis, the plant is screened to identify areas susceptible to internal flooding. Areas within the plant that are essential to plant operation and that house safe shutdown equipment are screened through a two-step process to determine the susceptibility to an internal flood. This process evaluates the effects of an internal flood on the plant operation and safe shutdown. Areas that have no effect on plant operation and safe shutdown are eliminated from further analysis. Flooding scenarios are developed for the areas that are not eliminated, including any flood-induced equipment failures. These scenarios are then quantified to determine the flood-induced contribution to core damage frequency (CDF). Quantification of these scenarios considers the flood-induced equipment failure as well as random failures modeled as part of the internal events PRA. The steps necessary to perform an internal flooding evaluation are outlined below and discussed in detail in the following sections.

- Obtain information required to perform the flooding analysis
  - Collect and review plant information pertinent to the internal flooding evaluation to identify areas within the plant that contain potential flooding sources and areas that

house equipment important to plant operation and safe shutdown of the plant that could be affected by a flood

- Initial screening to identify potential critical areas
  - Postulate total immersion and identify areas that when flooded result in either a reactor trip or affect safe shutdown
  - Identify which areas have potential flooding sources
- Detailed screening to eliminate certain areas
  - Determine the maximum expected flood height in each area
  - Determine the potential for propagation to other areas
  - Determine consequences and eliminate certain areas
- Quantify flood-induced events that may contribute to core damage
  - Evaluate detection, isolation, and mitigation of the flood
  - Calculate the frequency for each flooding event
  - Calculate the flood-induced event contribution to core damage

56.2.2 Information Collection

The first step in the flooding analysis is collecting the information needed to perform the analysis. The information needed to perform a flooding analysis includes, but is not limited to: components required for safe shutdown, components that when flooded can result in a reactor trip, locations of the aforementioned components, potential flooding sources and their locations, flooding volumes and propagation paths, areas evaluated for flooding, and a Level 1 PRA.

Equipment modeled in the internal events PRA provides an excellent basis for the components required for safe shutdown. Other information useful in conducting a flooding analysis that can be obtained from the internal events PRA includes initiating event analysis, event tree analysis, and system analyses. Plant design documentation that is useful in performing the analysis includes general arrangement drawings, flood zone drawings, piping and instrumentation drawings, elevation plans, drainage capacities, estimated flow rates through piping, system volumes, and flood detection, and mitigation methods and devices.

From this information, data is assembled that summarize by area the systems or components that are located in that area and that data is then used to perform the initial screening assessment.

56.2.3 Initial Screening Assessment

Screening of the areas is accomplished by conservatively postulating that the area is completely flooded and all equipment affected by flooding in that area has failed. For this analysis, it is assumed that submerging equipment (motors or solenoids for valves, control

cabinets, and circuitry) results in equipment failure. Also, water intrusion from equipment being sprayed or splashed will result in equipment failure unless it can be otherwise justified.

Failure of a safe shutdown system due to an internal flood is defined as flooding equipment that causes sufficient damage to a component or components within the system, so that the system is in a degraded state or unable to function. Once the failed equipment is identified, two questions are posed:

- Is any of the failed equipment used to reach a safe, stable state?
- Is a reactor trip initiated as a result of the postulated maximum flood?

Affect Safe Shutdown?	Cause Reactor Trip?	Action
Yes	Yes	Area retained for further analysis.
Yes	No	Area retained for further analysis.
No	Yes	Area retained for further analysis.
No	No	Potential for area to be screened from further analysis.

From these two questions, four scenarios can result:

- Areas that would fail safe shutdown components and initiate a reactor trip upon a maximum flood are retained for further analysis. Since the initiation of a reactor trip places a demand on the safe shutdown systems, the degradation of some of these systems jeopardizes the safe shutdown of the reactor and may lead to plant damage states.
- Areas that would initiate a reactor trip but do not affect safe shutdown components upon a maximum flood are retained for further analysis. This is because the flood-induced initiation of a reactor trip places a demand on the safe shutdown components.
- Areas that would fail safe shutdown components but would not initiate a reactor trip are retained for further analysis. It is conservatively assumed that the operator trips the reactor when significant flooding of PRA-modeled equipment occurs.
- Areas with no safe shutdown components and that do not result in a reactor trip upon a maximum flood may potentially be screened from further analysis. This is because the safe shutdown systems are intact and there is no demand on them because the plant would not be tripped. Before an area can be screened from further analysis, another question must be posed:

- Are there any potential flooding sources located in the area?

Previous Area Action	Potential Flooding Sources?	Action
Potential to screen	Yes	Area is retained to evaluate potential flooding propagation
Potential to screen	No	Area is screened from further analysis

If an area contains a potential flooding source, the area must be analyzed further for the potential for flooding propagation. If the area does not contain a potential flooding source and a maximum flood does not result in a reactor trip and does not fail any safe shutdown components, the area is screened from further analysis.

By performing this type of screening, areas that have no impact on the plant's operation and safe shutdown can be eliminated without performing detailed calculations.

56.2.4 Detailed Screening Assessment

After reviewing all of the areas identified by assuming the area is completely flooded, a more detailed screening is performed on the areas that were not eliminated. This detailed screening assessment is divided into four phases: determination of maximum flood heights, determination of spray effects, evaluation of flooding propagation, and screening assessment.

56.2.4.1 Determination of Maximum Flood Heights

For the areas that were not eliminated in the initial screening, the maximum expected flood is determined. This calculation considers the flooding source, flow paths into the area, the height of the equipment above the floor, and curbing.

In some cases, it is possible to avoid performing detailed calculations on areas that were not eliminated in the initial screening. It may be evident that a flood does not impact an area if the equipment in the area is located at an elevation above the possible flood height. Large open areas can be eliminated if no barriers exist to contain the flooding in these area and if components in that area cannot be damaged from water spraying or dripping. These areas may be eliminated without performing any formal calculations.

When calculating flood heights in each area, the maximum expected flood should be conservatively calculated without considering drainage and other protective features. Therefore, if a flood in an area is calculated without taking into account the drainage and other mitigative features and it does not threaten the equipment contained within that area, then that area can be eliminated without performing additional time consuming calculations to account for the mitigative features. If the calculated flood height threatens the equipment within the area, then calculations may be performed to account for the mitigative features, such as the drains, sump pumps, and any other flow paths out of the area.

In performing these more detailed calculations, the maximum flood rates and volumes are assumed for the flooding sources. For example, double-ended guillotine breaks are assumed

for pipe ruptures, and catastrophic tank, valve, and pump ruptures are also assumed as the component failures that would result in flooding. When the maximum expected flood height is calculated, it can be determined whether the equipment in the room can be submerged by taking into account the capacity of the drainage system and other protective features. If design information is not complete, design engineers help provide conservative estimates and engineering judgements to estimate whether components in the area will be affected.

56.2.4.2 Determination of Spray Effects

It should be noted that equipment failures might result not only from submerging but could also be caused from wetting (e.g., water spraying, splashing, or dripping from a pipe above). After calculating the maximum flood height in each area, the area is reviewed to determine if there is any equipment located above the maximum flood height that could fail as a result of water spraying or splashing onto it. For this analysis, it is conservatively assumed that if water comes in contact with electrical equipment, excluding insulated cables or pump or valve motors that are covered and/or sealed to protect them from water intrusion, the water spraying or splashing onto them will cause equipment failure. The equipment qualification documentation can provide information on the resistance of the equipment to water intrusion. The source of the spraying or splashing and the relative position of equipment is identified. If it is determined that it is feasible for water to splash or spray on equipment, then this is analyzed in addition to equipment failures resulting from the flood in that area. If equipment is located either below or within a direct line of sight with one of these sources, then it will be analyzed with respect to failure modes as a result of spraying or splashing.

56.2.4.3 Evaluation of Propagation

After a flood is identified, the surrounding areas are reviewed to determine the potential for the flood to propagate to other areas. When considering propagation, louvers, stairwells, height under doors, etc., are identified and examined. If it is found that a flood propagating to another area could potentially cause a flooding event, then that area is reviewed by calculating the maximum potential flood.

56.2.4.4 Screening Assessment

After determining the maximum expected flood height, spray potential, and any flooding propagation, the area is evaluated for screening. If any PRA-modeled equipment is failed, the area is retained for quantification. If all PRA-modeled equipment in that area is above the maximum flood height and is not subject to spray or is qualified for spray and there is no potential for propagation into or out of the area that will affect safe shutdown equipment, the area is screened from further analysis. In addition, flooding events in an area that result in just a reactor trip but have no effect on safe shutdown equipment and no adverse propagation effects are not retained for further analysis.

56.2.5 Identification of Flood-Induced Initiating Events

The internal initiating events analysis forms the basis for identifying and evaluating the flood-induced initiating events. The initiating events developed in the internal initiating events analysis are reviewed to determine which sequences a flood can induce. The flooding

scenarios remaining after the detailed screening assessment are reviewed to determine if they could result in any of the initiating events identified in the internal initiating events analysis. For those flooding scenarios that do not result in an existing initiating event, a new initiating event is developed.

An event tree is created for each flooding scenario that addresses the frequency of an internal flood, any detection devices, and the ability to isolate and mitigate the flooding event. In many cases, no credit is taken for detection devices and the ability to isolate and mitigate the flooding event. For these cases, the event tree is reduced to the initiating event.

In cases where multiple failures can affect drainage, detection, isolation, or mitigation, fault trees can be used to calculate the probabilities for the event. In cases where only one or two failures contribute to the probability of failure, a table is used to list and sum these faults. This may include quantifying operator actions for detection and isolation using human error analysis procedures or determining random equipment failure probabilities, such as flood sensors failing to operate or valves failing to close for isolation.

56.2.6 Initiating Event Frequencies

The frequency of each flooding source in all plant areas not eliminated from further analysis is calculated. This is achieved by identifying each flooding source and its failure mode, and correlating this to failure data. All quantified potential flood sources are based on pipe failures. The pipe break failure rate is taken from the data analysis. This pipe failure rate is multiplied by 0.05 to reflect that 5 percent of pipe breaks are severe enough to constitute a rupture. This pipe rupture rate is multiplied by the number of pipe sections. A pipe section is defined as a segment of pipe between major discontinuities (i.e., pumps, valves, elbows, bends, etc.,) up to 10 ft. in length. This hourly failure data is converted to an annual frequency by multiplying by the number of hours per year (8760 hrs/yr.).

56.3 Assumptions

Various assumptions and engineering judgments provide a basis for the internal flooding analysis. The assumptions and engineering judgments used in this analysis are divided into two categories: general flooding analysis assumptions and AP1000-specific assumptions.

56.3.1 General Flooding Analysis Assumptions and Engineering Judgments

a. Flooding resulting from pipe ruptures is considered in this analysis.

b. As in the AP1000 Design Control Document (DCD) Section 3.4, line breaks of piping with nominal diameters of 1 in. or less are not considered a significant flooding threat and are not evaluated.

c. For each storage tank rupture, it is assumed that the entire tank inventory is drained.

d. For this analysis, submerging equipment (motors or solenoids for valves, control cabinets and circuitry) is assumed to result in equipment failure. Also, water intrusion

from equipment being sprayed or splashed results in equipment failure unless it can be otherwise justified.

e. The expected effect of spraying or flooding electrical equipment such as motor control centers, electrical cabinets, and terminal boxes, is a short to ground, removing power from the loads served by the component. This analysis addresses all such failures of electrical equipment as ground shorts.

f. Water-induced failure of air-operated valves (AOVs) causes the valve to go to the deenergized position.

g. Motor-operated valves (MOVs) require the application of current to the motor to change the valve position. Without power, the valve will remain in its current position. Flooding and/or spraying of a motor-operated valve will therefore cause the valve to fail as is. Each valve is addressed individually to determine how this affects plant operation.

h. Passive components, such as check valves, pipes, and tanks are not considered to be vulnerable to flooding effects.

i. Flooding has no effect on test and maintenance unavailability. Additional testing and maintenance may be required after a flood. Prior to and during a flood, the unavailability of equipment from test and maintenance is unaffected by flooding.

j. Flooding has no effect on common cause failures from an equipment design standpoint. The flooding itself may be considered a common cause failure in that it can result in the simultaneous failure of several components. In addition, flooding may have an effect on future common cause failures; however, all equipment affected by a flood is assumed to be tested and repaired or replaced as necessary. Therefore, the effects of flooding on future common cause failures are not evaluated.

k. Water in a stairwell or propagating into a stairwell preferentially continues to travel down the stairwell as opposed to propagating under a door leading outside the stairwell.

l. A mission time of 24 hours is considered in the internal flooding analysis.

m. Concurrent spray and flooding events from different sources in the same area are not considered in the internal flooding analysis. Likewise, other initiating events, such as a loss of offsite power (LOOP), concurrent with a flood are not considered.

n. Components that are environmentally qualified are considered to be invulnerable to the effects of spraying. Some components are qualified for safe operation in submersion environments. The equipment evaluated in this analysis that is qualified for specific conditions is identified.

o. Piping is assumed to develop a double-ended guillotine break. Expansion joints and flex connections are assumed to fail catastrophically.

p. Low and medium-energy pipes that are insulated may be assumed to drip, but not spray, if a pinhole leak develops. This may not be assumed for high-energy lines. Low and medium-energy bare pipes are assumed to be spray sources.

q. Lines that are not normally pressurized or charged, such as drain lines and dry fire protection piping, are not considered as credible flood or spray sources.

r. Doors are assumed to remain intact and in their normal position, e.g., normally closed doors remain closed unless opened by plant personnel.

s. For those scenarios that affect PRA-modeled equipment but do not result in a reactor trip, a manual trip is conservatively assumed to be initiated; thereby, placing a demand on the PRA-modeled equipment.

t. Flooding effects on termination and junction boxes are considered; however, flooding effects are not considered to affect power or instrument cables themselves.

56.3.2 AP1000-Specific Assumptions

The following assumptions are specific to AP1000.

a. For this flooding analysis, the same success criteria as assumed in the internal events PRA are used; i.e., reaching and maintaining a safe, stable state as characterized by constant reactor coolant system (RCS) temperature, pressure, and inventory.

b. Control room personnel are not responsible for mitigating a flood outside of the control room. Therefore, the human error probabilities (HEPs) for control room operator actions (i.e., initiating automatic depressurization system [ADS]) during a flood will be comparable to other initiators (such as loss-of-coolant accidents [LOCAs]).

c. Electrical connections in the termination boxes on the containment wall are adequately protected to prevent water spray-induced failure.

d. The solenoid valve associated with an air-operated valve is located in the vicinity of the air-operated valve.

e. Fire doors are not watertight.

f. No credit is taken for operation of sump pumps to mitigate the consequences of flooding.

g. Flooding in a particular area that affects a non-safety-related system is assumed to fail the entire non-safety-related system with the exception of ac and dc power systems. (See assumption j.)

h. There are sprinklers in the auxiliary and annex buildings.

i. Walls are assumed to be capable of withstanding the expected maximum flood loading. Therefore, walls are assumed to remain intact throughout a flooding event.

j. It is assumed that electrical circuit fault protection has been designed to provide protection for plant electric circuits via protective relaying, circuit breakers, and fuses. The AP1000 electrical distribution system is designed so that acceptable coordination and selective tripping is provided for safe shutdown circuits (safety and non-safety-related) on the ac and dc power systems. The design of the protective equipment will provide adequate protection of electrical distribution equipment from electric fault and overload conditions in the circuits. Therefore, loss of a component due to flooding will not result in the loss of the bus that supplies power to the affected component.

k. Loss of switchgear room cooling is assumed not to impact the operability of the switchgear located in the switchgear rooms during their PRA mission time.

l. Safety-related Class 1E electrical equipment will be qualified for environmental conditions in which they are required to function, including water spray. Containment isolation valves located inside containment are not evaluated for spray-induced failure with respect to containment isolation because they will be qualified for the environmental conditions in which they are required to function.

m. For floor drains, appropriate precautions such as check valves, back flow preventers, and siphon breaks are assumed to prevent back flow and any potential flooding.

n. The flow rate from a rupture of a fire protection system pipe to the fire hose stations is assumed to be less than the flow rate from two hose stations.

o. The number of expansion joints on the circulating water system inside the turbine building is assumed to be four.

p. The demineralized water and hot water systems are assumed to be insignificant flooding sources in the turbine building due to the limited water supply of these systems.

q. As shown in the internal events PRA, the containment isolation valves have a negligible effect on the CDF with respect to isolation and therefore, are not evaluated in the flooding analysis with the following exception. Containment isolation valves whose failure affects other systems modeled in the internal events PRA are evaluated.

r. During shutdown, the main feedwater system (FWS), condensate system (CDS), and circulating water system are assumed to not be operated and therefore, are not considered as potential significant flooding sources.

s. A security guard is assumed to be present in or immediately around the security rooms in the annex building.

t. Assumptions made about the annex building design:

- Design features will be utilized to prevent water in the non-radiologically controlled areas (non-RCA) of the annex building from entering the auxiliary building. These features will typically consist of one or more of the following: sloped floors, floor drains, double ramps, curbs, and door gaps.

- Water normally drained from radiologically controlled areas (RCAs) of the annex building to the auxiliary building are reviewed as part of the auxiliary building, and shown to be bounded by auxiliary building flooding events.
- Flooding effects determined in the Section 3.4 of AP1000 DCD are based on operator corrective action taken within 30 minutes after control room indication.
- Each fire hose station is assumed to deliver 125 gpm.
- There are no water sources located in the annex building dc switchgear or dc battery rooms.

56.4 Information Collection

Information collection involves a review of the plant information and documentation to identify the systems and components necessary for safe shutdown of the plant and potential flooding sources by building area.

56.4.1 PRA-Modeled Equipment and Locations

Equipment used to reach a safe, stable state was determined in the internal events PRA; therefore, those systems that are identified in the internal event analysis are used in the internal flooding analysis. This information along with locations establishes the basis for the screening analysis.

The systems used to reach a safe, stable state are divided into two groups: safety-related systems and non-safety-related systems. The locations of some non-safety-related components are conducted on a system basis rather than a component basis. The two exceptions to this are the ac power system and the non-Class 1E dc power system.

Equipment locations are gathered from several sources: general arrangement drawings, AP1000 databases, and clarification discussions with design engineers.

56.4.2 Identification of Areas for Flooding Evaluation

In the nuclear island, areas are determined using the flood zones and barrier drawings. In the turbine building, the areas for flooding evaluation are defined as the entire floor on a given level. The circulating water pumphouse is evaluated as one area. In the annex building, the areas for flooding evaluation are determined using the annex building general arrangement drawings.

56.5 At-Power Operations

This portion of the analysis covers the flooding risk for full-power operations, as defined in the internal events PRA. To examine flooding accidents that may lead to core damage, those systems and components used in reaching a safe, stable state in the event of a trip are considered.

56.5.1 Initial Screening Assessment

The information gained through the information collection and review process is used for the screening analysis. This screening analysis is performed to locate areas in which flooding could possibly cause a reactor trip or fail safe shutdown equipment and to identify the sources of potential flooding. Those areas that, if completely flooded, do not result in a reactor trip and contain no PRA-modeled equipment and have no flooding sources are screened from further analysis. The results of the initial screening assessment including the systems affected by a complete flood of the area are presented in Table 56-1. Potential flooding sources are also identified. From this initial screening assessment, the following areas are eliminated from further analysis:

- Auxiliary building 135'-3" radiologically controlled staging area
- Auxiliary building 135'-3" upper VAS equipment room
- Auxiliary building 160'-6" north and south areas
- Containment 135'-3" area

56.5.2 Detailed Screening Assessment

In the detailed screening assessment, the area is reviewed using the same criteria as the initial screening except that, if available, actual flooding levels are used to determine the affected equipment. In addition, the potential for flooding propagation is evaluated. Potential propagation is discussed with the potential flooding source(s) in each flood zone. Table 56-2 presents a summary of the at-power detailed screening results.

56.5.2.1 Screening of Auxiliary Building

The non-radiologically controlled area of the auxiliary building are designed to provide maximum separation between the mechanical and electrical equipment areas. This separation is designed to minimize the potential for propagation of leaks from the piping areas and the mechanical equipment areas to the Class 1E electrical and Class 1E instrumentation and control equipment rooms. The AP1000 auxiliary building radiologically controlled areas (RCAs) and non-RCAs are physically separated by 2- and 3-ft. structural walls and floor slabs. These structural barriers are designed to prevent flooding propagation across the boundary between these areas. Electrical penetrations between these areas are located above the maximum flood height and are sealed.

Auxiliary Building 66'-6" Non-RCA

The non-radiologically controlled flood zone at elevation 66'-6" contains the four divisional (A, B, C, and D) Class 1E battery rooms and one Class 1E spare battery room. The only fluid sources in this area are the demineralized water and fire protection systems. The maximum nominal diameter of the demineralized water piping is 1 in.; therefore, it is excluded from consideration as a flooding source. Although there are no credible flood or spray sources inside the battery rooms, the threat of propagation of floodwater into the rooms is addressed. Accumulation from fire fighting or from the failure of the charged wet pipe system outside the battery rooms is determined. Due to the limited supply of firewater, the maximum water

height if the water could go into all the battery rooms is below the level of the battery terminals.

Credit is not taken for the sump pumps and level alarms provided at this elevation. There is no potential for flood propagation to other areas. The potential for flooding propagation from higher elevations is addressed in the following sections. The auxiliary building 66'-6" non-RCA is retained for further analysis due to the potential for flooding propagation from annex building 135'-3" north air handling equipment area. Further analysis of this area is conducted under the annex building 135'-3" north air handling equipment area.

Auxiliary Building 66'-6" RCA

The normal residual heat removal system (RNS) pumps are located on elevation 66'-6" in the RCA. Potential flooding sources include component cooling water (CCS), central chilled water, hot water heating, spent fuel pool cooling, normal residual heat removal, chemical and volume control (CVS), demineralized water, fire protection, and liquid radioactive waste systems. Most of the piping associated with these systems is located above elevation 66'-6"; however, the flow from any postulated ruptures in the RCA will eventually flood elevation 66'-6" RCA.

Flood levels are not expected to reach the normal residual heat removal pump motors. If however, the fire protection piping ruptures and conservatively assuming no corrective action is taken, flooding will fail the RNS pumps. In addition, a rupture of the RNS piping results in the non-availability of the RNS. No credit is taken for the sump pumps and level sensors. The auxiliary building 66'-6" RCA is retained for further analysis.

Auxiliary Building 82'-6" Non-RCA

The auxiliary building non-RCA at elevation 82'-6" contains the two Class 1E battery rooms, four divisional Class 1E dc electrical equipment rooms, and one Class 1E reactor coolant pump (RCP) trip switchgear room. This area contains similar fire protection system and demineralized water system piping as found at elevation 66'-6". The potential for floodwater is limited to fire fighting or the failure of the charged wet pipe system outside the rooms. Water from these sources drains away via the stairwells, drains, and elevator shaft. Therefore, no significant accumulation of water occurs at elevation 82'-6".

Flood propagation from the auxiliary building 82'-6" non-RCA to the auxiliary building 66'-6" non-RCA is the same as flooding in the auxiliary building 66'-6" non-RCA. Any propagation from higher elevations is assumed to continue down to elevation 66'-6" and would not affect this level. The auxiliary building 82'-6" non-RCA is not considered further in this analysis.

Auxiliary Building 82'-6" RCA

The auxiliary building RCA elevation 82'-6" contains a number of containment isolation valves as well as portions of the normal residual heat removal and chemical and volume control systems. The containment isolation valves are associated with normal residual heat removal, spent fuel pool cooling, chemical and volume control, and liquid radwaste systems.

The spent fuel pool cooling and liquid radwaste containment isolation valves are not required to prevent core damage. Potential flooding sources are the same as those identified in the auxiliary building 66'-6" RCA.

The containment isolation valves are located above the maximum flooding level. In addition, flooding is not expected to affect the chemical and volume control pumps. Spray from a rupture of the fire protection or chemical and volume control piping could potentially result in the inoperability of normal residual heat removal or chemical and volume control containment isolation valves or fail the chemical and volume control pumps. A rupture of the RNS piping results in the non-availability of the RNS. Propagation of floodwater to elevation 66'-6" from a rupture of the fire protection piping can result in the failure of the RNS pumps. Therefore, it is conservatively assumed that a rupture of the CVS, RNS, or fire protection piping results in the failure of the RNS and the CVS. The auxiliary building 82'-6" RCA is retained for further analysis.

Auxiliary Building 100'-0" Electrical Non-RCA

The auxiliary building 100'-0" electrical non-RCA includes the remote shutdown workstation room, one reactor coolant pump trip switchgear room, four divisional Class 1E instrumentation and control (I&C) rooms, one non-Class 1E electrical equipment room, electrical penetration room, and portions of the plant control system (PLS).

This level contains a similar fire protection system as on elevation 66'-6". The potential for floodwater is limited to fire fighting or failure of the charged wet pipe system outside the rooms. Water from these sources drains via the drains, stairwells, and elevator shaft to lower elevations. Therefore, no significant accumulation of water occurs in this area.

Flood propagation from the auxiliary building 100'-0" electrical non-RCA to the auxiliary building 66'-6" non-RCA is the same as flooding in the auxiliary building 66'-6" non-RCA. Any propagation from higher elevations is assumed to continue down to elevation 66'-6" and would not affect this level. The auxiliary building 100'-0" electrical non-RCA is not considered further in this analysis.

Auxiliary Building 100'-0" Valve/Piping Penetration Room

The valve/piping penetration room contains automatically actuated containment isolation valves for the steam generator blowdown system, and the chemical and volume control system. Potential flooding sources include the steam generator, demineralized water, fire protection, central chilled water, and hot water-heating systems.

Due to the access doors and drain lines the maximum postulated flood level for this room is 36 in. The portions of the steam generator system and chemical and volume control systems located in this room are not required to prevent core damage. Any flooding propagation to the turbine building is not expected to affect any equipment in the turbine building. The auxiliary building 100'-0" valve/piping penetration room is not considered further in this analysis.

Auxiliary Building 100′-0″ RCA

The auxiliary building 100′-0″ RCA contains no PRA-modeled components that are affected by flooding nor can a flood in this area result in a reactor trip. In addition, all potential flooding sources in this area are identified in the auxiliary building RCA at elevation 66′-6″. Therefore, the auxiliary building 100′-0″ RCA is retained only for its potential flooding sources.

Auxiliary Building 100′-0″ Middle Annulus RCA

The middle annulus contains no PRA-modeled components that are affected by flooding nor can a flood in this area result in a reactor trip. In addition, the potential flooding sources in this area are identified in the auxiliary building 66′-6″ RCA and have no effect on PRA-modeled equipment in the auxiliary building RCAs. Therefore, the auxiliary building middle annulus RCA is not considered further in this analysis.

Auxiliary Building 117′-6″ Main Control Non-RCA

The auxiliary building main control non-RCA at elevation 117′-6″ contains the main control room. The potential for flooding the main control room is limited to potable water and propagation of fire protection system water. The potable water lines are 1-in. and smaller, and are not evaluated. The fire protection piping is located outside the main control room in the east corridor. In the event that a hose is brought into the main control room through the east access corridor, water accumulation is limited by flow through the access doors that are open. This flow drains via floor drains, stairwell, and elevator shaft to elevation 66′-6″. The threshold of the emergency egress door to the remote shutdown workstation is flush with the raised portion of flooring in the main control room, which is approximately 14 in. above the east corridor entrance. Water discharged in the area of the emergency egress door will leak through the raised flooring and flow back out the east access doors. The auxiliary building 117′-6″ main control non-RCA is not considered further in this analysis.

Auxiliary Building 117′-6″ Main Steam Isolation Valve Compartments

The auxiliary building main steam isolation valve (MSIV) compartments contain the isolation valves for the steam generator system. Potential flood sources include demineralized water, main and startup feedwater, steam generator, central chilled water, and hot water systems. Floor drains and blowout panels, located at floor elevation, open to drain the main steam tunnel to the turbine building.

The containment isolation valves are located above the maximum flood level. Spray in one of the main steam isolation valve compartments could fail close the main and startup feedwater control valves, resulting in a loss of main and startup feedwater to one steam generator. The valves in the other MSIV compartment would not be affected. The loss of main feedwater to one steam generator scenario is bounded by the loss of main feedwater to both steam generators scenario. In addition, the turbine building contains more potential flooding sources that can result in loss of main feedwater. Propagation to the turbine building is assumed to have no effect on the PRA equipment in the turbine building. The auxiliary building main steam isolation valve compartments are not considered further in this analysis.

Auxiliary Building 117'-6" Lower Nuclear Island Non-radioactive Ventilation System Equipment Room

The auxiliary building lower nuclear island non-radioactive ventilation system (VBS) B&D equipment room at elevation 117'-6" contains containment isolation valves for the chilled water, compressed air, component cooling water, and passive core cooling (nitrogen) systems (PXS). Potential flood sources include chilled water and component cooling water. Floor drains and the access doors limit the accumulation of water.

The containment isolation valves are located above the maximum flood level. The portions of the chilled water, component cooling water and passive core cooling (nitrogen) systems are not required to prevent core damage. Spraying of the compressed air containment isolation valve fails the valve closed and conservatively results in the failure of the compressed air system. The effects from a loss of compressed air in this room from flooding is bounded by flooding effects in other areas with more potential flooding sources and that result in the loss of other systems in addition to compressed air. Propagation to the turbine building is assumed to have no effect on equipment in the turbine building. The auxiliary building 117'-6" lower VBS B&D equipment room is not considered further in this analysis.

Auxiliary Building 117'-6" Electrical Non-RCA

The auxiliary building electrical non-RCA at elevation 117'-6" contains one divisional Class 1E penetration room and one non-Class 1E electrical penetration room as well as portions of the plant control system. The only potential flooding source is the fire protection system located in the east corridor. Any accumulation of water is limited by the floor drains and the flow through the stairwell and elevator shaft to elevation 66'-6".

Flood propagation from the auxiliary building 117'-6" electrical non-RCA to the auxiliary building 66'-6" non-RCA is the same as flooding in the auxiliary building 66'-6" non-RCA. Any propagation from higher elevations is assumed to continue down to elevation 66'-6" and would not affect this level. The auxiliary building 117'-6" electrical non-RCA is not considered further in this analysis.

Auxiliary Building 117'-6" RCA

The auxiliary building RCA at elevation 117'-6" contains several containment isolation valves in the vertical pipe chase. These isolation valves are for the primary sampling system, chemical and volume control system, spent fuel pool cooling system, and containment air filtration system. The primary sampling system, spent fuel pool cooling system, containment air filtration system, and the portion of the chemical and volume control system in this area are not required to prevent core damage. No other PRA-modeled equipment is located in this area nor will a reactor trip result upon flooding in this area. The potential flooding sources in this area are identified in the RCA at elevation 66'-6". Therefore, the auxiliary building 117'-6" RCA is retained only for its potential flooding sources.

Auxiliary Building 135'-3" VBS MCR/A&C Equipment Room

The auxiliary building VBS main control room (MCR)/A&C equipment room at elevation 135'-3" contains the central chilled water low-capacity subsystem. Potential flooding sources include the fire protection system, demineralized water system, and the chilled water system. Water from a postulated pipe rupture drains to the turbine building via floor drains or to the annex building via doors and floor drains. The central chilled water low-capacity subsystem provides cooling to the chemical and volume control system makeup pump compartment unit coolers during accident conditions. Loss of the central chilled water low-capacity subsystem from a flooding event does not result in a demand on the chemical and volume control system to operate even if the reactor is tripped.

A raised curb around the stairwell and elevator shaft prevents water from flowing down to the lower levels in the auxiliary building. Any flooding propagation to the annex building is assumed to flow down the floor drains, stairwell, and elevator shaft in the annex building. The water then flows into the drains on the first floor of the annex building, out the front door, and under the door to the turbine building. The propagation is assumed to have no effect on PRA-modeled components in the annex or turbine building. The auxiliary building 135'-3" VBS MCR/A&C equipment room is not considered further in this analysis.

Auxiliary Building 135'-3" Upper VBS B&D Equipment Room

The auxiliary building upper VBS equipment room at elevation 135'-3" contains no PRA-modeled components nor can a flood in this area result in a reactor trip. Propagation to the turbine building is assumed to have no effect on equipment on the turbine building. The upper VBS B&D equipment room is not considered further in this analysis.

Auxiliary Building 135'-3" RCA

The auxiliary building RCA at elevation 135'-3" contains no PRA-modeled components nor can a flood in this area result in a reactor trip. In addition the potential flooding sources in this area are identified in the auxiliary building RCA at elevation 66'-6". Therefore, the auxiliary building 135'-3" RCA is retained only for its potential flooding sources.

Auxiliary Building 180'-0" PCS Valve Room

The auxiliary building passive containment cooling system (PCS) valve room contains three redundant safety-related valve trains for the passive containment cooling system. Per the internal events PRA, the passive containment cooling system is not required to prevent core damage. Flooding in this room will propagate under the door, down the containment to the floor of the upper annulus, from there it drains outside to the yard. The auxiliary building passive containment cooling system valve room is not considered further in this analysis.

56.5.2.2 Screening of Containment

The safe shutdown components inside containment are subject to wetting from design basis events inside containment. These conditions bound the effects of spray from moderate energy

cracks. Sensitive components are qualified for this environment as described in AP1000 DCD Section 3.11.

Containment Reactor Coolant System Area

The containment reactor coolant system area contains portions of the automatic depressurization system, component cooling water system, and the chemical and volume control system. Potential flooding sources include component cooling water, chemical and volume control, demineralized water, passive core cooling, reactor coolant, normal residual heat removal, spent fuel pool cooling, and steam generator systems. The fourth-stage ADS valves are located in the reactor coolant system area. These valves are located above the maximum flood level and are qualified for spray. The portion of the component cooling water system located inside containment has no effect on safe shutdown. The chemical and volume control valve V081 located in the reactor coolant system area is located above the maximum flood level and is a normally open, fail open air-operated valve; therefore, spraying of water in this area has no adverse effect on the chemical and volume control system. Propagation back through the PXS-A, PXS-B and chemical and volume control system compartment drain lines is prevented by redundant back flow preventers in each of the three drain lines. Therefore, the containment reactor coolant system area is not considered further in this analysis.

Containment 82′-6″ PXS-A Area

The containment passive core cooling system-A (PXS-A) area contains portions of the passive core cooling system and a spent fuel pool cooling system containment isolation valve. The PXS-A components subject to flooding include:

- Two isolation valves for the core makeup tank (CMT) are normally closed, fail open air-operated valves. In the event of flooding, the solenoid valves for the core makeup tank isolation valves would short to ground and fail open. Therefore, flooding has no adverse effect on the CMT isolation valve with respect to CDF.

- Accumulator isolation valve is a normally open, power lockout motor-operated valve. In the event of flooding, the position of the motor-operated valve would be unaffected. Therefore, flooding has no adverse effect on the accumulator isolation valve with respect to CDF.

- In-containment refueling water storage tank (IRWST) isolation valve is a normally open, power lockout motor-operated valve. In the event of flooding, the position of the motor-operated valve would be unaffected. Therefore, flooding has no effect on the IRWST isolation valve with respect to CDF.

- Two passive core cooling containment recirculation isolation valves are normally closed motor-operated valves. In the event of flooding, these valves will not be operable and therefore, would have an adverse effect on one train of long term cooling. The passive core cooling containment recirculation isolation valves are located at elevation 90′-0″. The motors for these valves are assumed to begin at elevation 92′-0″.

Potential flooding sources in the PXS-A compartment include a postulated rupture of the IRWST tank line, the accumulator injection line, CMT injection line, spent fuel pool cooling system piping, demineralized water piping, CVS piping, and the RNS piping. The RNS, demineralized water system, spent fuel pool cooling system, and the CVS in PXS-A are normally isolated and a pipe rupture results in a very limited release of water.

From the internal events PRA, the safety injection line break addresses the loss-of-coolant accident scenario in the PXS-A compartment. The safety injection line break also addresses the postulated rupture of the in-containment refueling water storage tank line and accumulator injection line downstream of the check valves and upstream of the check valves assuming that the check valves fail. Therefore, for non-loss-of-coolant accident flooding scenarios, the check valves in these lines are assumed to work. A postulated rupture of the CMT injection line is modeled in the internal events safety injection line break.

The flood levels corresponding to a postulated rupture of the accumulator injection line will not reach the passive core cooling containment recirculation isolation valves and is not evaluated further. A postulated rupture of the IRWST line will result in the flooding of the passive core cooling containment recirculation isolation valves. However, the IRWST line is a seismically qualified schedule 40 pipe that is under very low pressure – approximately 35 ft. of water. This pipe is expected to have low stress level. Based on this information, the probability of a double-ended rupture of this line is assumed to be approximately the same as failure of the reactor vessel. Smaller leaks in the IRWST line upstream of the check valve allow ample time for the operators to assess the situation and shutdown the plant before affecting safe shutdown. Therefore, this situation is not analyzed further.

Flooding in the PXS-A compartment can propagate to the reactor coolant system compartment via the drain line or overflowing the PXS-A compartment. Flood propagation to the reactor coolant system compartment from the PXS-A compartment will result in a lower maximum flood height than flooding in the reactor coolant system compartment. Propagation from PXS-A is not analyzed further. The containment 82'-6" PXS-A area is not considered further in this analysis.

Containment 82'-6" PXS-B Area

The containment passive core cooling system-B (PXS-B) area contains portions of the passive core cooling system and three RNS containment isolation valves. The PXS-B components subject to flooding include:

- Two isolation valves for the core makeup tank are normally closed, fail open air-operated valves. In the event of flooding, the solenoid valves for the core makeup tank isolation valves would short to ground and fail open. Therefore, flooding has no adverse effect on the CMT isolation valve with respect to safe shutdown.

- Accumulator isolation valve is a normally open, power lockout motor-operated valve. In the event of flooding, the position of the motor-operated valve would be unaffected. Therefore, flooding has no adverse effect on the accumulator isolation valve with respect to safe shutdown.

- IRWST isolation valve is a normally open, power lockout motor-operated valve. In the event of flooding, the position of the motor-operated valve would be unaffected. Therefore, flooding has no effect on the IRWST isolation valve with respect to safe shutdown.

- Two passive core cooling containment recirculation isolation valves are normally closed motor-operated valves. In the event of flooding, these valves will not be operable and therefore, would have an adverse effect on one train of long term cooling. The passive core cooling containment recirculation isolation valve is located at elevation 90′-0″. The passive core cooling containment recirculation isolation valve is located at elevation 90′-0″. The motors for these valves are assumed to begin at elevation 92′-0″.

Potential flooding sources in the PXS-B compartment include a postulated rupture of the in-containment refueling water storage tank line, the accumulator injection line, core makeup tank injection line, chemical and volume control piping, and normal residual heat removal piping. The RNS and the CVS in the PXS-B compartment are normally isolated, and a pipe rupture results in a very limited release of water.

From the internal events PRA, the safety injection line break addresses the loss-of-coolant accident scenario in the PXS-B compartment. The safety injection line break also addresses the postulated rupture of the in-containment refueling water storage tank line and accumulator injection line downstream of the check valves and upstream of the check valves assuming that the check valves fail. Therefore, for non-loss-of-coolant accident flooding scenarios the check valves in these lines are assumed to work. A postulated rupture of the CMT injection line is modeled in the internal events safety injection line break.

The flood levels corresponding to a postulated rupture of the accumulator injection line will not reach the passive core cooling containment recirculation isolation valves and is not evaluated further. As in the PXS-A compartment, a postulated rupture of the in-containment refueling water storage tank line in PXS-B will result in flooding of the passive core cooling containment recirculation isolation valves but is not evaluated further based on the estimated low probability of failure of the line.

Flooding in the PXS-B compartment can propagate to the reactor coolant system compartment via the drain line or overflowing the PXS-B compartment. Flood propagation to the reactor coolant system compartment from the PXS-B compartment will result in a lower maximum flood height than flooding in the reactor coolant system compartment. Propagation from PXS-B is not analyzed further. The containment 82′-6″ PXS-B area is not considered further in this analysis.

Containment 82′-6″ Chemical and Volume Control System Area

The containment chemical and volume control system area contains the majority of the components associated with the chemical and volume control system. Potential flood sources include the chemical and volume control system and the liquid radwaste system. Failures within the chemical and volume control system that result in a loss-of-coolant accident are assumed to be modeled in the internal events PRA. Flooding in this area is assumed to fail the chemical and volume control system. The effects of non-loss-of-coolant accident flooding in

this area are assumed to be bound by flooding effects in the RCA portion of the auxiliary building, which results in the failure of the chemical and volume control and RNSs.

Flooding in the chemical and volume control system compartment can propagate to the reactor coolant system compartment via the drain line or overflowing the chemical and volume control system compartment. Flood propagation to the reactor coolant system compartment from the chemical and volume control system compartment will result in a lower maximum flood height than flooding in the reactor coolant system compartment. Propagation from chemical and volume control system is not analyzed further. Therefore, the containment 82′-6″ area is not considered further in this analysis.

Containment 117′-6″ Area

The containment 117′-6″ area contains portions of the plant control system and electrical containment penetrations. Potential flooding sources in the area are identified in the containment reactor coolant system area. Flooding at this level quickly drains through the grating in the floor to the containment reactor coolant system area. The electrical containment penetrations are protected from water spray. The effects from a loss of the plant control system inside containment is bounded by the effects of flooding in other areas that result in the loss of the plant control system and other systems. Therefore, the containment 117′-6″ area is not considered further in this analysis.

Containment 160′-6″ Area

The containment 160′-6″ area contains the first, second, and third stage automatic depressurization system valves. Potential flooding sources in the area are identified in the containment reactor coolant system area. Any flooding at this level quickly drains through the grating in the floor to lower elevations inside containment. The first-, second-, and third-stage ADS valves are qualified for spray. Therefore, the containment 160′-6″ area is not considered further in this analysis.

56.5.2.3 Screening of Turbine Building

Several conservative assumptions are made when screening the turbine building due to the lack of isometric drawings for most systems located in the turbine building.

Turbine Building 100′-0″ Area

The turbine building 100′-0″ area contains portions of the following systems: main and startup feedwater, condensate, circulating water, component cooling water, service water, and ac power. Potential flooding sources include the circulating water, service water, condensate, main and startup feedwater, component cooling water, condensate polishing, auxiliary steam supply, and fire protection systems. Due to the locations of the condensate polishing system and the auxiliary steam supply system, ruptures from these systems are not expected to effect any PRA-modeled equipment.

The bounding flooding source for the turbine building 100′-0″ area is a break in the circulating water piping, which would result in flooding of the 100′-0″ floor. Flow from this break is expected to run out of the building to the yard through a relief panel in the turbine building west wall, which would limit the maximum flood height to less than 6 in. However, a rupture of the circulating water expansion joint is conservatively assumed to result in the failure of the main and startup feedwater system, condensate system, component cooling water system, service water system, and main AC power system (ECS) EC 411.

Spray from various potential flood sources could result in the individual failure of all the main and startup feedwater pumps, both condensate pumps, both component cooling water pumps, or both service water pumps. The spacing of these pumps prevents any single spray event from resulting in the failure of more than one system's pumps.

Flooding propagation to the auxiliary building valve/piping penetration room would be much less than a postulated break in the valve/piping penetration room. Flooding propagation under the door to the annex building is assumed to have no effect on components in the annex building due to the floor drains and sloped floor to the front door of the annex building. The turbine building 100′-0″ area is retained for further analysis.

Turbine Building 117′-6″ Area

The turbine building 117′-6″ area contains portions of the main and startup feedwater system and the ac power system. Potential flooding sources include the condensate system, main and startup feedwater system, and fire protection system. Any flooding in this area is quickly drained to the 100′-0″ elevation via the grating in the floor. It is conservatively assumed that this propagation results in spraying of all components located in the turbine building 100′-0″ elevation. Furthermore, it is conservatively assumed that a flood on the 117′-6″ level results in the additional failure of ECS EC 311, ECS EC 122, and ECS EC 222. The grating in the floor prevents any significant propagation of water to the auxiliary or annex buildings. The turbine building 117′-6″ area is retained for further analysis.

Turbine Building 135′-3″ Area

The turbine building 135′-3″ area contains portions of the compressed and instrument air systems, condensate system, main and startup feedwater system, plant control system, and ac power system. Potential flooding sources include the condensate system, main and startup feedwater system, and the fire protection system. Accumulation of floodwater is limited as any water is drained through the grating in the floor.

The north 6900-volt switchgear room contains two of the four main ac busses for the turbine building, busses ECS ES 4 and ECS ES 8, as well as other electrical components. This room contains piping for the fire protection system. Flooding is expected to propagate under the door to the south 6900-volt switchgear room and down to the lower levels. The flooding propagation is assumed to have no effect on other components in the turbine building. This room is retained for further analysis.

The south 6900-volt switchgear room is similar to the north switchgear room. This room houses two of the four main ac busses, ECS ES 3 and ECS ES 7, and other electrical

components. Analysis of the north switchgear room is considered representative of flooding in the south switchgear room. The fire protection lines located in the south switchgear room are included in the initiating event frequency for flooding in the north switchgear room.

The rest of the turbine building 135′-3″ area is evaluated as one area. Any flooding in this general area is conservatively assumed to result in the failure of all non-safety systems in this area. Furthermore, flood propagation to the lower levels of the turbine building is assumed to result in the failure of all non-safety components on those levels. The grating in the floor prevents any significant propagation of water to the auxiliary or annex buildings. The turbine building 135′-3″ area is retained for further analysis.

Turbine Building 160′-0″ Area

The turbine building 160′-0″ area contains portions of the condensate system. Potential flooding sources include the condensate system, main feedwater system, and the fire protection system. Flooding in this area is assumed to result in the failure of the condensate system. Furthermore, flooding propagation to the lower levels of the turbine building via the floor grating is conservatively assumed to result in the failure of all non-safety-related components on those levels with the exception of the equipment located in the north and south 6900 volt switchgear rooms. A flooding event from this area affects the same systems as those identified in the turbine building 135′-3″ general area. The turbine building 160′-0″ area is not considered for further analysis except to add the potential flood initiators to the turbine building 135′-3″ area.

56.5.2.4 Screening of Annex Building

Several conservative assumptions are made when screening the annex building due to lack of detailed design information, such as piping locations and passive flood mitigating devices, like sloped floors, curbs, and floor drains.

Annex Building 100′-0″ DC Switchgear Area

The annex building dc switchgear area at elevation 100′-0″ contains the non-Class 1E dc system and portions of the plant control system. Potential flooding sources include the fire protection system. The fire protection piping is located outside the rooms containing the non-Class 1E dc system and portions of the plant control system. Floodwater is removed through the floor drains and the front door. The floor in this area is sloped to carry water away from the doors to the auxiliary building to prevent water from propagating to the auxiliary building. Water that propagates under the door to the turbine building is assumed to have no effect on equipment in the turbine building due to the large floor space in the turbine building. The annex building 100′-0″ dc switchgear area is retained for further analysis due to the potential for flooding propagation from annex building 135′-3″ north air handling equipment area. Further analysis of the annex building 100′-0″ dc switchgear area is conducted under the annex building 135′-3″ north air handling equipment area.

Annex Building 100'-0" Changing and Office Area

The annex building changing and office area does not contain any components modeled in the PRA or components that could initiate a reactor trip if flooded. The only potential flooding source is the fire protection system, flooding propagation is limited to the annex building 100'-0" health physics area which does not contain any components modeled in the internal events PRA, and the floor drains. Therefore, the annex building 100'-0" changing and office area is not considered further in this analysis.

Annex Building 100'-0" Health Physics Area

The annex building health physics area does not contain any components modeled in the internal events PRA or components that could initiate a reactor trip if flooded. The only potential flooding source is the fire protection system. Flooding propagation is limited to the annex building 100'-0" changing and office area, which does not contain any equipment modeled in the internal events PRA, and the floor drains. Therefore, the annex building 100'-0" health physics area is not considered further in this analysis.

Annex Building 100'-0" Hot Machine Shop Area

The annex building hot machine shop area does not contain any components modeled in the internal events PRA or components that could initiate a reactor trip if flooded. Potential flooding sources include the fire protection system and the demineralized water transfer and storage system. The effects of flooding propagation from this area to the auxiliary building RCA is bounded by the effects of flooding in the auxiliary building RCA. Therefore, the annex building 100'-0" hot machine shop area is not considered further in this analysis.

Annex Building 100'-0" Demineralized Water Deoxygenating Room

The annex building 100'-0" demineralized water deoxygenating room contains portions of the plant control system. Potential flooding sources include the chemical and volume control system, demineralized water transfer and storage system, central chilled water system, and fire protection system. Flooding propagates outside through the stairwell. The effects from a loss of the plant control system due to flooding in this area is bounded by the effects of flooding in other areas with more potential flooding sources and that result in the loss of other systems in addition to the plant control system. Therefore, the annex building 100'-0" demineralized water deoxygenating room is not evaluated further in this analysis.

Annex Building 117'-6" Computer and Conference Room Area

The annex building computer and conference room area does not contain any components modeled in the internal events PRA or components that could initiate a reactor trip if flooded. The only potential flooding source is the fire protection system. The floor in this area is sloped to prevent propagation to the auxiliary building. Flooding can propagate down the stairwell and elevator shaft to the annex building 100'-0" dc switchgear area. However, the propagation is assumed to have no effect on components in the annex building 100'-0" dc switchgear area due to the floor drains and sloped floor in the dc switchgear area. Any propagation under the door to the turbine building is assumed to have no effect on equipment

in the turbine building. Therefore, the annex building 117'-6" computer and conference room area is not considered further in this analysis.

Annex Building 117'-6" AC Switchgear Area

The annex building ac switchgear area contains portions of the ac power system, diverse actuation system, and the plant control system. There are two rooms in this area. The fire protection system is the only potential flood source in this area. Flooding in this area is conservatively assumed to fail all components in the area. Floodwater is removed via the floor drains to the turbine building, and down the stairwell to the annex building 100'-0" changing and office area and through floor hatches to the annex building 100'-0" health physics area. The annex building 117'-6" ac switchgear area is retained for further analysis.

Annex Building 117'-6" Air Handling Unit Area

The annex building 117'-6" air handling unit area does not contain any components modeled in the internal events PRA or components that could initiate a reactor trip if flooded. The only potential flooding source is the fire protection system. Flooding propagation is down the stairwell and outside. Therefore, the annex building 117'-6" air handling unit area is not considered further in this analysis.

Annex Building 135'-3" North Air Handling Equipment Area

The annex building north air handling equipment area at elevation 135'-3" does not contain any components modeled in the internal events PRA or components that could initiate a reactor trip if flooded. Potential flooding sources include the component cooling water system, the demineralized water transfer and storage system, central chilled water system, and the fire protection system. Flooding from a double-ended rupture of the 8-in. fire main propagates from the north air handling equipment area to the auxiliary building 135'-3" VBS MCR/A&C equipment room. A curb around the stairwell and elevator shaft prevents propagation from the VBS MCR/A&C equipment room to lower levels in the auxiliary building. Floodwater in the north air handling equipment area is also removed via the floor drains to the turbine building and under the door to the turbine building. Flooding propagation to the turbine building is assumed to have no effect on components in the turbine building. Additional flooding propagation occurs via the stairwell and elevator shaft to the annex building dc switchgear area at elevation 100'-0". If the flooding propagation exceeds the capacity of the 100'-0" elevation floor drains and the propagation under the door to the turbine building and outside, water will begin to buildup in the dc switchgear area. This buildup of water could result in flooding propagation to the auxiliary building where it will propagate to the auxiliary building 66'-6" non-RCA. If not corrected, the flooding may eventually fail the Class 1E batteries on this level. In addition, if there is sufficient buildup in the annex building 100'-0" dc switchgear area, the non-Class 1E dc switchgear and batteries and plant control system will fail. Flooding propagation from a rupture of any potential flooding source except the 8-in. fire main extension is assumed to have no effect on PRA-modeled components. Therefore, the annex building 135'-3" north air handling equipment area is retained for further analysis.

Annex Building 135′-3″ Staging and Storage Area

The annex building staging and storage area does not contain any components modeled in the internal events PRA or components that could initiate a reactor trip if flooded. Potential flooding sources include the component cooling water system, demineralized water transfer and storage system, central chilled water system, and the fire protection system. Flooding could propagate to the auxiliary building RCA. Therefore, the annex building 135′-3″ staging and storage area is retained for further analysis for its potential flooding sources.

Annex Building 135′-3″ South Air Handling Equipment Area

The annex building 135′-3″ south air handling equipment area contains portions of the plant control system. Potential flooding sources include the component cooling water system, demineralized water transfer and storage system, central chilled water system, and fire protection system. Flooding propagates down the stairwell and outside. The effects from a loss of the plant control system due to flooding in this area is bounded by effects of flooding in other areas with more potential flooding sources and that result in the loss of other systems in addition to the plant control system. Therefore, the annex building 135′-3″ south air handling equipment area is not evaluated further in this analysis.

56.5.2.5 Screening of Other Buildings

The diesel generator building and circulating water pumphouse are the only other buildings that contain equipment, which if flooded, may result in a reactor trip or contain equipment modeled in the internal events PRA.

Diesel Generator Building

The diesel generator building houses two diesel generators in two rooms. Potential flooding sources include the fire protection system and two diesel fuel day tanks. The diesel fuel tanks are enclosed in separate diesel fuel day tank vaults. The fire protection system is divided into two separate diesel generator rooms. The potential for floodwater is limited to failure of the fire protection piping. Flooding propagation to the other diesel generator under doors is possible; therefore, it is conservatively assumed that both diesel generators fail upon flooding in the diesel generator building. Loss of the diesel generators does not result in a reactor trip; however, it is conservatively assumed that the operator trips the reactor upon loss of the diesel generators due to flooding. The diesel generator building is retained for further analysis.

Circulating Water Pumphouse

The circulating water pumphouse contains the circulating water pumps. A loss of both circulating water pumps leads to a loss of both condensers and a turbine trip. Flooding of the pump house is not credible, as any floodwater exits the building via the doors leading outside. It is conservatively assumed that the circulating water pumps are not qualified for spray and that a spray event results in the loss of both circulating water pumps. The circulating water pumphouse is retained for further analysis.

56.5.3 Identification of Flood-Induced Initiating Events

From the internal events PRA, the following postulated initiating events could be caused by or is the cause of a flood-induced initiating event.

- Large loss-of-coolant accident
- Medium loss-of-coolant accident
- Core makeup tank line break
- Safety injection line break
- Small loss-of-coolant accident
- Interfacing system loss-of-coolant accident
- Transient with main feedwater
- Loss of reactor coolant system flow
- Loss of main feedwater to one steam generator
- Loss of component cooling/service water
- Loss of main feedwater to both steam generators
- Loss of condenser
- Loss of compressed air
- Loss of offsite power

After a review of these initiating events, it is concluded that flood-induced loss of offsite power is not a credible flood-induced event due to the separation of electrical equipment. Flooding events that can result in a loss of main feedwater are conservatively modeled as a loss of main feedwater to both steam generators event over the loss of main feedwater to one steam generator event. In general, loss-of-coolant accident scenarios take into account the effects of flooding; therefore, none of the loss-of-coolant accident scenarios are retained for further analysis. Flooding events that can result in both a loss of main feedwater to both steam generators event and a loss of condenser event are conservatively modeled as a loss of main feedwater to both steam generators event. The loss of reactor coolant system flow and the transient with main feedwater are modeled essentially the same except the loss of reactor coolant system flow assumes the reactor coolant pumps fail and the transient with main feedwater assigns a probability that the reactor coolant pumps do not stop. The transient with main feedwater is more conservative and is used when a flooding event can result in both a loss of reactor coolant system flow and a transient with main feedwater. A flood could initiate the remaining initiating events, transient with main feedwater, loss of main feedwater to both steam generators, loss of component cooling/service water, loss of condenser, and loss of compressed air. The applicability of the chosen accident sequence is discussed in the analysis of each flooding scenario.

The area determined to be vulnerable to flooding effects in the detailed screening assessment form the basis for the various flooding scenarios and are discussed below.

Turbine Building 100'-0" Area

A rupture of the expansion joint on the circulating water system could fail the main and startup feedwater system, condensate system, component cooling water system, service water system, and ECS EC 411. This event can result in two scenarios: a loss of main feedwater to

both steam generators and a loss of component cooling/service water. To determine the more limiting scenario, both are retained for quantification.

A rupture of the component cooling water, service water, or fire protection piping can spray the component cooling/service water pumps and result in a loss of the component cooling water system or the service water system. This scenario is retained for quantification under the loss of component cooling/service water and is considered separately from the expansion joint rupture.

A rupture of the condensate or fire protection piping can spray the condensate pumps and result in failure of the condensate system. This scenario is retained for quantification under the loss of condenser and is considered separately from the expansion joint rupture.

A rupture of the main and startup feedwater or fire protection piping can spray the main and startup feedwater pumps and result in failure of the main and startup feedwater system. This scenario is retained for quantification under the loss of main feedwater to both steam generators and is considered separately from the expansion joint rupture.

Turbine Building 117'-6" Area

A rupture of the condensate, main and startup feedwater or fire protection piping at this elevation is conservatively assumed to spray and fail ECS EC 122, ECS EC 222, and ECS EC 311 in addition to all the PRA-modeled turbine building components at elevation 100'-0". As in the expansion joint rupture, this event can result in a loss of main feedwater to both steam generators and a loss of component cooling/service water. Both scenarios are retained for quantification.

Turbine Building 135'-3" Area

A rupture of the fire protection system in the north switchgear room could spray and fail ECS ES 4, ECS ES 8, and ECS EK 41. To provide representation of the south switchgear room, the fire protection lines located in the south switchgear room are included in the initiating event frequency for flooding in the north switchgear room. This scenario is retained for quantification under the transient with main feedwater.

Excluding the north and south switchgear rooms the rest of the turbine building 135'-3" area is evaluated as a single area. A rupture of the condensate, main and startup feedwater, or fire protection piping at this elevation is conservatively assumed to spray all PRA-modeled components at this elevation including the plant control system and the compressed and instrument air systems. A rupture of the condensate, main feedwater, or fire protection system at elevation 160'-0" is conservatively assumed to spray all PRA-modeled components at elevation 135'-3" general area. In addition, all PRA-modeled systems located in the turbine building at elevations 117'-6" and 100'-0" are conservatively assumed to fail. This event can result in a loss of main feedwater to both steam generators, loss of component cooling/service water, and loss of compressed air. To determine the more limiting scenario, all three are retained for quantification.

Diesel Generator Building

A rupture of the fire protection system is conservatively assumed to result in the failure of both diesel generators. The operator is conservatively assumed to trip the reactor upon loss of both diesel generators due to flooding. This scenario is retained for quantification under transient with main feedwater.

Circulating Water Pumphouse

A rupture of the circulating water piping can spray and fail both circulating water pumps. Loss of both circulating water pumps leads to a loss of both condensers and a turbine trip. This scenario is retained for quantification under loss of condenser.

Annex Building 117'-6" AC Switchgear Area

A rupture of the fire protection piping is assumed to spray all the components in one switchgear room. The water from the rupture is conservatively assumed to propagate and flood all components in the other switchgear room. The spray and flooding results in the failure of the diverse actuation system (DAS), plant control system, ECS EC 131, ECS EK 11, ECS EK 12, ECS EK 13, ECS ES 1, ECS EC 231, ECS EK 21, ECS EK 22, ECS EK 23, and ECS ES 2. This scenario is retained for quantification under transient with main feedwater.

Annex Building 135'-3" North Air Handling Equipment Area

A rupture of the 8-in. fire main extension is conservatively assumed to result in the flooding and failure of the five Class 1E dc batteries in the auxiliary building at elevation 66'-6", the non-Class 1E dc batteries and switchgear, and the plant control system. For the loss of the these systems, there must be a failure of the following:

- Failure to provide an alternate drain path by opening the front door. Opening the front door provides a sufficient drain path to prevent buildup of water in the annex building 100'-0" dc switchgear area and prevents water from propagating to the auxiliary building.

- Failure to isolate the source of flooding by stopping the fire water pumps or isolating the rupture by closing isolation valves in the fire protection system.

This scenario is retained for quantification under loss of main feedwater. In addition, a sensitivity case involving the loss of the Class 1E dc batteries in the auxiliary building at elevation 66'-6", but with no effect to the systems in the annex building 100'-0" dc switchgear area, is quantified under the loss of main feedwater.

Auxiliary Building 66'-6", 82'-6" RCA

From the detailed screening assessment a rupture of the normal residual heat removal, chemical volume and control, or fire protection piping can result in the failure of the normal residual heat removal and chemical volume and control systems. This scenario is retained for

quantification under the transient with main feedwater. The potential flooding sources from the auxiliary building 100'-0", 117'-6", 135'-3" RCA and annex building 135'-3" staging and storage area included. Chemical and volume control, normal residual heat removal, and fire protection systems are the potential flooding sources from the auxiliary building 100'-0", 117'-6" RCA. The fire protection system is a potential flooding source from the auxiliary building 135'-3" RCA and annex building 135'-3" staging and storage area.

56.5.4 Calculation of Flood-Induced Initiating Event Frequencies

For the annex building 135'-3" north air handling equipment area, the loss of main feedwater to both steam generators scenario due to rupture of the 8-in. fire main extension, credit is taken for corrective and mitigative actions. An event tree is developed to model these actions. For all the other flood-induced scenarios, no credit is taken for corrective or mitigative actions and just an initiating event frequency is determined.

The frequency of a pipe break, 8.5E-09 per hour per section, is taken from the PRA data analysis. As noted in the data presented in Chapter 32, 5 percent of the pipe breaks are severe enough to constitute a rupture. Therefore the pipe rupture frequency is 8.5E-09 x 0.05 = 4.25E-10 per hour per section.

Turbine Building 100'-0" Area

Rupture of the circulating water expansion joint for the loss of main feedwater and loss of component cooling water

- The initiating event frequency is calculated at follows:
  - Expansion joint failure rate: 2.5E-04 per expansion joint per year
  - Number of expansion joints: 8
- The circulating water expansion joint rupture frequency is:
  - 2.5E-04 x 8 = 2.00E-03 per year.

Rupture of the component cooling water, service water, or fire protection piping, resulting in loss of component cooling/service water

- To spray either the component cooling or service water pumps, the pipe rupture must occur in the vicinity of the component cooling or service water pumps. The initiating event frequency is calculated as follows:
  - Pipe rupture rate: 4.25E-10 per section per hour
  - Number of service water pipe sections: 16
  - Number of component cooling water pipe sections: 22
  - Number of fire protection pipe sections in the vicinity: 10
  - Number of hours per year: 8760

- The frequency of a rupture of the component cooling water or service water piping in the vicinity of the component cooling or service water pumps is:
  - 4.25E-10 x (16 + 22 + 10) x 8760 = 1.79E-04 per year

Rupture of the condensate or fire protection piping resulting in loss of condenser

- To spray the condensate pumps, the pipe rupture must occur in the vicinity of the pumps. The initiating event frequency is calculated as follows:
  - Pipe rupture rate: 4.25E-10 per section per hour
  - Number of condensate pipe sections in the vicinity: 26
  - Number of fire protection pipe sections in the vicinity: 10
  - Number of hours per year: 8760
- The frequency of a rupture of the condensate piping in the vicinity of the condensate pumps is:
  - 4.25E-10 x (26 + 10) x 8760 = 1.34E-04 per year

Rupture of the main and startup feedwater or fire protection piping resulting in loss of main feedwater to both steam generators

- To spray the main and startup feed water pumps, the pipe rupture must occur in the vicinity of the pumps. The initiating event frequency is calculated as follows:
  - Pipe rupture rate: 4.25E-10 per section per hour
  - Number of main and startup feedwater pipe sections in the vicinity: 56
  - Number of fire protection pipe sections in the vicinity: 10
  - Number of hours per year: 8760
- The frequency of a rupture of the main and startup feedwater or fire protection piping in the vicinity of the main or startup feedwater pumps is:
  - 4.25E-10 x (56 + 10) x 8760 = 2.46E-04 per year

Turbine Building 117'-6" Area

Rupture of the condensate, main and startup feedwater, or fire protection piping for the loss of main feedwater to both steam generators and loss of component cooling water

- The initiating event frequency is calculated as follows:
  - Pipe rupture rate: 4.25E-10 per section per hour
  - Number of condensate pipe sections at 117'-6" elevation: 150
  - Number of main and startup feedwater pipe sections at 117'-6" elevation: 150
  - Number of fire protection pipe sections at 117'-6" elevation: 70
  - Number of hours per year: 8760

- The frequency of a rupture of the condensate, main and startup feedwater and fire protection piping in the turbine building 117'-6" elevation is:
  - 4.25E-10 x (150 + 150 + 70) x 8760 = 1.38E-03 per year

Turbine Building 135'-3" Area

Rupture of the fire protection piping in the north switchgear room resulting in a transient with main feedwater

- The initiating event frequency is calculated as follows:
  - Pipe rupture rate: 4.25E-10 per section per hour
  - Number of fire protection pipe sections in north and south switchgear rooms: 10
  - Number of hours per year: 8760
- The frequency of a rupture of the fire protection piping in the north switchgear room is:
  - 4.25E-10 x 10 x 8760 = 3.72E-05 per year

Rupture of the condensate, main and startup feedwater or fire protection piping in the general area resulting in loss of main feedwater to both steam generators, loss of component cooling/service water, and loss of compressed air.

- The initiating event frequency is calculated as follows:
  - Pipe rupture rate: 4.25E-10 per section per hour
  - Number of condensate pipe sections in 135'-3" general area: 123
  - Number of main and startup feedwater pipe sections in 135'-3" general area: 123
  - Number of condensate pipe sections in 160'-0" general area: 19
  - Number of main feedwater pipe sections in 160'-0" general area: 19
  - Number of fire protection pipe sections in 135'-3" general area: 86
  - Number of fire protection pipe sections in 160'-0" general area: 24
  - Number of hours per year: 8760
- The frequency of a rupture of the condensate, main and startup feedwater, and fire protection piping in the turbine building 135'-3" and 160'-0" elevations is:
  - 4.25E-10 x (123 + 123 + 19 + 19 + 86 + 24) x 8760 = 1.47E-03 per year

Diesel Generator Building

Rupture of the fire protection piping in the diesel generator building resulting in a transient with main feedwater

- The initiating event frequency is calculated as follows:
  - Pipe rupture rate: 4.25E-10 per section per hour

- Number of fire protection pipe sections in diesel generator building: 10
- Number of hours per year: 8760

- The frequency of a rupture of the fire protection piping in the diesel generator building is:
  - 4.25E-10 x 10 x 8760 = 3.72E-05 per year

Circulating Water Pumphouse

Rupture of the circulating water piping resulting in a loss of condenser

- To spray the circulating water pumps, the pipe rupture must occur in the vicinity of the pumps. The initiating event frequency is calculated as follows:
  - Pipe rupture rate: 4.25E-10 per section per hour
  - Number of circulating water pipe sections in the vicinity: 10
  - Number of hours per year: 8760
- The frequency of a rupture of the circulating water piping in the vicinity of the pumps is:
  - 4.25E-10 x 10 x 8760 = 3.72E-05 per year

Annex Building 117′-6″ AC Switchgear Area

Rupture of the fire protection piping resulting in a transient with main feedwater

- The initiating event frequency is calculated as follows:
  - Pipe rupture rate: 4.25E-10 per section per hour
  - Number of fire protection pipe sections: 4
  - Number of hours per year: 8760
- The frequency of a rupture of the fire protection piping in the ac switchgear room is:
  - 4.25E-10 x 4 x 8760 = 1.49E-05 per year

Annex Building 135′-3″ North Air Handling Equipment Area

Rupture of the 8-in. fire main extension resulting in a loss of main feedwater to both steam generators

- A rupture of the fire main in the north air handling equipment area can result in propagation to the annex building 100′-0″ elevation. If no action is taken to mitigate or isolate the flood, the water is assumed to buildup in the annex building dc switchgear area, resulting in a loss of the non-Class 1E dc and the plant control system. In addition, the water is assumed to propagate to the auxiliary building where it flows to the auxiliary building 66′-6″ non-RCA. If no action is taken, the water will eventually rise

high enough to fail the Class 1E 24 batteries for divisions A, B, C, and D, as well as the spare battery. In analyzing this scenario, no credit is taken for auxiliary personnel to detect the flooding on their own. Human error probabilities are based on data taken from the human reliability analysis.

- The frequency of the 8-in. fire main extension rupture at-power (FMRAP) is calculated as follows:
  - Pipe rupture rate: 4.25E-10 per section per hour
  - Number of fire protection pipe sections in north air handling equipment area: 10
  - Number of hours per year: 8760
- Therefore, the rupture frequency, FMRAP, is: 4.25E-10 x 10 x 8760 = 3.72E-05 per year.
- Four operator actions are defined for flooding scenarios. These are:
  - SGDTM – security guard fails to diagnose that water is leaking and fails to mitigate by opening the annex building front door
  - CRDET – control room personnel fail to respond to the fire protection system alarms and notify auxiliary personnel to investigate
  - SGCCR – security guard fails to call control room personnel
  - FLISM – auxiliary personnel fail to isolate or mitigate the flood
- In evaluating these operator actions, the following major assumptions are made with regard to timing:
  - The time window from pipe rupture to flood isolation to preclude water from reaching the terminals of the Class 1E 24 hour batteries is judged to be 2 hours.
  - From the overall window of 2 hours, it is estimated that SGDTM has a time window of 90 minutes. The estimated actual time to complete the action is believed to be less than 2 minutes.
  - Control room alarms are expected shortly after pipe rupture; and time window for response and corrective action for CRDET is estimated to be about 30 minutes. The actual time for completing CRDET is about 5 minutes.
  - Operator action SGCCR is assigned a time window of 30 minutes. The actual time to complete this action is about 1 minute.
  - The action to locally isolate the leak (in action FLISM) is assigned a time window of about 90 minutes. The actual time for this operator action is about 45 minutes.

- It is estimated that there is a significant length of slack time to perform each of the operator actions delineated above. However, in this evaluation, no credit is taken for recovery based on the available slack time.

  - The human error probability of the security guard failure to diagnose the water leakage and failure to open the front, door (SGDTM) is estimated as follows:

    The human error probability of the security guard failing to diagnose that water is leaking is estimated to be highly unlikely, based on the security guard being located in one of the flooded areas. A human error probability of 1.0E-05 is assigned to this subtask.

    The security guard is assumed to have a procedure that lists the actions to take in the event of a large quantity of water on the floor. The nominal human error probability of the security guard error of omission when a short list procedure without check off provisions is used is: 3.8E-03. Conservatively a high stress level is assumed by assigning a multiplier of 5. The human error probability for this subtask is 3.8E-03 x 5 = 1.9E-02.

    The human error probability of SGDTM = 1.9E-02 + 1.05E-05 = 1.9E-02.

  - The probability of the control room personnel failure to respond to the fire protection system alarms and notify auxiliary personnel to investigate (CRDET) is estimated as follows:

    The failure probability of the fire protection alarm system is assumed to be the same as the failure probability of the primary controller, a pressure switch sensor for the air compressors. The failure probability of the air compressors primary controller is 1.61E-02 and is assumed to be the failure probability of the fire protection alarm system.

    The nominal human error probability of the control room personnel failure to respond to two fire protection system alarms is 1.6E-03. Conservatively assuming a high stress level, the human error probability for this subtask is 1.6E-03 x 5 = 8.0E-03.

    The nominal human error probability of the control room personnel failure to notify auxiliary personnel to investigate is estimated as an error of omission when a short list procedure without check off provisions is used. Conservatively assuming a high stress level, the human error probability for this subtask is: 5 x 3.8E-03 = 1.9E-02.

    The human error probability of CRDET is: 1.61E-02 + 8.00E-03 + 1.9E-02 = 4.31E-02.

- The human error probability of the security guard identified in SGDTM failure to call the control room within 30 minutes (SGCCR) is estimated as follows:

  The nominal human error probability of omission when a short list procedure without check off provisions is used is: 3.8E-03. Conservatively assuming a high stress level, the human error probability for this subtask is 5 x 3.8E-03 = 1.9E-02.

  SGCCR is assessed as having a high dependency on SGDTM. Therefore, the conditional human error probability of SGCCR is (1 + 1.9E-02)/2 = 5.10E-01.

- The human error probability of the auxiliary personnel isolate or mitigate the fire protection system flood is estimated as follows:

  There are three options for the auxiliary personnel to isolate or mitigate the flooding: close two valves to isolate the flooding, shutoff the fire protection system pumps to stop the flooding, or open the annex building front door to provide an alternate drain path. In this evaluation only the failure to close two valves to isolate the flooding is modeled. The other options can be viewed as recovery actions that would reduce the human error probability; therefore this task is modeled conservatively.

  The nominal human error probability of failing to locally close a valve is based on an error of commission of selecting the wrong valve that is identified by labels only is 3.8E-03. Conservatively assuming a high stress level and that two valves must be closed, the human error probability of FLISM is 2 x 5 x 3.8E-03 = 3.8E-02.

- There are three paths that lead to failure:

  - FMRAP x SGDTM x (1-CRDET) x FLISM
    Conservatively assuming that (1-CRDET) = 1
    3.72E-05 x 1.9E-02 x (1) x 3.8E-02 = 2.69E-08 per year

  - FMRAP x SGDTM x CRDET x (1-SGCCR) x FLISM
    Conservatively assuming that (1-SGCCR) = 1
    3.72E-05 x 1.9E-02 x 4.31E-02 x (1) x 3.8E-02 = 1.16E-09 per year

  - FMRAP x SGDTM x CRDET x SGCCR
    3.72E-05 x 1.9E-02 x 4.31E-02 x 5.10E-01 = 1.55E-08 per year

- Therefore, the initiating event frequency is:

  - 2.69E-08 + 1.16E-09 + 1.55E-08 = 4.36E-08 per year

Auxiliary Building 66'-6", 82'-6" RCA

Rupture of the normal residual heat removal, chemical and volume control or fire protection piping results in a transient with main feedwater.

- The initiating event frequency is calculated as follows:
  - Pipe rupture rate: 4.25E-10 per section per hour
  - Number of RNS pipe sections (including those in the auxiliary building 100'-0", 117'-6" RCA): 60
  - Number of chemical and volume control pipe sections (including those in the auxiliary building 100'-0", 117'-6" RCA): 90
  - Number of fire protection pipe sections (including those in the auxiliary building 100'-0", 117-6", 135'-3" and annex building 135'-3" staging and storage area): 74
  - Number of hours per year: 8760
- The frequency of a rupture of the normal residual heat removal, chemical and volume control, or fire protection piping in the auxiliary building RCA is:
  - 4.25E-10 x (60 + 90 + 74) x 8760 = 8.34E-04 per year

Turbine Cooling Water System

The Turbine Cooling Water System (TCS) at this time is not designed but will consist of large diameter piping and a storage tank. To capture the potential flooding risk from the system, it is treated as or similar to the rupture of the cooling/service water expansion joint. It is assigned the initiating event frequency of 2.00E-03 per year.

Heater Drain System

The Heater Drain System (HDS) at this time is not designed but will consist of large diameter piping and a storage tank. To capture the potential flooding risk from the system, it is treated as or similar to the rupture of the cooling/service water expansion joint. It is assigned the initiating event frequency of 2.00E-03 per year.

56.5.5 Quantification of At-Power Flood-Induced Events

In this section, the flooding-induced CDF is quantified for internal flooding-induced initiating events at-power. The flooding-induced initiating event frequency and component(s) or system(s) that would be disabled by the given flooding event that are used in the flooding-induced CDF quantification are determined in subsection 56.5.4 and summarized in Table 56-3.

56.5.5.1 At-Power Quantification Methodology

Given the initiating event frequency for an internal flooding event and identification of component(s) or system(s) potentially affected by the flooding, the flood-induced CDF for each flooding scenario is calculated as follows.

The first step in calculating the flooding scenario CDF is identifying an event tree model that most closely models the plant conditions and mitigation strategy for the given flooding scenario. For example, if the flooding scenario causes failure of both main feedwater pumps, the loss of main feedwater to both steam generators case is used.

Once the event tree model is selected, all associated cutsets from the total core damage output file are extracted and the initiating event frequency is changed to the flooding scenario's initiating event frequency. WLINK code is used to extract the associated cutsets by setting the associated initiating event frequency to the flooding initiating event frequency, setting all other initiating event frequencies to zero, and requantifying. Using the total core damage output file as the input for this step captures all consequential events associated with the selected event tree model.

After capturing all applicable cutsets and adjusting the initiating event frequency, the failure probabilities of components of those systems that may be disabled by the given flooding event are changed to a value of one. The revised file is then quantified to obtain the flooding scenario's CDF.

The above process is used to compute each flooding scenario except for flooding scenario 6. Flooding scenario 6 causes an event similar to the transient with main feedwater available event. It includes the loss of two major ac buses (ECS ES 1 and ECS ES 2), loss of the plant control system, and loss of the diverse actuation system. This approach gives a conservative result since this flooding scenario does not cause loss of all non-safety-related systems. The contribution to the total flooding-induced CDF due to this scenario is negligible.

The final step is assessing the flooding-induced total CDF is summing the results of the main flooding scenarios for each area.

56.5.5.2 Summary of Results

The results of the flooding-induced CDF quantification are summarized in Table 56-3. Table 56-3 delineates the internal flooding contribution to core damage for the different flooding scenarios and shows the conditions and assumptions that are used in the quantification.

Scenario 1 has the same flooding initiator with two different flooding induced initiating events. The postulated rupture of the circulation water expansion joint results in both a loss of component cooling/service water event and a loss of feedwater to both steam generators event. Modeling the rupture of the circulating water expansion joint as a loss of component cooling/service water event resulted in a higher CDF than modeling the rupture as a loss of feedwater to both steam generators event. Therefore, the loss of component cooling/service

water event bounds the loss of feedwater to both steam generators and is selected to model the flooding scenario.

Scenario 2 is similar to Scenario 1 but having a different flooding initiator, the postulated rupture of condensate system (CDS), fire protection system (FPS) or main and startup feedwater system (FWS) piping, contributing to two flooding induced initiating events of loss of cooling/service water and loss of feedwater to both steam generators. The loss of cooling/service water event results in a higher CDF and is used for this scenario.

Scenario 3 has a rupture of CDS, FPS, and FWS piping as the flooding initiator contributing to three flooding induced initiating events, loss of cooling/service water, loss of feedwater to both steam generators and loss of compressed air service. The loss of cooling/service water event results in a higher CDF and is used for this scenario.

Scenario 11 has a flooding initiator contributing to one flooding induced initiating event having two distinct damage states. The flooding induced CDF is the same for both damage states therefore only one of the two damage states is considered.

Based on the conservative assumptions used to determine the affected equipment, generating the flooding initiating event frequencies, and the conservative estimates in the quantification process, the total at-power flooding-induced CDF is 8.82E-10 per year.

56.5.5.3 Sensitivity to Feedwater System Piping Length

Since the AP1000 design has a considerably higher power level than the AP600, the feedwater system may contain more piping. To compensate for the power upgrade, each AP600 feedwater system piping rupture-flood scenario was multiplied by a factor of 1.72 (power ratio AP1000/AP600). This increased the flooding-induced CDF from 8.82E-10 to 1.09E-09 as shown in Table 56-4.

56.6 Internal Flooding During Low-Power and Shutdown Conditions

The shutdown flooding analysis reviews the effects of flooding on maintaining a safe, stable state during the modes identified in the low-power and shutdown assessment. Only changes from the at-power assessment are documented in the following subsections.

56.6.1 Detailed Screening Assessment

Screening for the shutdown analysis is based on the flood screening assessment conducted for at-power operations. For shutdown, screening is based only on the systems modeled for maintaining a safe, stable state in the low-power and shutdown assessment.

- Screening of Auxiliary Building

  There are no changes from the at-power flooding assessment.

- Screening of Containment

  There are no changes from the at-power flooding assessment.

- Screening of Turbine Building

  Areas in the turbine building are retained for further analysis only for their effects on the component cooling water and service water systems. Flooding in the turbine building north or south switchgear rooms does not result in the failure of the component cooling water, service water, or RNSs and is not considered further in this analysis. The loss of main feedwater to both steam generators, loss of compressed air, and loss of condenser events are eliminated from further analysis because these systems are not modeled for maintaining a safe, stable state during shutdown.

- Screening of Annex Building

  There are no changes from the at-power flooding assessment.

- Screening of Other Buildings

  - Diesel Generator Building

    A flooding event in the diesel generator building is conservatively assumed to result in the loss of both diesel generators; however, it does not place a demand on the plant to recover from this effect. Therefore, the diesel generator building is screened from further analysis.

  - Circulating Water Pumphouse

    The circulating water pumphouse has no components used to maintain a safe, stable state during shutdown. Therefore, the circulating water pumphouse is eliminated from further analysis.

56.6.2 Identification of Flood-Induced Initiating Events

From the low-power and shutdown assessment, the following postulated initiating events could be caused by a flood-induced initiating event:

- Loss of decay heat removal due to failure within the RNS during reactor coolant system hot/cold shutdown condition

- Loss of decay heat removal due to failure within the RNS during reactor coolant system drained condition

- Loss of decay heat removal due to failure of the component cooling water system or service water system during reactor coolant system hot/cold shutdown condition

- Loss of decay heat removal due to failure of the component cooling water system or service water system during reactor coolant system drained condition
- Postulated loss-of-coolant accident and normal residual heat removal pipe break scenarios are addressed in the low-power and shutdown assessment.

Turbine Building 100′-0″, 117′-6″, 135′-3″ Areas

A rupture of the component cooling water, service water, or fire protection piping can result in a loss of the component cooling water and/or the service water systems. This scenario is retained for quantification under loss of decay heat removal due to failure of the component cooling water system or service water system for both the reactor coolant system hot/cold shutdown and the reactor coolant system drained conditions.

Annex Building 117′-6″ ac Switchgear Area

The rupture of the fire protection piping in the annex building ac switchgear area is retained for quantification under the loss of normal residual heat removal due to failure within the RNS during reactor coolant system hot/cold shutdown and the reactor coolant system drained conditions.

Annex Building 135′-3″ North Air Handling Equipment Area

The rupture of the fire protection piping in the north air handling equipment area is retained for quantification under the loss of normal residual heat removal due to failure within the RNS during reactor coolant system hot/cold shutdown and reactor coolant system drained conditions.

Auxiliary Building 66′-6″, 82′-6″ RCA

A rupture of the chemical and volume control or fire protection systems can result in a failure of the RNS. This scenario is retained for quantification under the loss of normal residual heat removal due to failure within the RNS during reactor coolant system hot/cold shutdown and reactor coolant system drained conditions. Rupture of the RNS piping is considered separately in the low-power and shutdown assessment.

56.6.3 Calculation of Flood-Induced Initiating Event Frequencies

For the annex building 135′-3″ north air handling equipment area, the loss of decay heat removal, due to failure of the normal residual heat removal scenarios from the rupture of the 8-inch fire main extension, uses the same event tree developed for the at-power annex building 135′-3″ north air handling equipment area loss of main feedwater to both steam generators scenario except for the pipe rupture probability. For all the other flood-induced scenarios, no credit is taken for corrective or mitigative actions and only an initiating event frequency is determined.

As documented in the low-power and shutdown assessment, the frequency of the plant being at hot/cold shutdown condition is 2.87 events per year. The mission time used to calculate the initiating event frequencies during the hot/cold shutdown phase is 220 hours. The frequency of the plant being at reactor coolant system drained conditions is estimated to be 1.07 events per year. The mission time used to calculate the initiating event frequencies during reactor coolant system drained conditions is 120 hours.

Turbine Building 100'-0", 117'-6", 135'-3" Areas

Rupture of the component cooling water, service water, or fire protection piping results in loss of decay heat removal due to failure of the component cooling or service water system.

- During Hot/Cold Shutdown Condition
  - The initiating event frequency is calculated as follows:
    - Pipe rupture rate: 4.25E-10 per section per hour
    - Number of service water pipe sections in the vicinity of the pumps: 16
    - Number of component cooling water pipe sections in the vicinity of the pumps: 22
    - Number of fire protection pipe sections in the vicinity of the pumps: 10
    - Number of fire protection pipe sections in 117'-6" general area: 70
    - Number of fire protection pipe sections in 135'-3" general area: 86
    - Number of fire protection pipe sections in 160'-0" general area: 24
    - Mission time: 220 hours
    - Frequency of hot/cold shutdown: 2.87 per year
  - The failure probability is:
    4.25E-10 x (16 + 22 + 10 + 70 + 86 + 24) x 220 = 2.13E-05
  - Therefore, the initiating event frequency is:
    2.13E-05 x 2.87 = 6.11E-05 per year
- During Drained Condition
  - The initiating event frequency is calculated using the same number of pipe sections and pipe failure rate as used in the hot/cold shutdown.
    - Mission time: 120 hours
    - Frequency of drained conditions: 1.07 per year
  - The failure probability is:
    4.25E-10 x (16 + 22 + 10 + 70 + 86 + 24) x 120 = 1.16E-05
  - Therefore, the initiating event frequency is:
    1.16E-05 x 1.07 = 1.24E-05 per year

Annex Building 117'-6" AC Switchgear Area

Rupture of the fire protection piping results in a loss of decay heat removal due to failure within RNS.

- During Hot/Cold Shutdown Condition
  - The initiating event frequency is calculated as follows:
    - Pipe rupture rate: 4.25E-10 per section per hour
    - Number of fire protection pipe sections: 4
    - Mission time: 220 hours
    - Frequency of hot/cold shutdown: 2.87 per year
  - The failure probability is:
    4.25E-10 x 4 x 220 = 3.74E-07
  - Therefore, the initiating event frequency is:
    3.74E-07 x 2.87 = 1.07E-06 per year
- During Drained Condition
  - The initiating event frequency is calculated using the same number of pipe sections and pipe failure rate as used in the hot/cold shutdown.
    - Mission time: 120 hours
    - Frequency of drained condition: 1.07 per year
  - The failure probability is:
    4.25E-10 x 4 x 120 = 2.04E-07
  - Therefore, the initiating event frequency is:
    2.04E-07 x 1.07 = 2.18E-07 per year

Annex Building 135'-3" North Air Handling Equipment Area

Rupture of the 8-inch fire main extension results in a loss of decay heat removal due to failure within the RNS.

- The event tree for the rupture of the fire main extension during hot/cold shutdown or during drained conditions is the same as the at-power rupture of the 8-inch fire main extension with the exception of the rupture frequency.

- During Hot/Cold Shutdown Condition
  - The rupture frequency (FMRHC) is calculated as follows:
    - Pipe rupture rate: 4.25E-10 per section per hour
    - Number of fire protection pipe sections: 10
    - Mission time: 220 hours
    - Frequency of hot/cold shutdown: 2.87 per year
  - The failure probability is:
    4.25E-10 x 10 x 220 = 9.35E-07
  - Therefore, the rupture frequency FMRHC is:
    9.35E-07 x 2.87 = 2.68E-06 per year
  - Based on the event tree, there are three paths that lead to failure:
    - FMRAP x SGDTM x (1-CRDET) x FLISM
      Conservatively assuming (1-CRDET) = 1
      2.68E-06 x 1.9E-02 x (1) x 3.8E-02 = 1.94E-09 per year
    - FMRAP x SGDTM x CRDET x (1-SGCCR) x FLISM
      Conservatively assuming (1-SGCCR) = 1
      2.68E-06 x 1.9E-02 x 4.31E-02 x (1) x 3.8E-02 = 8.35E-11 per year
    - FMRAP x SGDTM x CRDET x SGCCR
      2.68E-06 x 1.9E-02 x 4.31E-02 x 5.10E-01 = 1.12E-09 per year
  - Therefore, the initiating event frequency is:
    1.94E-09 + 8.35E-11 + 1.12E-09 = 3.14E-09 per year
- During Drained Condition
  - The rupture frequency (FMRML) is calculated using the same number of pipe sections and pipe failure rate as used in the hot/cold shutdown.
    - Mission time: 120 hours
    - Frequency of drained condition: 1.07 per year
  - The failure probability is:
    4.25E-10 x 10 x 120 = 5.10E-07
  - Therefore, the rupture frequency FMRML is:
    5.10E-07 x 1.07 = 5.46E-07 per year

- Based on the event tree, there are three paths that lead to failure:

  - FMRAP x SGDTM x (1-CRDET) x FLISM
    Conservatively assuming (1-CRDET) = 1
    5.46-07 x 1.9E-02 x (1) x 3.8E-02 = 3.94E-10 per year

  - FMRAP x SGDTM x CRDET x (1-SGCCR) x FLISM
    Conservatively assuming (1-SGCCR) = 1
    5.46E-07 x 1.9E-02 x 4.31E-02 x (1) x 3.8E-02 = 1.70E-11 per year

  - FMRAP x SGDTM x CRDET x SGCCR
    5.46E-07 x 1.9E-02 x 4.31E-02 x 5.10E-01 = 2.28E-10 per year

- Therefore, the initiating event frequency is:
  3.94E-10 + 1.70E-11 + 2.28E-10 = 6.39E-10 per year

Auxiliary Building 66'-6", 82'-6" RCA

Rupture of the chemical and volume control or fire protection piping results in a loss of decay heat removal due to failure within the RNS.

- During Hot/Cold Shutdown Condition

  - The initiating event frequency is calculated as follows:

    - Pipe rupture rate: 4.25E-10 per section per hour
    - Number of normal residual heat removal pipe sections: 60
    - Number of chemical and volume control pipe sections: 90
    - Number of fire protection pipe sections: 74
    - Mission time: 220 hours
    - Frequency of hot/cold shutdown: 2.87 per year

  - The failure probability is:
    4.25E-10 x (60 + 90 + 74) x 220 = 2.09E-05

  - Therefore, the initiating event frequency is:
    2.09E-05 x 2.87 = 6.00E-05 per year

- During Reactor Coolant System Drained Conditions

  - The initiating event frequency is calculated using the same number of pipe sections and pipe failure rate as used in the hot/cold shutdown.

    - Mission time: 120 hours
    - Frequency of reactor coolant system drained conditions: 1.07 per year

- The failure probability is:
  4.25E-10 x (60 + 90 + 74) x 120 = 1.14E-05

- Therefore, the initiating event frequency is:
  1.14E-05 x 1.07 = 1.22E-05 per year

56.6.4 Quantification of Shutdown Internal Flooding Scenario CDFs

In this section, the CDFs of shutdown internal flooding scenarios are quantified by using the initiating event frequencies calculated in the previous section, and the conditional core damage probabilities (CCDPs) obtained from the shutdown PRA (see Table 56-6). The results are summarized in Table 56-5.

Scenario 1: Turbine Building General Area – Hot/Cold Shutdown – Rupture of Component Cooling Water System, Fire Protection System, Service Water System

The applicable initiating event from the shutdown PRA for this scenario is loss of decay heat removal due to component cooling water system/service water system failure (IEV-CCWND). Since the damaged nonsafety-related accident mitigation systems are not used in this event tree, the event tree is quantified with no additional equipment failures and with a 6.11E-05 initiating event frequency. The resulting CDF is 2.71E-11 per year.

Scenario 2: Turbine Building General Area – Reactor Coolant System Drained – Rupture of Component Cooling Water System, Fire Protection System, and Service Water System

The applicable initiating event from the shutdown PRA for this scenario is loss of decay heat removal due to component cooling water system/service water system failure (IEV-CCWD). Since the damaged nonsafety-related accident mitigation systems are not used in this event tree, the event tree is quantified with no additional equipment failures and with a 1.24E-05 initiating event frequency. The resulting CDF is 1.46E-09 per year.

Scenario 3: Annex Building 117′-6″ ac Switchgear – Hot/Cold Shutdown – Rupture of Fire Protection System

The applicable initiating event from the shutdown PRA for this scenario is loss of decay heat removal due to RNS failure (IEV-RNSND). Since the damaged accident mitigation systems include both ac power buses, this scenario is essentially the corresponding shutdown focused PRA sensitivity study-initiating event. Therefore, the shutdown focused PRA event tree IEV-RNSND is quantified with no additional equipment failures and with a 1.07E-06 initiating event frequency. Additionally, prior to the quantification, the initiating event ID "IEV-RNSND" was changed to "IEV-RNSND-F" to be able to distinguish between the flooding case where the shutdown base case event tree with the same name is used. The resulting CDF is 4.74E-13 per year.

Scenario 4: Annex Building 117′-6″ ac Switchgear – Reactor Coolant System Drained – Rupture of Fire Protection System

The applicable initiating event from the shutdown PRA for this scenario is loss of decay heat removal due RNS failure (IEV-RNSD). Since the damaged accident mitigation systems include both ac power buses, this scenario is essentially the corresponding shutdown focused PRA sensitivity study. Therefore, the shutdown focused PRA sensitivity study event tree IEV-RNSD is quantified with additional equipment failures and a 2.18E-07 initiating event frequency. Additionally, prior to the quantification, the initiating event ID "IEV-RNSD" was changed to "IEV-RNSD-F" to be able to distinguish between the flooding case where the shutdown base case event tree with the same name was used. To account for the additional equipment failure caused by the loss of both ac power buses, a factor of 10 penalty was assessed on the conditional core damage probability. The resulting CDF is:

1.18E-04 x 10 x 2.18E-07 = 2.57E-10 per year.

Scenario 5: Annex Building 135′-3″ North Air Handling Equipment Area – Hot/Cold Shutdown – Rupture of 8-inch Fire Main Extension

The applicable initiating event from the shutdown PRA for this scenario is loss of decay heat removal due to RNS failure (IEV-RNSND). Due to the small initiating event frequency, 3.14E-09, and the plant systems that would remain available to respond to this event, this initiator was not explicitly quantified. Although the class 1E dc power batteries are failed, the ac feeds to the inverters and to the protection and safety monitoring system (PMS) cabinets remain intact and the safety-related systems should operate as expected. The non-class 1E dc failures would fail the diverse actuation system backup signals in the shutdown model. Conceding a reduced reliability of the signals to the safety-related systems, the flooding CDF for this initiator is estimated by putting a factor of 100 penalty on the conditional core damage probability for the loss of decay heat removal due to RNS failure (hot/cold shutdown):

4.43E-07 x 100 x 3.14E-09 = 1.39E-13 per year

Scenario 6: Annex Building 135′-3″ North Air Handling Equipment Area – Reactor Coolant System Drained – Rupture of 8-inch Fire Main Extension

The applicable initiating event from the shutdown PRA for this scenario is loss of decay heat removal due to RNS failure (IEV-RNSD). Due to the small initiating event frequency, 6.39E-10, and the plant systems that would remain available to respond to this event, this initiator is not explicitly quantified. Although the class 1E dc power batteries are failed, the ac feeds to the inverters and to the protection and safety monitoring system cabinets remain intact and the safety-related systems should operate as expected. The non-class 1E dc failures would fail the diverse actuation system backup signals in the shutdown model. Conceding a reduced reliability of the signals to the safety-related systems, the flooding CDF for this initiator is estimated by putting a factor of 100 penalty on the conditional core damage probability for the loss of decay heat removal due to RNS failure (reactor coolant system drained):

1.18E-04 x 100 x 6.39E-10 = 7.53E-12 per year

Scenario 7: Auxiliary Building RCA Portion - Hot/Cold Shutdown - Rupture of Chemical and Volume Control System, Fire Protection System

The applicable initiating event from the shutdown PRA for this scenario is loss of decay heat removal due to RNS failure (IEV-RNSND). Since the damaged nonsafety-related accident mitigation system is the initiator and is not used for mitigation in this event tree, the event tree is quantified with no additional equipment failures and with a 6.00E-05 initiating event frequency. The resulting CDF is 2.66E-11 per year.

Scenario 8: Auxiliary Building RCA Portion - Reactor Coolant System Drained - Rupture of Chemical and Volume Control System, Fire Protection System

The applicable initiating event from the shutdown PRA for this scenario is loss of decay heat removal due to RNS failure (IEV-RNSD). Since the damaged nonsafety-related accident mitigation system is the initiator and is not used for mitigation in this event tree, the event tree is quantified with no additional equipment failures and with a 1.22E-05 initiating event frequency. The resulting CDF is 1.44E-09 per year.

56.6.5 Total Shutdown Flooding Core Damage Frequency

Based on the conservative assumptions used to generate the flooding initiating event frequencies and the conservative estimates in the quantification process, the total shutdown flooding CDF is 3.22E-09.

The results of the shutdown flood-induced CDF quantification are summarized in Table 56-5. The eight dominant flooding accident sequences are also shown in the Table 56-5.

56.6.6 Seismically Induced Flooding

Seismic events could threaten the integrity of tanks and other flooding sources. The consequences of seismic events are modeled in the seismic margin study and in the AP1000 DCD.

56.6.7 Flooding Hazards During Refueling Outages

Flooding events during refueling outages are evaluated qualitatively. Flooding can occur during refueling outages when isolation procedures are not properly followed or when tanks are overfilled. With maintenance procedures that address potential flooding problems, flooding incidents are avoided. It is assumed that administrative controls during refueling outages would effectively mitigate flooding.

56.6.8 Summary of Results

A PRA internal flooding analysis is performed for low-power and shutdown events based on the AP1000 DCD, available detailed design information, and conservative assumptions or engineering judgement.

The minimization of potential flooding sources in the safety-related areas, in addition to the physical separation of redundant safety-related components and systems from each other and from nonsafety-related components, reduces the consequences of internal flooding. The CDFs arising from flooding events during shutdown operations are not appreciable contributors to overall AP1000 CDFs.

The internal flooding analysis conservatively assumes that flooding of nonsafety-related equipment results in system failure of the affected system. This resulted in a higher flooding-induced CDF at shutdown than at-power because of the use of the nonsafety-related RNS as the primary means of decay heat removal at shutdown.

The top two shutdown flooding scenarios comprise 90 percent of the shutdown flooding-induced CDF. The dominant shutdown flooding core damage initiators are as follows:

- Shutdown flooding scenario 2, loss of decay heat removal due to failure of the component cooling water system or service water system during reactor coolant system drained condition. This is due to a rupture of component cooling water, fire protection, or service water piping in the turbine building general area. This initiator contributes 45 percent of the shutdown flooding CDF.

- Shutdown flooding scenario 8, loss of decay heat removal due to failure within the RNS during reactor coolant system drained condition. This is due to a rupture of chemical and volume control or fire protection piping in the auxiliary building RCA. This initiator contributes 45 percent of the shutdown flooding core damage.

56.7 Large Release Frequency Estimates for Internal Flooding

The large release frequency for internal flooding events is estimated by using the already calculated conditional containment failure probabilities for at-power and shutdown events. These probabilities are 0.081 and 0.1667, respectively (taken from Chapters 43 and 54). Thus the LRF estimates are:

- LRF (internal flooding at-power) = 8.82E-010 * 0.081 = 7.14E-11/yr
- LRF (internal flooding during shutdown) = 3.22E-09 * 0.1667 = 5.37E-10/yr.

Both of these LRF estimates are low and indicate a low plant risk from internal flooding events in AP1000.

56.8 Results of AP1000 Internal Flooding Analysis

In this section, a quantitative internal flooding PRA of AP1000 design is performed to estimate plant CDF and LRF for at-power and during low-power and shutdown events. The results are:

	Plant CDF	Plant LRF
Internal Flooding During At-Power Events	8.82E-10/yr	7.14E-11/yr
Internal Flooding During Low-Power and Shutdown Events	3.22E-09/yr	5.37E-10/yr

The minimization of potential flooding sources in the safety-related areas, in addition to the physical separation of redundant safety-related components and systems from each other and from nonsafety-related components, reduces the consequences of internal flooding. The core damage and large release frequencies arising from flooding events during shutdown operations are not appreciable contributors to overall AP1000 risk.

Table 56-1 (Sheet 1 of 3)

FLOODING ANALYSIS INITIAL SCREENING RESULTS

Building Area Description	Reactor Trip	PRA System	Flood Sources
Auxiliary Building 66'-6" non-RCA	Yes	IDS	DWS, FPS
Auxiliary Building 66'-6" RCA	No	RNS	CCS, CVS, DWS, FPS, RNS, SFS, VWS, VYS, WLS
Auxiliary Building 82'-6" non-RCA	Yes	ECS, IDS	DWS, FPS
Auxiliary Building 82'-6" RCA	No	CVS, RNS, Containment Isolation	CCS, CVS, DWS, FPS, RNS, SFS, VWS, VYS, WLS
Auxiliary Building 100'-0" Electrical non-RCA	Yes	ECS, PLS, PMS	FPS
Auxiliary Building 100'-0" Valve/Piping Penetration Room	Yes	SGS, CVS, Containment Isolation	DWS, FPS, SGS, VWS, VYS
Auxiliary Building 100'-0" RCA	No	No	CCS, CVS, DWS, FPS, RNS, SFS, VWS, VYS, WLS
Auxiliary Building 100'-0" Middle Annulus RCA	No	No	CCS, CVS, DWS, FPS, SFS, VWS, WLS
Auxiliary Building 117'-6" Main Control non-RCA	Yes	PLS, PMS	PWS
Auxiliary Building 117'-6" MSIV Compartments	Yes	SGS, Containment Isolation	DWS, FWS, SGS, VWS, VYS
Auxiliary Building 117'-6" Lower VBS B&D Equipment Room	No	CAS, CCS, PXS Containment Isolation	CCS, VWS
Auxiliary Building 117'-6" Electrical non-RCA	Yes	ECS, PLS, PMS	FPS
Auxiliary Building 117'-6" RCA	No	CVS, Containment Isolation	CCS, CVS, DWS, FPS, SFS, WLS
Auxiliary Building 135'-3" VBS MCR/A&C Equipment Room	No	VWS	DWS, FPS, VWS

Table 56-1 (Sheet 2 of 3)

FLOODING ANALYSIS INITIAL SCREENING RESULTS

Building Area Description	Reactor Trip	PRA System	Flood Sources
Auxiliary Building 135'-3" Upper VBS B&D Equipment Room	No	No	VWS
Auxiliary Building 135'-3" RCA	No	No	DWS, CCS, FPS
Auxiliary Building 135'-3" RCA Staging Area	No	No	No
Auxiliary Building 135'-3" Upper VAS Equipment Room	No	No	No
Auxiliary Building 160'-6" North and South Areas	No	No	No
Auxiliary Building 180'-0" PCS Valve Room	No	PCS	PCS
Containment RCS Area	Yes	ADS, CCS, CVS	CCS, CVS, PXS, RCS, RNS, SFS, SGS
Containment 82'-6" PXS-A Area	No	PXS, Containment Isolation	CVS, PXS, RNS, SFS
Containment 82'-6" PXS-B Area	No	PXS, RNS, Containment Isolation	CVS, PXS, RNS
Containment 82'-6" CVS Area	No	CVS	CVS, WLS
Containment 117'-6" Area	Yes	PLS	CCS, CVS, PXS, RCS, RNS, SFS, SGS
Containment 135'-3" Area	No	No	No*
Containment 160'-6" Area	No	ADS	PXS, RCS, SGS
Turbine Building 100'-0" Area	Yes	CCS, CDS, ECS, FWS, SWS	ASS, CCS, CDS, CPS, CWS, DWS, FPS, FWS, HDS, SWS, TCS, VYS

* No additional flooding sources identified at this containment elevation

Table 56-1 (Sheet 3 of 3)

FLOODING ANALYSIS INITIAL SCREENING RESULTS

Building Area Description	Reactor Trip	PRA System	Flood Sources
Turbine Building 117'-6" Area	Yes	ECS, FWS	CDS, DWS, FPS, FWS, HDS, TCS, VYS
Turbine Building 135'-3" Area	Yes	CAS, CDS, ECS, FWS, PLS	CDS, DWS, FPS, FWS, HDS, TCS, VYS
Turbine Building 160'-0" Area	Yes	CDS	CDS, DWS, FPS, FWS, HDS, TCS, VYS
Annex Building 100'-0" DC Switchgear Area	Yes	EDS, PLS	FPS
Annex Building 100'-0" Changing & Office Area	No	No	FPS
Annex Building 100'-0" Health Physics Area	No	No	FPS
Annex Building 100'-0" Hot Machine Shop Area	No	No	FPS, DWS
Annex Building 100'-0" Demineralized Water Deoxygenating Room	Yes	PLS	CVS, DWS, FPS, VWS
Annex Building 117'-6" Computer & Conference Room Area	No	No	FPS
Annex Building 117'-6" AC Switchgear Area	Yes	DAS, ECS, PLS	FPS
Annex Building 117'-6" Air Handling Unit Area	No	No	FPS
Annex Building 135'-3" North Air Handling Equipment Area	No	No	CCS, DWS, FPS, VWS
Annex Building 135'-3" Staging and Storage Area	No	No	CCS, DWS, FPS, VWS
Annex Building 135'-3" South Air Handling Equipment Area	Yes	PLS	CCS, DWS, FPS, VWS
Diesel Generator Building	No	ECS	FPS
Circulating Water Pumphouse	Yes	CWS	CWS

Table 56-2 (Sheet 1 of 5)

AT-POWER DETAILED SCREENING RESULTS

Building Area	Results	Flooding Effects*	Spray Effects*	Propagation Effects Out of Area	Propagation Effects into Area
Auxiliary Building 66'-6" non-RCA	Retained	None	None	None	From Annex Building 135'-3" North Air Handling Equipment Area – fails Class 1E 24 hour batteries
Auxiliary Building 66'-6" RCA	Retained	Fails RNS	Fails RNS	None	From Auxiliary Building 82'-6" 100'-0", 117'-6", 135'-3" RCAs and Annex Building 135'-3" Staging & Storage Area – fails RNS
Auxiliary Building 82'-6" non-RCA	Eliminated	None	None	None	None
Auxiliary Building 82'-6" RCA	Retained	None	Fails CVS and RNS	To Auxiliary Building 66'-6" RCA – fails RNS	From Auxiliary Building 100'-0", 117'-6", 135'-3" RCAs and Annex Building 135'-3" Staging & Storage Area – fails CVS and RNS
Auxiliary Building 100'-0" Electrical non-RCA	Eliminated	None	None	None	None
Auxiliary Building 100'-0" Valve/Piping Penetration Room	Eliminated	None	None	None	None
Auxiliary Building 100'-0" RCA	Retained	None	None	To Auxiliary Building 82'-6" RCA – fails CVS and RNS To Auxiliary Building 66'-6" RCA – fails RNS	None
Auxiliary Building 100'-0" Middle Annulus RCA	Eliminated	None	None	None	None

Table 56-2 (Sheet 2 of 5)

AT-POWER DETAILED SCREENING RESULTS

Building Area	Results	Flooding Effects*	Spray Effects*	Propagation Effects Out of Area	Propagation Effects into Area
Auxiliary Building 117′-6″ Main Control non-RCA	Eliminated	None	None	None	None
Auxiliary Building 117′-6″ MSIV Compartments	Eliminated	None	Failure of FWS to 1 steam generator is bounded by failure of FWS to 2 steam generators in the Turbine Building	None	None
Auxiliary Building 117′-6″ Lower VBS B&D Equipment Room	Eliminated	None	Failure of CAS is bounded by failure of CAS and other systems in the Turbine Building	None	None
Auxiliary Building 117′-6″ Electrical non-RCA	Eliminated	None	None	None	None
Auxiliary Building 117′-6″ RCA	Retained	None	None	To Auxiliary Building 82′-6″ RCA – fails CVS and RNS To Auxiliary Building 66′-6″ RCA – fails RNS	None
Auxiliary Building 135′-3″ VBS MCR/A&C Equipment Room	Eliminated	None	None	None	None
Auxiliary Building 135′-3″ Upper VBS B&D Equipment Room	Eliminated	None	None	None	None
Auxiliary Building 135′-3″ RCA	Retained	None	None	To Auxiliary Building 82′-6″ RCA – fails CVS and RNS To Auxiliary Building 66′-6″ RCA – fails RNS	None
Auxiliary Building 180′-0″ PCS Valve Room	Eliminated	None	None	None	None

Table 56-2 (Sheet 3 of 5)

AT-POWER DETAILED SCREENING RESULTS

Building Area	Results	Flooding Effects*	Spray Effects*	Propagation Effects Out of Area	Propagation Effects into Area
Containment RCS Area	Eliminated	None	None	None	None
Containment 82'-6" PXS-A Area	Eliminated	None	None	None	None
Containment 82'-6" PXS-B Area	Eliminated	None	None	None	None
Containment 82'-6" CVS Area	Eliminated	Failure of CVS is bounded by failure of CVS and RNS in auxiliary building RCA	Failure of CVS is bounded by failure of CVS and RNS in auxiliary building RCA	None	None
Containment 117'-6" Area	Eliminated	None	Failure of PLS is bounded by failure of PLS and other systems in Turbine Building 135'-3" Area	None	None
Containment 160'-6"	Eliminated	None	None	None	None
Turbine Building 100'-0" Area	Retained	Fails CCS, CDS, ECS, FWS, and SWS	Fails CCS, CDS, FWS, or SWS	None	From Turbine Building 117'-6", 135'-3", 160'-0" Areas - fails CCS, CDS, ECS, FWS, and SWS
Turbine Building 117'-6" Area	Retained	None	Fails ECS and FWS	To Turbine Building 100'-0" Area – fails CCS, CDS, ECS, FWS, and SWS	From Turbine Building 135'-3", 160'-0" Areas – fails ECS and FWS
Turbine Building 135'-3" Area	Retained	None	Spray in general area fails CAS, CDS, FWS and PLS Spray in switchgear rooms fails ECS	To Turbine Building 117'-6" Area – fails ECS and FWS To Turbine Building 100'-0" Area – fails CCS, CDS, ECS, FWS, and SWS	From Turbine Building 160'-0" Area – fails CAS, CDS, FWS, and PLS

Table 56-2 (Sheet 4 of 5)

AT-POWER DETAILED SCREENING RESULTS

Building Area	Results	Flooding Effects*	Spray Effects*	Propagation Effects Out of Area	Propagation Effects into Area
Turbine Building 160'-0" Area	Retained	None	Fails CDS	To Turbine Building 135'-3" Area – fails CAS, CDS, FWS and PLS To Turbine Building 117'-6" Area – fails ECS and FWS To Turbine Building 100'-0" Area – fails CCS, CDS, ECS, FWS, and SWS	None
Annex Building 100'-0" DC Switchgear Area	Retained	None	None	None	From Annex Building 135'-3" North Air Handling Equipment Area – fails EDS and PLS
Annex Building 100'-0" Changing & Office Area	Eliminated	None	None	None	None
Annex Building 100'-0" Health Physics Area	Eliminated	None	None	None	None
Annex Building 100'-0" Hot Machine Shop Area	Eliminated	None	None	None	None
Annex Building 100'-0" Demineralized Water Deoxygenating Room	Eliminated	Failure of PLS is bounded by failure of PLS and other systems in 135'-3"	Failure of PLS is bounded by failure of PLS and other systems in Turbine Building 135'-3" Area	None	None

Table 56-2 (Sheet 5 of 5)

AT-POWER DETAILED SCREENING RESULTS

Building Area	Results	Flooding Effects*	Spray Effects*	Propagation Effects Out of Area	Propagation Effects into Area
Annex Building 117'-6" Computer & Conference Room Area	Eliminated	None	None	None	None
Annex Building 117'-6" AC Switchgear Area	Retained	Fails ECS	Fails ECS	None	None
Annex Building 117'-6" Air Handling Unit Area	Eliminated	None	None	None	None
Annex Building 135'-3" North Air Handling Equipment Area	Retained	None	None	To Annex Building 100'-0" DC Switchgear Area – fails EDS and PLS To Auxiliary Building 66'-6" non-RCA – fails Class 1E 24 hour batteries	None
Annex Building 135'-3" Staging & Storage Area	Retained	None	None	To Auxiliary Building 82'-6" RCA – fails CVS & RNS To Auxiliary Building 66'-6" RCA – fails RNS	None
Annex Building 135'-3" South Air Handling Equipment Area	Eliminated	None	Failure of PLS is bounded by failure of PLS and other systems in Turbine Building 135'-3"	None	None
Diesel Generator Building	Retained	Fails both DGs	Fails one diesel generator	None	None
Circulating Water Pumphouse	Retained	None	Fails CWS	None	None

* Effects are from sources in the area

Table 56-3 (Sheet 1 of 6)

AT-POWER FLOODING-INDUCED CORE DAMAGE FREQUENCY QUANTIFICATION SUMMARY RESULTS

Flooding Scenario	Flooding-Induced Initiating Event	Accident Mitigating System Damage	Flooding-Induced IEV Frequency	Conditional Core Damage Probability	Flooding-Induced Core Damage Frequency	Comments
1. Turbine 100'-0" General Area • Rupture of expansion joint on CWS	Loss of component cooling/service water event	Damage to the following non-safety-related systems: Component cooling water system; condensate system, non-class 1E ac ECS EC411; main and startup feedwater system and service water system	2.00E-03	8.96E-08	1.79E-10	
	Loss of feedwater to both steam generators event	Damage to the following non-safety-related systems: Component cooling water system; condensate system, non-class 1E ac ECS EC411; main and startup feedwater system and service water system	2.00E-03	7.26E-08		Flooding-induced CDF of 1.45E-10 was not used to calculate total CDF
2. Turbine 117'-6" General Area • Rupture of CDS, FPS, or FWS piping	Loss of component cooling/service water event	Damage to the following non-safety-related systems: Component cooling water system, condensate system, non-class 1E ac ECS EC 122, ECS EC 222, ECS EC 411, ECS EC 411, main and startup feedwater system, and service water system	1.38E-03	8.97E-08	1.24E-10	

Table 56-3 (Sheet 2 of 6)

AT-POWER FLOODING-INDUCED CORE DAMAGE FREQUENCY QUANTIFICATION SUMMARY RESULTS

Flooding Scenario	Flooding-Induced Initiating Event	Accident Mitigating System Damage	Flooding-Induced IEV Frequency	Conditional Core Damage Probability	Flooding-Induced Core Damage Frequency	Comments
	Loss of feedwater to both steam generators event	Damage to the following non-safety-related systems: Component cooling water system, condensate system, non-class 1E ac ECS EC 122, ECS EC 222, ECS EC 411, ECS EC 411, main and startup feedwater system, and service water system	1.38E-03	7.26E-08		Flooding-induced CDF of 1.00E-10 was not used to calculate total CDF
3. Turbine 135'-3" General Area • Rupture of CDS, FPS, or FWS piping	Loss of component cooling/service water event	Damage to the following non-safety-related systems: Compressed air system, component cooling water system, condensate system, non-class 1E ac ECS EC 122, ECS EC 222, ECS EC 311, ECS EC 411; main and startup feedwater system; plant control system, and service water system	1.47E-3	9.18E-08		Flooding-induced CDF of 1.35E-10 was not used to calculate total CDF
	Loss of feedwater to both steam generators event	Damage to the following non-safety-related systems: Compressed air system, component cooling water system, condensate system, non-class 1E ac ECS EC 122, ECS EC 222, ECS EC 311, ECS EC 411; main and startup feedwater system; plant control system, and service water system	1.47E-3	9.43E-08	1.39E-10	

Table 56-3 (Sheet 3 of 6)

AT-POWER FLOODING-INDUCED CORE DAMAGE FREQUENCY QUANTIFICATION SUMMARY RESULTS

Flooding Scenario	Flooding-Induced Initiating Event	Accident Mitigating System Damage	Flooding-Induced IEV Frequency	Conditional Core Damage Probability	Flooding-Induced Core Damage Frequency	Comments
	Loss of compressed air event	Damage to the following non-safety-related systems: Compressed air system, component cooling water system, condensate system, non-class 1E ac ECS EC 122, ECS EC 222, ECS EC 311, ECS EC 411; main and startup feedwater system; plant control system, and service water system	1.47E-3	7.10E-08		Flooding-induced CDF of 1.04E-10 was not used to calculate total CDF
4. Turbine 135'-3" North 4160 volt Switchgear Room • Rupture of CDS, FPS or FWS piping	Transient with main feedwater available event	Damage to the following non-safety-related systems: Non-class 1E ac ECS ES 4, ECS ES 8, ECS EK 41	3.72E-05	6.67E-08	2.48E-12	
5. Diesel Generator Building • Rupture of FPS piping	Transient with main feedwater available event	Damage to both diesel generators (non-safety-related system)	3.72E-05	2.84E-09	1.06E-13	

Table 56-3 (Sheet 4 of 6)

AT-POWER FLOODING-INDUCED CORE DAMAGE FREQUENCY QUANTIFICATION SUMMARY RESULTS

Flooding Scenario	Flooding-Induced Initiating Event	Accident Mitigating System Damage	Flooding-Induced IEV Frequency	Conditional Core Damage Probability	Flooding-Induced Core Damage Frequency	Comments
6. Circulating Water Pumphouse • Rupture of CWS piping	Loss of condenser event	Damage to the circulating water system	3.72E-05	1.11E-08	4.13E-13	
7. Turbine 100′-0″ General Area • Rupture of CCS, FPS, or SWS piping	Loss of component cooling/service water event	Damage to the component cooling water and service water system	1.79E-4	8.77E-08	1.57E-11	
8. Turbine 100′-0″ General Area • Rupture of FWS, or FPS piping	Loss of feedwater to both steam generators event	Damage to the main and startup feedwater system	2.46E-04	7.02E-08	1.73E-11	
9. Turbine 100′-0″ General Area • Rupture of CDS, or FPS piping	Loss of condenser event	Damage to the condensate system	1.34E-04	1.11E-08	1.49E-12	
10. Annex Building 117′-6″ AC Switchgear • Rupture of FPS piping	Transient with main feedwater available event	Damage to the following non-safety-related systems: Diverse actuation system, non-class 1E ac ECS EC 131, ECS EK 11, ECS EK 12, ECS EK 13, ECS ES 1, ECS EC 231, ECS EK 21, ECS EK 22, ECS EK 23, ECS EK 23, ECS ES 2; plant control system	1.49E-5	2.60E-09	3.87E-14	

Table 56-3 (Sheet 5 of 6)

AT-POWER FLOODING-INDUCED CORE DAMAGE FREQUENCY QUANTIFICATION SUMMARY RESULTS

Flooding Scenario	Flooding-Induced Initiating Event	Accident Mitigating System Damage	Flooding-Induced IEV Frequency	Conditional Core Damage Probability	Flooding-Induced Core Damage Frequency	Comments
11. Annex Building 135′-3″ North Air Handling Area • Rupture of 8″ fire main extension	Loss of feedwater to both steam generators event	Damage to the following safety-related systems: Class 1E 24 hour batteries for divisions A, B. C and D; Class 1E 24 hour spare battery. Note that class 1E division B and C 72-hour batteries remain intact. Damage to the following non-safety-related systems: Non-class 1E dc EDS1 DD 113, EDS1 DS 1, EDS1 DS 11, EDS1 EA 1, EDS1 EA 11, EDS1 EA 2, EDS3 DD 111, EDS3 DS 1, EDS3 DS 11, EDS3 EA 1, EDS3 EA 11, EDS3 EA 12, EDS3 EA 2, EDS2 DS 11, EDS2 DS 1, EDS2 DS 111, EDS2 EA 1, EDS2 EA 11, EDS2 EA 2, EDS4 DD 111, EDS4 DD 112, EDS4 DS 1, EDS4 DS 11, EDS1 DB 1, EDS2 DB1, EDS3 DB 1, EDS4 DB 1, plant control system	4.36E-08	9.78E-04	4.26E-11	
	Loss of feedwater to both steam generators event	Damage to the following safety-related systems: Class 1E 24-hour batteries for divisions A, B, C, D; Class 1E 24-hour spare battery. Note that class 1E division B and C 72-hour batteries remain intact	4.36E-08	9.78E-04		Flooding-induced CDF of 4.26E-11 was not used to calculate total CDF

Table 56-3 (Sheet 6 of 6)

AT-POWER FLOODING-INDUCED CORE DAMAGE FREQUENCY QUANTIFICATION SUMMARY RESULTS

Flooding Scenario	Flooding-Induced Initiating Event	Accident Mitigating System Damage	Flooding-Induced IEV Frequency	Conditional Core Damage Probability	Flooding-Induced Core Damage Frequency	Comments
12. Annex Building 82′-6″ & 66′-6″ RCA Portion • Rupture of CVS, FPS or RNS piping	Transient with main feedwater available event	Damage to the non-safety-related systems: Normal residual heat removal and chemical and volume control system	8.34E-04	2.58E-09	2.15E-12	
13. Turbine 100′-0″ General Area • Rupture of TCS	Loss of component cooling/ service water event	Damage to the following non-safety-related systems: Component cooling water system; condensate system, non-class 1E ac ECS EC411; main and startup feedwater system and service water system	2.00E-03	8.96E-08	1.79E-10	
14. Turbine 100′-0″ General Area • Rupture of HDS	Loss of component cooling/ service water event	Damage to the following non-safety-related systems: Component cooling water system; condensate system, non-class 1E ac ECS EC411; main and startup feedwater system and service water system	2.00E-03	8.96E-08	1.79E-10	
					8.82E-10	

Table 56-4

POWER UPGRADE DIFFERENCE BETWEEN AP1000 AND AP600

Flooding Scenario	Flooding-Induced IEV Frequency	Conditional Core Damage Probability	Flooding-Induced Core Damage Frequency	Percent of Total	Power Upgrade from AP600 to AP1000
1. Turbine 100'-0" General Area • Rupture of expansion joint on CWS	2.00E-03	8.96E-08	1.79E-10	20.31%	
2. Turbine 117'-6" General Area • Rupture of CDS, FPS, or FWS piping	1.38E-03	8.97E-08	1.24E-10	14.03%	2.13E-10
3. Turbine 135'-3" General Area • Rupture of CDS, FPS, or FWS piping	1.47E-03	9.43E-08	1.39E-10	15.71%	2.38E-10
4. Turbine 135'-3" North 4160 volt Switchgear Room • Rupture of CDS, FPS, or FWS piping	3.72E-05	6.67E-08	2.48E-12	0.28%	4.27E-12
5. Diesel Generator Building • Rupture of FPS piping	3.72E-05	2.84E-09	1.06E-13	0.01%	
6. Circulating Water Pumphouse • Rupture of CWS piping	3.72E-05	1.11E-08	4.13E-13	0.05%	
7. Turbine 100'-0" General Area • Rupture of CCS, FPS, or SWS piping	1.79E-04	8.77E-08	1.57E-11	1.78%	
8. Turbine 100'-0" General Area • Rupture of FWS, or FPS piping	2.46E-04	7.02E-08	1.73E-11	1.96%	2.97E-11
9. Turbine 100'-0" General Area • Rupture of CDS, or FPS piping	1.34E-04	1.11E-08	1.49E-12	0.17%	
10. Annex Building 117'-6" AC Switchgear • Rupture of FPS piping	1.49E-05	2.60E-09	3.87E-14	0.00%	
11. Annex Building 135'-3" North Air Handling Area • Rupture of 8" fire main extension	4.36E-08	9.78E-04	4.26E-11	4.83%	
12. Annex Building 82'-6" & 66'-6" RCA Portion • Rupture of CVS, FPS or RNS piping	8.34E-04	2.58E-09	2.15E-12	0.24%	
13. Turbine 100'-0" General Area • Rupture of expansion joint on CWS	2.00E-03	8.96E-08	1.79E-10	20.31%	
14. Turbine 100'-0" General Area • Rupture of expansion joint on CWS	2.00E-03	8.96E-08	1.79E-10	20.31%	
Total			8.82E-10	100.00%	1.09E-09

Table 56-5

SHUTDOWN FLOODING PRA

Scenario No.	Initiating Event Frequency	Conditional Core Damage Probability (CCDP)	Core Damage Frequency	Percentage Contribution	Initiating Event	Initiating Event CDP Modified
1	6.11E-05	4.43E-07	2.71E-11	0.84	IEV-CCWND	
2	1.24E-05	1.18E-04	1.46E-09	45.41	IEV-CCWD	
3	1.07E-06	4.43E-07	4.74E-13	0.01	IEV-RNSND	
4	2.18E-07	1.18E-03	2.57E-10	7.98	IEV-RNSD	Factor of 10
5	3.14E-09	4.43E-05	1.39E-13	0.00	IEV-RNSND	Factor of 100
6	6.39E-10	1.18E-02	7.53E-12	0.23	IEV-RNSD	Factor of 100
7	6.00E-05	4.43E-07	2.66E-11	0.83	IEV-RNSND	
8	1.22E-05	1.18E-04	1.44E-09	44.68	IEV-RNSD	
Sum =	1.47E-04		3.22E-09	100.00		

Note:
The conditional core damage probabilities are obtained from the AP1000 PRA Shutdown Risk Evaluation – Level 1 Analysis (see Table 56-6).

Table 56-6

SHUTDOWN INITIATING EVENT CCDPs

Initiating Event	Initiating Event Frequency	Conditional Core Damage Probability	Core Damage Frequency	Percentage Contribution	System Condition	Initiating Event Description
IEV-CCWD	7.16E-04	1.178E-04	8.431E-08	68.5	DRAINED	Loss of CCS/SWS with RCS drained initiating event occurs
IEV-LOSPD	5.28E-03	3.293E-06	1.739E-08	14.13	DRAINED	Loss of offsite power initiating event occurs with RCS drained
IEV-RNSD	9.69E-05	1.178E-04	1.141E-08	9.27	DRAINED	Loss of RNS with RCS drained initiating event occurs
IEV-RCSOD	5.28E-06	7.102E-04	3.750E-09	3.05	DRAINED	Over draining of RCS during drain down to mid-loop initiating event
IEV-LOCA24ND	1.73E-05	1.173E-04	2.029E-09	1.65		LOCA/RNS-V024 opens initiating event occurs with RCS filled
IEV-CCWND	3.99E-03	4.434E-07	1.769E-09	1.44		Loss of CCS/SWS with RCS filled initiating event occurs
IEV-LOCA24D	1.15E-05	1.177E-04	1.354E-09	1.1	DRAINED	LOCA/RNS-V024 opens initiating event occurs with RCS drained
IEV-LOSPND	1.82E-02	2.804E-08	5.103E-10	0.41		Loss of offsite power initiating event occurs with RCS filled
IEV-RNSND	1.02E-03	4.432E-07	4.521E-10	0.37		Loss of RNS with RCS filled initiating event occurs
IEV-LOCAPRND	1.61E-05	7.236E-06	1.165E-10	0.09		LOCA/RNS pipe rupture with RCS filled initiating event occurs
Sum =	2.94E-02		1.231E-07	100		

CHAPTER 59

PRA RESULTS AND INSIGHTS

59.1 Introduction

This chapter summarizes the use of the AP1000 PRA in the design process, PRA results and insights, plant features important to reducing risk, and PRA input to the design certification process.

AP1000 is expected to achieve a higher standard of severe accident safety performance than current operating plants, because both prevention and mitigation of severe accidents have been addressed during the design stage, taking advantage of PRA insights, PRA success criteria analysis, severe accident research, and severe accident analysis. Since PRA considerations have been integrated into the AP1000 design process from the beginning, many of the traditional PRA insights relating to current operating plants are not at issue for the AP1000. The Level 1, Level 2, and Level 3 results show that addressing PRA issues in the design process leads to a low level of risk. The PRA results indicate that the AP1000 design meets the higher expectations and goals for new generation passive pressurized water reactors (PWRs).

The core damage frequency (CDF) and large release frequency (LRF) for at-power internal events (excluding seismic, fire, and flood events) are 2.41E-07 events per reactor-year and 1.95E-08 events per reactor-year, respectively. These frequencies are at least two orders of magnitude less than a typical pressurized water reactor plant currently in operation. This reduction in risk is due to many plant design features, with the dominant reduction coming from highly reliable and redundant passive safety-related systems that impact both at-power and shutdown risks. These passive systems are much less dependent on operator action and support systems than plant systems in current operating plants.

The Level 3 analysis shows the potential offsite dose from a severe accident is very small and well within the established goals. The risk measured by the potential offsite dose does not increase significantly after the first 24 hours after a severe accident is assumed to cause a release to the environment.

Conservative, bounding fire and flood assessments show the core damage risk from these events is small compared to the core damage risk from at-power and shutdown events.

A synopsis of the insights gained from the PRA about the AP1000 design includes:

- The AP1000 design benefits from the high level of redundancy and diversity of the passive safety-related systems. The passive systems have been shown to be highly reliable, their designs are simple so that a limited number of components are required to function.

- AP1000 is less dependent on nonsafety-related systems than current plants or advanced light water reactor evolutionary plants.

- The nonsafety-related support systems (ac power, component cooling water, service water, and instrument air) have a limited role in the plant risk profile because the passive safety-related systems do not require cooling water or ac power.

- AP1000 is less dependent on human actions than current plants or advanced light water reactor evolutionary plants. Even when no credit is taken for operator actions, the AP1000 meets the NRC safety goal, whereas current plants may not.

- The core damage and large release frequencies are low despite the conservative assumptions made in specifying success criteria for the passive systems. The success criteria have been developed in a more systematic, rigorous manner than typical PRA success criteria. The baseline success criteria are bounding cases for a large number of PRA success sequences. The baseline success sequences, in most cases, have been defined with:

  - Worst (i.e., the most limiting) break size and location for a given initiating event
  - Worst automatic depressurization system (ADS) assumption in the success criterion
  - Worst number of core makeup tanks (CMT) and accumulators
  - Worst containment conditions for in-containment refueling water storage tank (IRWST) gravity injection

  Many less-limiting sequences are therefore represented by a baseline success criterion.

- Single system or component failures are not overly important due to the redundancy and diversity of safety-related systems in the design. For example, the following lines of defense are available for reactor coolant system (RCS) makeup:

  - Chemical and volume control system (CVS)
  - Core makeup tanks
  - Partial automatic depressurization system in combination with normal residual heat removal
  - Full automatic depressurization system with accumulators and in-containment refueling water storage tank
  - Full automatic depressurization system with core makeup tanks and in-containment refueling water storage tank

- Typical current PRA dominant initiating events are significantly less important for the AP1000. For example, the reactor coolant pump (RCP) seal loss-of-coolant accident (LOCA) event has been eliminated as a core damage initiator since AP1000 uses canned motor reactor coolant pumps which do not have seals. Another example is the loss of offsite power (LOOP) event. The station blackout and loss of offsite power event is a

minor contributor to AP1000 since the passive safety-related systems do not require the support of ac power.

- Passive safety-related systems are available in all shutdown modes. Planned maintenance of passive features is only performed during shutdown modes when that feature is not risk important. In addition, planned maintenance of nonsafety-related defense-in-depth features used during shutdown is performed at power.

- The AP1000 passive containment cooling design is highly robust. Air cooling alone is significant and may prevent containment failure, although the design has other lines of defense for containment cooling such as fan coolers and passive containment cooling water.

- The potential for containment isolation and containment bypass is lessened by having fewer penetrations to allow fission product release. In addition, normally open and risk important penetrations are fail-closed, thus eliminating the dependence on instrumentation and control (I&C) and batteries.

- The reactor vessel lower head has no vessel penetrations, thus eliminating penetration failure as a potential vessel failure mode. Preventing the relocation of molten core debris to the containment eliminates the occurrence of several severe accident phenomena, such as ex-vessel fuel-coolant interactions and core-concrete interaction, which may threaten the containment integrity. Therefore, AP1000, through the prevention of core debris relocation to the containment, significantly reduces the likelihood of containment failure.

- The potential for the spreading of fires and floods to safety-related equipment is significantly reduced by the AP1000 layout.

59.2 Use of PRA in the Design Process

The AP1000 design has evolved over a period of years, including the work done for the AP600 design. PRA techniques have been used since the beginning in an iterative process to optimize the AP600/AP1000 with respect to public safety. Each of these iterations has included:

- Development of a PRA model
- Use of the model to identify weaknesses
- Quantification of PRA benefits of alternate designs and operational strategies
- Adoption of selected design and operational improvements.

The scope and detail of the PRA model has increased from the early studies as the plant design has matured. This iterative design process has resulted in a number of design and operational improvements.

59.3 Core Damage Frequency from Internal Initiating Events at Power

Internal initiating events are transient and accident initiators that are caused by plant system, component, or operator failures. External initiating events, which include internal fire and flooding events and events at shutdown are discussed in other subsections.

The AP1000 mean plant core damage frequency for internal initiating events at power is calculated to be 2.41E-07 events per year. Twenty-six separate initiating event categories were defined to accurately represent the AP1000 design. Of these event categories, 11 are loss-of-coolant accidents, 12 are transients, and 3 are anticipated transients without scram precursors (initiating events that result in an anticipated transient without scram sequence as a result of failure to trip the reactor). Initiating event categories unique to the AP1000 design have been defined and evaluated, including safety injection line breaks, core makeup tank line breaks, and passive residual heat removal heat exchanger (HX) tube ruptures. The resulting core damage frequency is very small; a value of 2.41E-07 means that only one core damage event is expected in 4 million plant-years of operation. This core damage frequency value is two orders of magnitude (i.e., 100 times) smaller than corresponding values typically calculated for current pressurized water reactors.

The contribution of initiating events to the total plant core damage frequency is summarized in Table 59-1. Figure 59-1 illustrates the relative contributions to core damage frequency from the various at-power initiating events. Table 59-2 shows the conditional core damage probability of the initiating events. The conditional core damage probability listed in Table 59-2 is the ratio of the core damage frequency contribution for an initiating event divided by the initiating event frequency.

Seven initiating events, including 6 loss-of-coolant accidents, and steam generator tube rupture (SGTR), make up approximately 92 percent of the total at-power plant core damage frequency. The remaining initiating events contribute a total of approximately 8 percent to the core damage frequency from internal events. The dominant initiating events are:

- Safety injection (DVI) line break
- Large loss-of-coolant accident
- Spurious ADS actuation
- Small loss-of-coolant accident
- Medium loss-of-coolant accident
- Reactor vessel rupture
- Steam generator tube rupture

Within this group of events, each of the first three contribute more than 10 percent to the total core damage frequency. These three events account for approximately 70 percent of the total core damage frequency. Small LOCA, medium LOCA, and reactor vessel rupture events contribute 7 percent, 6 percent and 4 percent, respectively.

The results show a very low core damage frequency dominated by rare events (initiating events that are not expected to occur during the lifetime of a plant). This indicates that the AP1000 design is robust with respect to its ability to withstand challenges from more

frequent events (e.g., transients) and that adequate protection against the more severe events is provided through the defense-in-depth features.

Information regarding loss-of-coolant accident categories defined for the AP1000 PRA was presented in the discussion of PRA success criteria. For the PRA, the various loss-of-coolant accident categories have been defined based on which plant features are required to mitigate the events. As a result, the PRA and loss-of-coolant accident size definitions are not identical to the loss of coolant accident size definitions used in the Chapter 15, Accident Analyses included in the *AP1000 Design Control Document* (DCD). The following listing shows how the PRA and DCD break sizes are related and identifies the PRA size criteria:

- DCD Chapter 15 break size definitions are large (break size greater than 1 $ft.^2$) or small (break size less than 1 $ft.^2$).

- PRA break sizes are defined as follows:

  - Large breaks are those with an equivalent inside diameter of approximately 9 in. or larger. Reactor vessel rupture is included in this category. The automatic depressurization system is not required for in-containment refueling water storage tank injection for large breaks. (For large breaks that are slightly larger than a medium break, there is a potential effect of containment isolation upon in-containment refueling water storage tank injection. The success criteria include automatic depressurization system in these cases.)

  - Medium breaks are those with an equivalent inside diameter between approximately 2 in. and 9 in. Core makeup tank line breaks and safety injection line breaks are included in this category (but are evaluated separately). Operation of automatic depressurization system stages 1, 2, or 3 (or, alternatively, passive residual heat removal) is not required to satisfy the automatic depressurization system stage 4 automatic actuation pressure interlock, but is required to depressurize the reactor coolant system to the normal residual heat removal system operating pressure.

  - Small breaks are those with an equivalent inside diameter between approximately 3/8 in. and 2 in. Steam generator tube rupture and passive residual heat removal heat exchanger tube rupture break sizes fall within this range, but are evaluated as separate events based on differing initial plant response. Small breaks are larger than those for which the chemical and volume control system can maintain reactor coolant system water level, but not large enough to allow automatic actuation of automatic depressurization system stage 4 without operation of either automatic depressurization system stages 1, 2, or 3 or passive residual heat removal.

  - Coolant losses smaller than those resulting from small breaks are defined as reactor coolant system leaks. Operation of one chemical and volume control system makeup pump can maintain reactor coolant system water inventory for reactor coolant system leaks.

59.3.1 Dominant Core Damage Sequences

A total of 791 potential core damage event sequences for internal initiating events at power are modeled in the AP1000 PRA. These core damage sequences are the combinations of initiating event occurrences and subsequent successes and failures of plant systems and operator actions that result in core damage. Of these 791 event sequences, 190 result in frequencies ranging from 7-08 to 1E-15 events per year. The remaining sequences do not produce any cutsets representing them in the top 19,000 cutsets; that is, their core damage frequencies are not significant relative to the core damage frequencies for the other sequences.

- The 10 sequences with the highest core damage frequencies together contribute 79 percent of the total (approximately 1.92E-07 events per year).
- The top 19 sequences contribute 90 percent of the total (approximately 2.18E-07 events per year).
- The top 58 sequences contribute 99 percent of the total (approximately 2.39E-07 events per year).
- The top 100 sequences contribute 99.9 percent of the total (approximately 2.41E-07 events per year).

The 19 dominant sequences are given in Table 59-3.

Moreover, each core damage sequence is composed of component-level cutsets, with a total of approximately 19,000 cutsets included in the baseline internal initiating events at-power analysis (100 percent of 2.41E-07 events per year core damage frequency). A cutset is a combination of initiating event occurrence and the component or operator failures that constitute the various system-level failures that lead to core damage.

- The 100 highest-frequency cutsets together contribute approximately 86 percent of the total core damage frequency (approximately 2.1E-07 events per year).
- The top 200 cutsets contribute approximately 91 percent (2.2E-07 events per year). These cutsets are reported in Section 36.
- The top 500 cutsets contribute approximately 95 percent (2.3E-07 events per year).
- The top 1,000 cutsets contribute approximately 97 percent (2.35E-07 events per year).
- The top 2,000 cutsets contribute approximately 98 percent (2.37E-07 events per year).

The top 10 accident sequences contribute 79 percent of the core damage frequency from internal initiating events at power. These sequences are listed in Table 59-3. The top 25 cutsets for these sequences are given in Tables 59-4 through 59-13.

The first four dominant accident sequences make up 63 percent of the core damage frequency. These sequences are:

1. Safety injection line break event occurs, which is postulated to lead to spilling of one train of core makeup tank, in-containment refueling water storage tank, and recirculation flows. The reactor is tripped. The second core makeup tank successfully injects, and the automatic depressurization system is successfully actuated. Thus, the reactor coolant system pressure is low. However, the remaining in-containment refueling water storage tank line fails to inject; core damage occurs with low reactor coolant system pressure, leading to a postulated 3BE end state. The sequence frequency is 6.9E-08 per year, contributing 29 percent to the plant core damage frequency.

2. Large loss-of-coolant accident event occurs, and the reactor is tripped or is rendered subcritical because of voids in the reactor coolant system. Reactor coolant system rapidly depressurizes but one of the accumulators does not inject water into the RCS. Core damage with low reactor coolant system pressure, leading to the 3BR end state is postulated. The sequence frequency is 4.3E-08 per year, contributing 18 percent to the plant core damage frequency.

3. Spurious ADS actuation event occurs, and the reactor is tripped or is rendered subcritical because of voids in the reactor coolant system. Reactor coolant system rapidly depressurizes and at least one of the two accumulators injects, making up the RCS water loss in the short time frame. The CMT injection or ADS actuation fails. Thus, automatic IRWST injection is not actuated. Core damage with medium reactor coolant system pressure, leading to the 3D end state is postulated. The sequence frequency is 2.1E-08 per year, contributing 9 percent to the plant core damage frequency.

4. Safety injection line break event occurs, which is postulated to lead to spilling of one train of core makeup tank, in-containment refueling water storage tank, and recirculation flows. The reactor is tripped. The second core makeup tank successfully injects, but the automatic depressurization system actuation fails. Core damage is postulated with a medium reactor coolant system pressure, leading to a 3D end state. The sequence frequency is 2.0E-08 per year, contributing 8 percent to the plant core damage frequency.

The fifth dominant sequence, with 4 percent contribution to plant core damage frequency, is a reactor vessel rupture event. By the definition of this event, core damage is postulated to occur. The end state is 3C.

59.3.2 Component Importances for At-Power Core Damage Frequency

Chapter 50 presents tables of the relative importances of all basic events appearing in the cutsets for the baseline core damage quantification. These tables indicate risk decrease and risk increase. Risk decrease is the factor by which the core damage frequency would decrease if the failure probability for a given basic event is set to 0.0; it is a useful measure of the benefit that might be obtained as a result of improved component maintenance or testing, better procedures, or operator training. Risk increase is the factor by which the core damage frequency would increase if the failure probability for a given basic event is set to 1.0; it is a useful measure of which components or actions would most adversely affect the core damage

frequency if actual operating practices resulted in higher failure probabilities than assumed in the PRA.

The risk decrease results (as discussed in detail in Chapter 50) show that only six components have a risk reduction worth (RRW) of greater than or equal to 1.05. The in-containment refueling water storage tank discharge line strainer plugging has the highest RRW value, followed by common cause failure (CCF) of various components as shown in the following table.

IWA-PLUG	1.27	IRWST discharge Line "A" strainer plugged
ADX-EV-SA2	1.11	CCF of 2 squib valves to operate
REX-FL-GP	1.08	CCF plugging of both recirculation lines due to sump screens
ADX-EV-SA	1.05	CCF of 4th stage ADS squib valves to operate
IWX-CV-AO	1.05	CCF of 4 gravity injection check valves
IWX-EV-SA	1.05	CCF of 4 gravity injection & 2 recirculation squib valves

The remaining components each have a risk reduction worth of 1.04 or less. The contribution to the core damage frequency from unscheduled maintenance is also small. These results indicate that there are no components for which an improvement in design, test, or maintenance (i.e., a change resulting in a significant reduction of the component failure rate) would have a significant impact on the core damage frequency.

Excluding common cause failures, the risk increase results indicate that the accumulator system components have high risk achievement worth (RAW) values, followed by one Non-Class 1E dc and uninterruptible power supply system (EDS) bus, various Class 1E dc and uninterruptible power supply system (IDS) components and CMT components. Other single-component failures have significantly lower risk increase values, corresponding to a factor of six or lower increase in core damage frequency given an assumption of total unreliability for these components.

59.3.3 System Importances for At-Power Core Damage

System importances for plant core damage frequency from internal initiating events at power are presented in Chapter 50. They are obtained by setting the failure probabilities for the affected system components to 1.0 in the baseline cutsets and recalculating the core damage frequency.

The results of the sensitivity analyses show that the protection and safety monitoring system and the Class 1E dc power system are most important in maintaining a low core damage frequency. The risk-important systems are safety-related systems. The safety-related systems are all of high or medium importance. The nonsafety-related systems are only marginally important to the plant core damage frequency.

A sensitivity analysis is made for the unavailability of all five of the standby non-safety related systems (chemical and volume control system (CVS), startup feedwater system (SFW), normal residual heat removal system (RNS), diverse actuation system (DAS), diesel generators (DGs)). The plant CDF obtained is 7.40E-6, which is a factor of 31 increase over the base case. This sensitivity analysis shows that the plant CDF is somewhat sensitive to the simultaneous failure of the five systems listed above.

59.3.4 System Failure Probabilities for At-Power Core Damage

Some selected system failure probabilities for typical success criteria used in the at-power PRA are listed in Table 59-14. A system may have different failure probabilities based on the success criteria assigned. For a key safety-related system such as the automatic depressurization system, this is especially pronounced; the automatic depressurization system has many success criteria and corresponding failure probabilities that range over a factor of 100. The values in the table are representative of the various cases.

As can be seen from the system unavailabilities listed in Table 59-14, the highest unavailabilities (i.e., 10^{-2} to 10^{-3}, indicating lower reliability) are associated with nonsafety-related systems or functions. The lower unavailabilities (i.e., 10^{-4} to 10^{-6}, indicating higher reliability) are associated with safety-related systems.

59.3.5 Common Cause Failure Importances for At-Power Core Damage

The common cause importance results are presented in Chapter 50. The risk increase importances for common cause failures of the following sets of components show that these are also of potential significance to the current low level of core damage frequency from internal events: common cause failure of software in the protection and safety monitoring system and plant control system, logic board failures of the protection and safety monitoring system; failures of transmitters used in the protection and safety monitoring system; failures of reactor trip breakers; plugging of containment sump recirculation screens; failures of in-containment refueling water storage tank gravity injection line check valves and squib valves; plugging of strainers in the in-containment refueling water storage tank; failures of fourth-stage automatic depressurization system squib valves and failures of output cards for the protection and safety monitoring system. These and similar common cause failures are of potential significance in maintaining the current level of low plant core damage frequency.

The leading risk decrease common cause failures of hardware are associated with ADS fourth stage squib valves, gravity injection and recirculation line components, and I&C components and sensors.

59.3.6 Human Error Importances for At-Power Core Damage

In the PRA, credit is taken for various tasks to be performed in the control room by the trained operators. These tasks are rule-based and proceduralized. Although these tasks are usually termed operator actions, the tasks almost always refer to the completion of a well-defined mission by trained operators following procedures. Further, not every individual or group error during a mission necessarily fails the mission, since procedural recovery is built into the emergency procedures. Moreover, a very strong diversity is introduced through

monitoring of the emergency procedure status trees by a shift technical advisor. These considerations are factored into the PRA evaluation of human errors.

The risk decrease results for operator actions (discussed in Chapter 50) show that there are 10 human actions with importances greater than 1 percent. There are no actions for which the internal initiating events at-power core damage frequency contribution would decrease by more than 3 percent if it were assumed that the operators always were successful. This indicates that there would be no significant benefit from additional refinement of the actions modeled, nor from special emphasis on operator training in these actions (versus other emergency actions).

The risk increase results show that there are only 7 operator actions with importance greater than 100 percent; i.e., these are the only modeled operator actions whose guaranteed failure would result in a core damage increase greater than the base case core damage frequency. The most important action in this ranking (operator fails to diagnose a steam generator tube rupture event) has a risk achievement worth of 6.3. It is followed by manual actuation of ADS with a RAW value of 4.25. These results indicate that the plant design is not overly sensitive to failure of operator actions and the core damage models do not take undue credit for operator response.

A sensitivity analysis was performed in which the failure probabilities for the 30 operator actions are set to 0.0 (perfect operator). The resulting core damage frequency is only slightly smaller. This indicates that perfection in human error probabilities is not risk important at the level of plant risk obtained by the base case; there is no significant benefit to be gained by improving operator response beyond the assumptions made in the PRA.

Another sensitivity analysis was performed in which the failure probabilities for the 30 human error probabilities and also for indication failure (protection and safety monitoring system, plant control system, or diverse actuation system originated) are set to 1.0 (failure). The result of the sensitivity analysis shows that the core damage frequency increased to 1.4E-05 events per year. The resulting core damage frequency with no credit for operator actions is still low (about one event in 71,000 reactor-years), on the order of core damage frequency for current plants with credit for operators. This means that, in general, operator actions are important in maintaining a very low plant core damage frequency for internal events at power but are not essential to establishing the acceptability of plant risk. The presence of trained operators will help ensure that the very low core damage frequency prediction is valid. This finding demonstrates a significantly lower dependence on human actions than exists for current plants. The AP1000 meets the core damage frequency safety goal without human action, whereas current plants typically do not.

59.3.7 Accident Class Importances

The accident classes (also referred to as end states) are described in Chapter 44, and the contribution of accident classes to plant core damage frequency is presented in the same chapter. Two low-pressure reactor coolant system core damage end states, 3BE and 3BL, contribute 43 percent to the total core damage frequency. Together with 3BR and 3D, full or partially depressurized core damage states make up 87 percent of the core damage. In these

end states, the probability of retaining containment integrity is very likely. Thus, severe release potential for these end states is low.

59.3.8 Sensitivity Analyses Summary for At-Power Core Damage

Thirty-six importance and sensitivity analyses were performed on the core damage model for internal initiating events at power. These cases and results are discussed in Chapter 50.

The analyses were chosen to address the following issues:

- Importances of individual basic events and their effect on plant core damage frequency
- Importances of safety-related and nonsafety-related systems in maintaining a low plant core damage frequency
- Importances of containment safeguards systems in maintaining a low large-release frequency
- Effect of human reliabilities as a group on plant core damage frequency
- Other specific issues such as passive system check valve reliability, etc.

The sensitivity analyses results are discussed in Chapter 50. They show that:

- If no credit is taken for operator actions, the plant core damage frequency is 1.4E-05 events per year. This compares well with core damage frequencies for existing plants where credit is taken for operator actions.
- The most important systems for core damage prevention are the protection and safety monitoring system, Class 1E dc power, automatic depressurization system, in-containment refueling water storage tank recirculation, core makeup tanks, and accumulators. None of the nonsafety-related systems have high system importance.
- There are no operator actions that would provide a significant risk decrease if they were made to be more reliable. There are only eight operator actions that would increase the core damage frequency by more than the base case if they were assumed to fail. The most important of these is the failure to diagnose a steam generator tube rupture event.
- If the reliability of all check valves is assumed to be a factor of 10 worse, the total plant core damage frequency would only increase to 8.8E-7 events per year. This shows that the passive safety-related systems that depend on check valve opening will perform acceptably, even if pessimistic check valve reliabilities are assumed.
- The plant core damage frequency is not affected by the diesel generator mission time duration. This is due to the AP1000 design's passive features, which do not require ac power for operation.

- The common cause failure basic events, particularly those associated with safety-related systems, are important individually, and also as a group for plant core damage frequency. This is expected for a plant with highly redundant safety-related systems, for which individual component random failure contributions are of reduced significance.

59.3.9 Summary of Important Level 1 At-Power Results

The results of the PRA show that the following AP1000 design features provide the ability to respond to internal initiating events and contribute to a very low core damage frequency:

- The manual feed and bleed operation in current pressurized water reactors is replaced by the automatic depressurization system and core makeup tank/in-containment refueling water storage tank injection. This increases the success probability for feed and bleed and helps reduce core damage contribution from transients with failure of decay heat removal.

- The switchover-to-recirculation operation in current pressurized water reactors is replaced with automatic recirculation of sump water into the reactor coolant system loops by natural circulation.

- The diverse actuation system provides diverse backup for automatic or manual actuation of safety-related systems, increasing the system reliability for the passive residual heat removal, core makeup tank, and automatic depressurization systems.

- The AP1000 plant design is based on a defense-in-depth concept. There are several means (both active and passive) of providing reactor coolant system makeup following a loss-of-coolant accident, at both high and low pressures (i.e., chemical and volume control system pumps, core makeup tanks, accumulators, in-containment refueling water storage tank gravity injection, and normal residual heat removal system). Similarly, there are diverse means of core cooling, including the passive residual heat removal and normal residual heat removal systems.

- The ability to depressurize and establish feed and bleed heat removal via the automatic depressurization system and core makeup tanks without operator action provides an additional reliable means of core cooling and inventory control.

- The diversity and redundancy in the design of the automatic depressurization system provide a highly reliable system for depressurizing to allow injection and core cooling by the various sources of water.

- The design of the reactor coolant pumps eliminates the dependence on component cooling water and accompanying reactor coolant pump seal loss-of-coolant accident core damage contribution, which is typically significant for current plants.

- The design of the safety-related heat removal systems eliminates the dependence on service water and ac power during accidents; such dependencies can be significant contributors to core damage for current plants.

Core Damage Contribution from Important Initiating Events

Loss-of-Coolant Events. The at-power core damage results are dominated (top 8 dominant contributors with 93 percent) by various loss-of-coolant events. Thirty-four percent of the contribution is due to the safety injection line break, which is a special initiator, in that its occurrence partially defeats features incorporated into the plant to respond to losses of primary coolant. Even though the safety injection line break core damage frequency dominates the results, its value is very small (one event in 10 million reactor years), with little credit for nonsafety-related systems.

The conditional probability of core damage, given the occurrence of a "conventional" loss-of-coolant accident, is generally in the range of about 1E-03 to 1E-05 (with the exception of reactor vessel rupture and interfacing systems loss-of-coolant accident, for which core damage is assumed). These events have frequencies of about 1E-08 per year to 5E-04 per year. This indicates that the various features of the AP1000 would act to prevent core damage from all but between 1 in 1000 and 1 in 100,000 loss-of-coolant accidents. Since loss-of-coolant accidents are relatively rare events, this is a significant level of protection.

Anticipated Transients Without Scram. Anticipated transients without scram (ATWS) sequences contribute about 2 percent of the at-power core damage frequency, in part due to modeling simplifications whereby, in the absence of specific modeling and success criteria, it has been assumed that core damage will occur given certain combinations of failures. With additional analysis and modeling detail, it is expected that the anticipated transient without scram core damage frequency could be shown to be lower.

Transients. The contribution of transients to core damage frequency is about 5 percent of the at-power core damage frequency (total contribution from all transient initiators with reactor trip is 1 event in 100 million reactor years). This is the result of the defense-in-depth features of the AP1000 design, whereby core cooling following transients is available from main feedwater, startup feedwater, and passive residual heat removal, as well as from feed and bleed, using diverse and redundant sources of makeup (core makeup tanks, accumulators, in-containment refueling water storage tank, normal residual heat removal system), and of depressurization (four stages of automatic depressurization system).

Loss of Offsite Power. The loss of offsite power core damage frequency contribution at power is insignificant (less than 1 percent). AP1000 passive systems require only dc power provided by the long-term batteries for actuation to provide cooling. In addition, the passive residual heat removal heat exchanger is backed up by bleed and feed cooling using the automatic depressurization system and core makeup tanks or in-containment refueling water storage tank gravity injection, which also require only dc power provided by long-term batteries. With onsite power available, startup feedwater provides an additional means of decay heat removal.

Steam Generator Tube Rupture. The steam generator tube rupture event contributes about 3 percent of the at-power core damage frequency. Compared to operating pressurized water reactors this is a very low contribution. Among the reasons for the small steam generator tube rupture core damage contribution are the following:

- The first line of defense is the startup feedwater system and chemical and volume control system
- A reliable safety-related passive residual heat removal system coupled with the core makeup tank subsystem, which provides automatic protection
- A third line of defense using automatic depressurization system and in-containment refueling water storage tank for accident mitigation should the above-mentioned systems fail.

Further, the automatic depressurization system provides a more reliable alternate decay heat removal path through feed and bleed than the high-pressure manual feed and bleed cooling of current operating plants.

Finally, the large capacity of the in-containment refueling water storage tank increases the long-term recovery probability for unisolable steam generator leaks that bypass containment, by preventing depletion of borated water and core damage.

Dependence on Operator Action

The results of the PRA show that the AP1000 is significantly less dependent on operator action to reduce plant risk to acceptable levels than are current plants. This was shown through the sensitivity analyses and the operator action contributions from both the risk decrease and risk increase measures. Almost all operator actions credited in this PRA are performed in the control room; there are very few local actions outside the control room. Further, the human actions modeled in the AP1000 PRA are generally simpler than those for current plants. Thus, the tasks for AP1000 operators are easier and less likely to fail. If it were assumed that the operators never perform any actions credited in the PRA, the internal events core damage frequency would still be lower than the result obtained for many current pressurized water reactors including operator actions.

Dominant System/Component Failure Contributors

Contribution to Core Damage Frequency. Component-related contributors to core damage frequency from internal events at power are dominated by common cause failures. The single component failures are limited to strainer or tank failures, and accumulator check valve failures.

Dependence on Component Reliability. Most of the component failures with relatively high risk increase worth are common cause failures. This is an indication of the high degree of built-in redundancy and diversity of AP1000 safety-related systems, particularly in view of the low baseline core damage frequency. The results demonstrate a well-balanced design, for which diversity eliminates the strong dependence on active valves or on the specific type of valve.

Sensitivity to Numerical Values and Modeling Assumptions. The core damage results are not strongly sensitive to increases in the failure probabilities of basic events. Check valves are relatively important; if the check valve failure probability is increased by a factor of 10, the

core damage frequency increases by a factor of 4. This increase is not large, and the core damage goal of 1E-05 is comfortably met. Finally, the modeling assumptions in system and accident sequence success criteria are bounding (e.g., conservative) whenever a range of conditions are represented by a single selected condition or success criterion. Since the modeling assumptions already represent an upper bound type estimate, there are no significant contributions to core damage due to conditions outside the assumed ranges that are unaccounted for. As an example, the automatic depressurization system success criteria for loss-of-coolant accident events are selected to cover the worst conditions (e.g., break size, break location) of the range.

System Reliability and Defense-in-Depth. The results show that the safety-related systems have demonstrated high reliabilities (e.g., failure probability in the range of 1E-05 to 1E-03), due to the nature of the system designs (passive systems). Moreover, multiple means of success exist for transients and credible loss-of-coolant accident events. This means that a failure of a safety-related system will not lead to core damage, because other diverse systems back up the first one. This defense-in-depth philosophy contributes to the low core damage frequency.

59.4 Large Release Frequency for Internal Initiating Events at Power

The results of the Level 2 (containment response) and Level 3 (plant risk) analyses for the internal initiating events at power demonstrate that the AP1000 containment design is robust in its ability to prevent releases following a severe accident and that the risk to the public due to severe accidents for AP1000 is very low. The large release frequency (containment failure frequency) of the AP1000 can be divided into two types of failures: 1) initially failed containment, in which the integrity of the containment is either failed due to the initiating event or never achieved from the beginning of the accident; and 2) containment failure induced by high-energy severe accident phenomena. The total of these failures is the overall large release frequency. The following summarizes important results of the containment event tree quantification with respect to large release frequency.

The overall release frequency for AP1000 is 1.95E-08 events per year. This is approximately 8 percent of the core damage frequency for internal initiating events at power. The ability of the containment to prevent releases (i.e., the containment effectiveness) is 92 percent.

The Level 3 analysis shows that the resulting risk to the population is small and well within the established goals.

59.4.1 Dominant Large Release Frequency Sequences

The large release frequency is dominated by release categories BP (bypass), with a 54-percent contribution and CFE (early containment failure) with a contribution of 38 percent. The total frequency of these two categories is 1.8E-08 events per year. These two categories make up 92 percent of the plant large release frequency, followed by 7.0 percent contribution from containment isolation failure category. Contributions of the late containment failure (CFL) and intermediate containment failure (CFI) release categories to large release frequency are negligible.

The early containment failures are caused by sump flooding, vessel failure, and core reflooding failure plus containment overtemperature failure due to diffusion flame.

The dominant accident class in the large release frequency is the Class 6 with a 21-percent contribution. This class represents sequences in which steam generator tube rupture or interfacing LOCA events occur. It is followed by accident class 3A, with a 21 percent contribution. 3A contains core damage events with high RCS pressure and ATWS events.

The dominant large release frequency sequences are shown below. These sequences make up 98 percent of the large release frequency. Two containment bypass sequences from 3A and 6 accident classes contribute 21 percent and 19 percent, followed by 2 early containment failures from 3BE and 3D accident sequences with 14 and 11 percent contributions. These four sequences add up to 65 percent of the plant LRF.

Dominant Containment Event Tree (CET) Sequences					
CET SEQ	REL CAT	PDS	FREQ	%	SEQUENCE DESCRIPTION
23	BP	3A	4.08E-09	20.9%	Containment Bypass
23	BP	6	3.78E-09	19.4%	Containment Bypass
21	CFE	2E	2.67E-09	13.7%	Sump Flooding Fails
21	CFE	3D	2.05E-09	10.5%	Sump Flooding Fails
23	BP	1A	2.04E-09	10.5%	Containment Bypass
10	CFE	3C	9.97E-10	5.1%	Vessel Failure
12	CFE	3D	9.71E-10	5.0%	Core Reflooding Fails; Diffusion Flame
23	BP	1P	6.05E-10	3.1%	Containment Bypass
22	CI	2L	5.83E-10	3.0%	Containment Isolation Fails
6	CFE	2E	4.75E-10	2.4%	Hydrogen Igniters Fail; Early deflagration to detonation transition (DDT)
22	CI	3D	3.62E-10	1.9%	Containment Isolation Fails
21	CFE	6	1.86E-10	1.0%	Sump Flooding Fails
4	CFI	2E	1.82E-10	0.9%	Hydrogen Igniters fail; Intermediate DDT

59.4.2 Summary of Important Level 2 At-Power Results

The results of the PRA show that the following AP1000 design features provide the ability to respond to various severe accidents and contribute to a very small release frequency and a small release of radioactive material to the environment.

- The capability to flood the reactor cavity prevents the failure of the reactor vessel given a severe accident without water in the cavity. The vessel and its insulation are designed so that the water in the cavity is able to cool the vessel and prevent it from failing (in-vessel retention - IVR). By maintaining the vessel integrity, the core debris in the vessel eliminates the potential of a large release due to ex-vessel phenomena and its potential to fail the containment.

- The capability to depressurize the reactor coolant system in a high-pressure transient mitigates the consequences of a high-pressure severe accident. Such accidents have a large potential to fail the reactor coolant system pressure boundary vessel, piping, or steam generator tubes, and such a failure is assumed without further analysis if the reactor coolant system remains at high pressure. A high-pressure failure of the reactor coolant system pressure boundary is assumed to fail or bypass the containment. Thus, the capability to depressurize the reactor coolant system reduces the large release frequency due to high-pressure severe accidents.

- The annular spaces between the steel containment vessel and the shield building help to reduce the release of radioactive materials to the environment by enhancing the deposition of the materials before they exit the containment.

The Level 2 results highlight some insights in the AP1000 design:

- The containment effectiveness for AP1000 is over 90 percent, which provides an order of magnitude decrease from CDF to LRF. Since this result already includes CDF sequences that directly bypass the containment, the containment effectiveness for remaining sequences is actually much better. For example, for 5 (3BE, 3BL, 3BR, 3C, 3D) of the 9 accident classes studied, the containment effectiveness ranges from 90 to 99.8 percent.

- The containment effectiveness is lowest for the 3A accident class where the RCS pressure is high after core damage. The post-core-damage depressurization for this class proves to be ineffective since failure of ADS by common cause failures leading to core damage also causes failure of post-core-damage depressurization.

- Based on detailed analysis, the containment effectiveness for accident class 6, mainly SGTR events, is 56.9 percent, due to those sequences where the RCS pressure is low after the postulated core damage. In such sequences, the fission products can be retained in the pressure vessel, shielded by the water in the faulted steam generator. A sensitivity analysis where all accident class 6 events are assigned to LRF shows that the plant containment effectiveness drops slightly to 89.7 percent (from 91.9 percent). Thus, the LRF results are not very sensitive to the treatment of the SGTR events for LRF.

- A frequency of 1.0E-08/year has been assigned to the vessel failure initiating event (accident class 3C). In 90 percent of these events, the vessel is assumed to undergo failures that will be above the beltline – in which case the molten core could be cooled and containment would not be challenged. In the remaining 10 percent of the cases, the failure is assumed to be below the pressure vessel beltline, whereby the molten core would drop into the containment. In this case, it is conservatively assumed that the

containment would fail. A sensitivity analysis is made where by 100 percent of the failures would be below the beltline. The result shows that the containment effectiveness drops to 88.2 percent. This change is not significant, and the assumptions behind the case are very conservative.

- The LRF results are sensitive to failure of hydrogen igniters. If no credit is taken for hydrogen igniters, the containment effectiveness drops to 74 percent.
- However, LRF is not very sensitive to the reliability of hydrogen igniters; if IG reliability is assumed to be degraded (0.1) across the board for all accident classes, the containment effectiveness becomes 90.5 percent, which is an insignificant change from the base case.
- For accident classes 3D and 1AP, if the large hydrogen releases through the IRWST is conservatively assumed to cause containment failure, the containment effectiveness drops to 84.5 percent. The LRF increases to 7.58E-08/year. The increase is about a factor of 4 of the base. Such an increase is significant. This sensitivity analysis addresses the uncertainties in hydrogen mixing model for the case where the hydrogen is released into the IRWST and comes out from the IRWST vents above the operating deck.
- The LRF is dominated (53.9 percent) by containment failures or bypasses due to SGTR, and unmitigated high-RCS-pressure core damage sequences, classified as BP. The remaining containment failures are dominated by an early containment failure due to reactor cavity flooding failure.
- The LRF is not very sensitive to the reliability of PCS. If PCS reliability is assumed to be 0.001 across the board for all accident classes, the LRF becomes 1.97E-08, which is an insignificant change from the base case.
- The LRF is sensitive to the operator action to flood the reactor cavity in a short time following core damage. This operator action has been moved to the beginning of Emergency Response Guideline (ERG) AFR.C-1 to increase its likelihood of success.
- The potential for a release of radioactive materials to the environment is very small. This is largely due to the very small core damage frequency and very small release frequency. The containment design provides enhanced deposition of core materials that could be released in a severe accident, and the passive containment cooling system minimizes the energy available to expel such materials from the containment.

The results of the at-power analyses show the AP1000 design includes redundancy and diversity not found in current plants. The safety-related passive systems do not require ac power or operator actions to actuate, and the plant design is robust in the prevention and mitigation of the consequences of an accident. The AP1000 core damage frequency and large release frequency are much lower than has been seen in current generation plants, despite the many conservatisms built into the PRA models. The assumed dose to the environment given a severe accident and a large release is well within the goals set for that analysis.

59.5 Core Damage and Severe Release Frequency from Events at Shutdown

59.5.1 Summary of Shutdown Level 1 Results

As shown by the dominant cutsets of the AP600 and AP1000 shutdown models (shutdown risk evaluation is presented in Chapter 54), the risk profiles of these plants for events during shutdown conditions are almost identical. The results indicate that the three events dominating the CDF are loss of component cooling/service water during drained condition, loss of offsite power during drained condition, and loss of RNS during drained condition. The AP1000 and AP600 initiating event core damage contributions are included in Chapter 54. This data shows the initiating event importance to be similar for the two plants.

The dominant sequences are described in the subsections that follow. The 12 dominant accident sequences comprise 77 percent of the level 1 shutdown core damage frequency. These dominant sequences consist of:

- Loss of component cooling or service water system initiating event during drained condition with a contribution of 64 percent of the CDF
- Loss of RNS initiating event during drained condition with a contribution of 6 percent of the CDF
- Loss of offsite power initiating event during drained condition with a contribution of 5 percent of the CDF
- RCS overdraining event during drainage to mid-loop with a contribution of a 2 percent of the CDF

Loss of Component Cooling or Service Water System Initiating Event During Drained Condition

These sequences are described as the loss of decay heat removal initiated by failure of the component cooling water or service water system during drained condition. The loss of decay heat removal occurs following loss of circulating water system (CWS) or service water system (SWS) during mid-loop/vessel flange operation, which has an estimated duration of 120 hours per 18 months refueling.

The major contributors to risk due to loss of CWS or SWS during drained condition are the following failures:

- Hardware failures of both service water pumps or common cause failure of output logic inputs/outputs (I/Os) from the plant control system (PLS)
- Common cause failure of the ADS 4th stage squib valves
- Common cause failure of the IRWST high-pressure squib valves

- Common cause failure of the strainers in the IRWST tank

- Common cause failure of the recirculation sump strainers

Loss of RNS Initiating Event During Drained Condition

This sequence is described as the loss of decay heat removal initiated by failure of the RNS during drained condition. The loss of decay heat removal occurs following loss of RNS during mid-loop/vessel flange operation, which has an estimated duration of 120 hours per 18 months refueling.

The major contributors to risk due to loss of RNS during drained condition are the following failures:

- Common cause failure of the RNS pumps to run
- Common cause failure of the ADS 4th stage squib valves
- Common cause failure of the IRWST injection squib valves
- Common cause failure of the strainers in the IRWST tank
- Common cause failure of the recirculation sump strainers

Loss of Offsite Power Initiating Event During Drained Condition (with failure of grid recovery within 1 hour)

This sequence is initiated by loss of offsite power during mid-loop/vessel flange operation, which has an estimated duration of 120 hours per 18 months refueling. Following this initiating event, the RNS does not restart automatically, and the grid is not recovered within 1 hour.

The major contributors to risk given loss of offsite power (without grid recovery) are the following failures:

- Software common cause failure of all cards
- Failure of the RNS pump to run or restart
- Failure of the diesel generator to start or run
- Failure of the main breaker to open
- Failure to recover ac power within 1 hour
- Common cause failure of the ADS 4th stage squib valves
- Common cause failure of the IRWST injection squib valves
- Common cause failure of the strainers in the IRWST tank
- Common cause failure of the recirculation sump strainers

Loss of Offsite Power Initiating Event During Drained Condition (with success of grid recovery within 1 hour)

This sequence is initiated by loss of offsite power during mid-loop/vessel flange operation which has an estimated duration of 120 hours per 18 months refueling. Following this

initiating event, the RNS does not restart automatically, the grid is recovered within 1 hour but manual RNS restart after grid recovery fails.

The major contributors to risk, given loss of offsite power (with grid recovery), are the following failures:

- Software common cause failure of all cards
- Failure of the RNS pump to run or restart
- Common cause failure of the ADS 4th stage squib valves
- Common cause failure of the IRWST injection squib valves
- Common cause failure of the strainers in the IRWST tank
- Common cause failure of the recirculation sump strainers

RCS Overdraining Event During Drainage to Mid-loop

This sequence is described as RCS overdraining initiating event during drainage to mid-loop condition; draining to mid-loop has an estimated duration of 39 hours per 18 months refueling. Following the initiating event, manual isolation of the RNS fails.

The major contributors to risk due to RCS overdraining are the following failures:

- Common cause failure of the CVS air-operated valves to close automatically upon receipt of low hot leg level signals and failure of the operator to stop draining

- Operator fails to isolate the RNS

- Common cause failure of the ADS 4th stage squib valves

- Operator fails to open IRWST injection squib valves

- Common cause failure of the strainers in the IRWST tank

- Common cause failure of the recirculation sump strainers

Conclusions

The conclusions drawn from the shutdown Level 1 study are as follows:

- The overall shutdown core damage frequency is very small (1.23E-07/year).

- Initiating events during reactor coolant system drained conditions contribute approximately 90 percent of the total shutdown core damage frequency. Loss of decay heat removal capability (during drained condition) due to failure of the component cooling water system or service water system are the initiating events with the greatest contribution (approximately 70 percent of the shutdown core damage frequency).

- Common cause failures of in-containment refueling water storage tank components contribute approximately 59 percent of the total shutdown core damage frequency.

Common cause failure of the in-containment refueling water storage tank valves contributes approximately 33 percent of the total shutdown core damage frequency.

- Common cause failures of the automatic depressurization system stage 4 squib valves contribute approximately 18 percent to the total shutdown core damage frequency. The function of the automatic depressurization system is important to preclude the effects of surge line flooding. This indicates that maintaining the reliability of the automatic depressurization system is important.

- Common cause failures of the containment sump recirculation squib valves contribute approximately 15 percent to the total shutdown core damage frequency. This function is important during drained conditions. This indicates that maintaining the reliability of the recirculation line squib valves is important.

- Human errors are not overly important to shutdown core damage frequency. There is no particular dominant contributor. Sensitivity results show that the shutdown core damage frequency would remain very low even with little credit for operator actions.

  One action, operator failure to recognize the need for reactor coolant system depressurization during safe/cold shutdown conditions, is identified as having a significant risk increase value. This indicates it is important that the procedures include this action and the operators understand and are appropriately trained for it.

- Individual component failures are not significant contributors to shutdown core damage frequency, and there is no particular dominant contributor. This confirms the at-power conclusion that single independent component failures do not have a large impact on core damage frequency for AP1000 and reflects the redundancy and diversity of protection at shutdown as well.

- The in-containment refueling water storage tank provides a significant benefit during shutdown because it serves as a passive backup to the normal residual heat removal system.

59.5.2 Large Release Frequency for Shutdown and Low-Power Events

The baseline PRA shutdown large release frequency for AP600 was calculated to be 1.5E-08 per reactor-year, associated with a shutdown CDF of 9.0E-08 per year. The AP1000 LRF is estimated to be 2.05E-08 per year, with the same risk profile as that of AP600 (see Table 19.59-15). This LRF compares well with the at-power LRF of 1.95E-08 per year.

59.5.3 Shutdown Results Summary

The results of the low-power and shutdown assessment show that the AP1000 design includes redundancy and diversity at shutdown not found in current plants. In particular, the in-containment refueling water storage tank provides a unique safety backup to the normal residual heat removal system. Maintenance at shutdown has less impact on the defense-in-depth features for AP1000 than for current plants. In accordance with plant technical specifications, safety-related system planned maintenance is performed only during

those shutdown modes when the protection provided by the safety-related system is not required. Further, maintenance of nonsafety systems, such as the normal residual heat removal system, component cooling water system, and service water system, is performed at power to avoid adversely affecting shutdown risk. These contribute to the extremely low shutdown core damage and the small release frequency.

59.6 Results from Internal Flooding, Internal Fire, and Seismic Margin Analyses

59.6.1 Results of Internal Flooding Assessment

A scoping internal flooding analysis was performed based on AP1000 design information, with conservative assumptions or engineering judgement used for simplifying the analysis.

The AP1000 design philosophy of minimizing the number of potential flooding sources in safety-related areas, along with the physical separation of redundant safety-related components and systems from each other and from nonsafety-related components, minimizes the consequences of internal flooding. The core damage frequencies from flooding events at power is not an appreciable contributor to the overall AP1000 core damage frequency. The internal flooding-induced core damage frequencies are estimated to be 8.8E-10 events per year for power operations.

The internal flooding analysis conservatively assumes that flooding of nonsafety-related equipment results in system failure of the affected system. As shown in AP600 PRA, this results in a higher flooding-induced core damage frequency at shutdown than at power, because of the use of the nonsafety-related normal residual heat removal system as the primary means of decay heat removal at shutdown.

The top five at-power flooding scenarios comprise 91 percent of the at-power flooding-induced core damage frequency. Each of these scenarios relate to large pipe breaks in the turbine building with an initiating event frequency in the range of 1.4 - 2.0E-03/year, leading to a loss of CCS/SWS event. Each scenario has a CDF of 1.2 - 1.8E-10/year.

Internal flooding events during shutdown operations are also evaluated. A quantitative internal flooding PRA of AP1000 design performed to estimate plant CDF and LRF for at-power and during low-power and shutdown events provided the following results:

	Plant CDF	Plant LRF
Internal Flooding During At-Power Events	8.82E-10/yr	7.14E-11/yr
Internal Flooding During Low-Power and Shutdown Events	3.22E-09/yr	5.37E-10/yr

The minimization of potential flooding sources in the safety-related areas, in addition to the physical separation of redundant safety-related components and systems from each other and from nonsafety-related components, reduces the consequences of internal flooding. The core damage and large release frequencies arising from flooding events during shutdown operations are not appreciable contributors to overall AP1000 risk.

59.6.2 Results of Internal Fire Assessment

The total at-power, fire-induced core damage frequency is 5.61E-08 per reactor year. The estimated LRF is 4.54E-09/yr. Results of the AP1000 fire PRA analysis are summarized below.

The estimated core damage frequency from main control room fires at power is insignificant (less than 3.18E-12 per year). This low contribution is a result of the following:

- The ignition frequency is low because of the use of low-voltage 48v 10 mA dc cables in the control room. These low-voltage cables do not produce enough energy to heat the cables, thus ignition is not probable.
- Redundancy in control room operations is available within the control room itself; that is, if control room evacuation is not required, there is at least one other means available within the control room to shut down and control the plant.
- If control room evacuation is necessary, the remote shutdown workstation provides complete redundancy in terms of control for safe shutdown functions.
- Loss of control of one division of power or for a whole system is not risk-significant. In addition, the passive systems are designed to operate without the need for operator interaction. Therefore, operator actions that might be disrupted by the fire scenario are backup actions, and are not significant for AP1000.

The results of the internal fire evaluation indicate that the plant's system and layout promote a low fire-induced core damage frequency compared with existing plants. Also, the results indicate that, when nonsafety-related systems are not credited and containment is treated as a special case, the fire-induced core damage frequency profile is relatively flat (i.e., no fire area is significantly more important than others).

The results from the AP1000 fire analysis confirm that the inherent design characteristics of the AP1000 also provide an effective barrier against fire hazards. This is true even within the pessimistic assumptions used throughout the study.

Conservatisms employed in the AP1000 fire analysis included the following:

- In order to minimize potential uncertainty in the results arising from the lack of as-built equipment location and cable routing information, a bounding approach to quantification was taken in accordance with the reference methodology.
- A fire originating from any ignition source in an area is assumed to disable all equipment located in the fire area. The historical evidence indicates that most fires are localized fires with limited severity.
- An assumed total at-power fire initiating event frequency corresponding to about one fire with significant consequences every 4 reactor years, well in excess of current plant experience and of that anticipated for AP1000, was assumed.

- Manual fire suppression is not credited to limit the extent of damage in an area nor to prevent fire propagation to an adjoining area. Historical evidence indicates that the majority of suppressed fires were manually suppressed with little or no additional damage.

- The assumption was made that a single hot short could result in spurious automatic depressurization system actuation.

- The estimation of containment fire frequency, not normally included in fire risk assessments, was done by making a conservative interpretation of the limited available data.

Because the approach taken in performing the internal fire analysis makes various conservative assumptions and is bounding, the results of uncertainty, sensitivity, or importance analyses would be biased. Therefore, these analyses were not performed based on the judgement that they would be of little value in providing additional insights to determine whether fire vulnerabilities exist for beyond-design-basis fires.

The major reasons for the AP1000's relatively low overall fire-induced core damage frequency, even on a bounding basis, include the following:

- The fire protection design provides, to the extent possible, separation of the alternate safety-related shutdown components and cabling using 3-hour-rated fire barriers. For example, areas containing safety-related cabling or components are physically separated from one another and from the areas that do not contain any safety-related equipment by 3-hour-rated fire barriers. This defense-in-depth feature diminishes the probability of a fire to impact more than one safety-related shutdown system.

- Since the passive safety-related systems do not require cooling water or ac power, they are less susceptible to being unavailable due to a fire than currently operating plants' active safe shutdown equipment. As a result, the impact of fires on the shutdown capability is significantly reduced compared to current plants.

The results of this analysis show that the AP1000 design is sufficiently robust that internal fires during either power operation or shutdown do not represent a significant contribution to core damage frequency.

59.6.3 Results of Seismic Margin Analysis

The seismic margin analysis (SMA) shows the systems, structures, and components required for safe shutdown. The high confidence, low probability of failure (HCLPF) values are greater than or equal to 0.50g. This HCLPF is determined by the seismically induced failure of the fuel in the reactor vessel, core assembly failures, IRWST failure, or containment interior failures. The SMA result assumes no credit for operator actions at the 0.50g review level earthquake, and assumes a loss of offsite power for all sequences.

The seismic margin analysis shows the plant to be robust against seismic event sequences that contain station blackout coupled with other seismic or random failures. The analysis also

shows the plant's capability to respond to seismic events without benefit of the operators' actions.

59.7 Plant Dose Risk From Release of Fission-Products

Chapter 49 discusses the Level 3 results for at-power and shutdown internal events. The dose risks are quantified by multiplying the fission product release category frequency vector by the release category mean dose vectors. The goal is that a 24-hour, whole-body, site boundary dose greater than 25 rem has a frequency (large release frequency) of less than 1E-06 per year. The AP1000 large release frequency is 1.95E-08 per year, which is a factor of 50 times less than the goal.

The total at-power risk from a postulated release of fission products (the 24-hour, site boundary effective dose equivalent (EDE) is 1.83E-04 rem per reactor-year. For shutdown, this risk was calculated to be 7.1E-05 rem per reactor-year for AP600. For AP1000, this shutdown risk could be estimated as 9.7E-05 rem per reactor-year (estimated the same way as shutdown LRF in Table 59-15). Table 59-16 and Figure 59-2 summarize the plant dose results.

Containment bypass failures account for 79 percent of the dose risk. These types of failures are usually assumed as a result of steam generator tube rupture. A less conservative analysis of the containment bypass failures may show a smaller frequency, and, as a result, a smaller dose risk.

59.8 Overall Plant Risk Results

The total plant risk expressed in terms of plant core damage frequency and severe release frequency for all events studied in this PRA are summarized in Table 59-17.

The contribution of various events to the at-power core damage frequency is shown in Figure 59-1.

The total plant core damage and large release frequency analysis results show the following:

- The total mean core damage frequency is at least two orders of magnitude smaller than those for existing pressurized water reactors. The cumulative core damage probability for a population of 50 AP1000 units operating for 60 years each would be less than 0.001, which is a low probability of occurrence.

- The total plant severe release frequency is another order of magnitude smaller than that of the core damage frequency; that places such a release frequency in the range of incredible events.

- A bounding analysis of the core damage due to internal fire and internal flooding events shows that these two categories of internal events are lower for AP1000 than are calculated for currently operating plants.

- The severe release frequency is about equal for at-power and shutdown events. The severe release frequency as a percentage of core damage frequency is 8 percent for at-power events and 17 percent for shutdown events.

- The results show that the design goals of low core damage frequency and low severe release frequency have been met. The AP1000 frequencies are lower than the Nuclear Regulatory Commission (NRC) goals set for new plant designs, as shown in Table 59-17. These results show the effectiveness of passive systems in mitigating severe accidents and reflect the reduced dependence of AP1000 on nonsafety systems and human actions.

Figure 59-2 shows the 24-hour, whole-body EDE site boundary dose cumulative distribution.

59.9 Plant Features Important to Reducing Risk

Westinghouse used PRA results extensively in the AP1000 design process to identify areas for design improvement and areas for further risk reduction. These results were also compared with existing commercial nuclear power plants to identify additional area of risk reduction. Examples of the more significant AP1000 plant features and operator actions that reduce risk are discussed in this section. Examples are provided in the area of reactor design, system design, plant structures and layout, and containment design.

AP1000 has more lines of defense as compared to current operating plants, which provide more success paths following an initiating event and provide redundancy and diversity to address common cause-related concerns. Examples of extensive AP1000 lines of defense follow:

- Criticality control:
  - Control rod insertion via reactor trip breaker opening
  - Control rod insertion via motor-generator set de-energization
  - Ride out via turbine trip

- Core heat removal:
  - Main feedwater
  - Startup feedwater
  - Passive residual heat removal
  - Automatic depressurization system and feed-and-bleed via normal residual heat removal injection
  - Automatic depressurization system and passive feed-and-bleed via in-containment refueling water storage tank injection

- Reactor coolant system makeup:
  - Chemical and volume control system
  - Core makeup tanks
  - Automatic depressurization system and normal residual heat removal
  - Automatic depressurization system, accumulators, and in-containment refueling water storage tank injection
  - Automatic depressurization system, core makeup tanks, and in-containment refueling water storage tank injection
- Containment cooling:
  - Fan coolers
  - Normal residual heat removal
  - Passive containment cooling system with passive water drain
  - Passive containment cooling system with alternate water supply
  - Passive containment cooling system without water (air only)
  - Fire water

59.9.1 Reactor Design

The AP1000 reactor coolant system has many features that reduce the plant risk profile. The pressurizer is larger than those used in comparable current operating plants, resulting in a longer drainage time during small loss-of-coolant accident events. The larger pressurizer increases transient operation margins, resulting in a more reliable plant with fewer reactor trips, avoiding challenges to the plant and operator during transients. The larger pressurizer also eliminates the need for fast-acting power-operated relief valves (PORVs), which are a possible source of reactor coolant system leaks.

The AP1000 steam generators have large secondary-side water inventories, allowing significant time to recover steam generator feedwater or other means of core heat removal. The AP1000 steam generators also employ improved materials and design features that significantly reduce the probability of forced outages or tube rupture.

The AP1000 has canned reactor coolant pumps, thus avoiding seal loss-of-coolant accident issues and simplifying the chemical and volume control system. The reactor coolant system has fewer welds, which reduces the potential for loss-of-coolant accident events. The probability of a loss-of-coolant accident is also reduced by the application of "leak-before-break" to reactor coolant system piping.

59.9.2 Systems Design

System design aspects that are intended to reduce plant risk are discussed in terms of safety-related and nonsafety-related systems.

59.9.2.1 Safety-Related Systems

The AP1000 uses passive safety-related systems to mitigate design basis accidents and reduce public risk. The passive safety-related systems rely on natural forces such as density differences, gravity, and stored energy to provide water for core and containment cooling. These passive systems do not include active equipment such as pumps. One-time valve alignment of safety-related valves actuates the passive safety-related systems using valve operators such as:

- DC motor-operators with power provided by Class 1E batteries
- Air-operators that reposition to the safeguards position on a loss of the nonsafety-related compressed air that keeps the safety-related equipment in standby
- Squib valves
- Check valves

The passive systems are designed to function with no operator actions for 72 hours following a design basis accident. These systems include the passive containment cooling system and the passive residual heat removal system.

Diversity among the passive systems further reduces the overall plant risk. An example of operational diversity is the option to use passive residual heat removal versus feed-and-bleed for decay heat removal functions, and an example of equipment diversity is the use of different valve operators (motor, air, squib) to avoid common cause failures.

The passive residual heat removal heat exchanger protects the plant against transients that upset the normal steam generator feedwater and steam systems. The passive residual heat removal subsystem of the passive core cooling system contains no pumps and significantly fewer valves than conventional plant auxiliary feedwater systems, thus increasing the reliability of the system. There are fewer potential equipment failures (pumps and valves) and less maintenance activities.

For reactor coolant system water inventory makeup during loss-of-coolant accident events, the passive core cooling system uses three passive sources of water to maintain core cooling through safety injection: the core makeup tanks, accumulators, and in-containment refueling water storage tank. These sources are directly connected to two nozzles on the reactor vessel so that no injection flow can be spilled for larger pipe break events.

The automatic depressurization system is incorporated into the design for depressurization of the reactor coolant system. The automatic depressurization system has 10 paths with diverse valves to avoid common cause failures and is designed for automatic or manual actuation by the protection and safety monitoring system or manual actuation by the diverse actuation system. The automatic depressurization system can be used in a partial depressurization mode to provide long-term reactor coolant system cooling with normal residual heat removal system injection, or it can be used in full depressurization mode for passive in-containment

refueling water storage tank injection for long-term reactor coolant system cooling. Switchover from injection to recirculation is automatic without manual actions.

The safety-related Class 1E dc and UPS system has a battery capacity sufficient to support passive safety-related systems for 72 hours. This system has four 24-hour batteries, two 72-hour batteries, and a spare battery. The presence of the spare battery improves testability.

The passive containment cooling system provides the safety-related ultimate heat sink for the plant. Heat is removed from the containment vessel following an accident by a continuous natural circulation flow of air, without any system actuations. By using the passive containment cooling system following an accident, the containment stays well below the predicted failure pressure. The steaming and condensing action of the passive containment cooling system enhances activity removal.

AP1000 containment isolation is significantly improved over that of conventional PWRs due to a large reduction in the number of penetrations. The number of normally open penetrations is reduced. Containment isolation is improved due to the chemical and volume control system being a closed system, the safety-related passive safety injection components being located inside the containment, and the number of heating, ventilation, and air-conditioning (HVAC) penetrations being reduced (no maxi purge connection).

Vessel failure potential upon core damage is reduced (in-vessel retention of the damaged core) by providing a provision to dump in-containment refueling water storage tank water into the reactor cavity. The vessel insulation enables this water to cool the vessel.

For events at shutdown, AP1000 has passive safety-related systems for shutdown conditions as a backup to the normal residual heat removal system. This reduces the risk at shutdown through redundancy and diversity.

Post-72-hour connections are incorporated into the passive system design to allow for long-term accident management. These connections allow for the refill of the in-containment refueling water storage tank, or the reactor cavity, should such actions become necessary.

59.9.2.2 Nonsafety-Related Systems

AP1000 has nonsafety-related systems capable of mitigating accidents. These systems use redundant components, which are powered by offsite and onsite power supplies. AP1000 has certain design features in the nonsafety-related systems to reduce plant risk compared to current operating plants. During transient events, the startup feedwater system can act as a backup to the main feedwater system if the latter is unavailable due to the nature of the initiating event or fails during the transient. During loss of ac power events, startup feedwater pumps are powered by the diesel generators and can be used to remove decay heat since main feedwater is not available. The main feedwater and startup feedwater pumps are motor-driven, rather than steam-driven, for better reliability. Main feedwater controls are digital for better reliability. Thus, the main feedwater and startup feedwater system creates fewer transients and provides additional nonsafety-related means for decay heat removal for transients. This makes the plant response to transients very robust due to the existence of two

nonsafety-related systems in addition to the passive safety-related means of removing decay heat.

The nonsafety-related normal residual heat removal system plays a role in decay heat removal in response to power and shutdown events. The normal residual heat removal system has additional isolation valves and is designed to withstand the reactor coolant system pressure to eliminate interfacing systems loss-of-coolant accident concerns that lead to containment bypass. The normal residual heat removal system provides reliable shutdown cooling, incorporating lessons learned from shutdown events. During mid-loop operations, operation procedures require both normal residual heat removal system pumps to be operable for risk reduction.

Component cooling water and service water systems have a very limited role in the plant risk profile because the passive safety-related systems do not require cooling, and the canned-motor reactor coolant pumps do not require seal cooling from the component cooling water.

The nonsafety-related ac power system (onsite and offsite) also has a very limited role in the plant risk profile since the plant safety-related systems do not depend on ac power. The loss of offsite power event is less important for the AP1000 than in current operating plants. The plant has full load rejection capability to minimize the number of reactor trips although this is not modeled in the PRA and no credit is taken for it. The onsite ac power has two nonsafety-related diesel generators. The diesel generator life is improved and the run failure rate is reduced by avoiding fast starts.

The compressed and instrument air system has low risk importance since the safety-related air-operated valves are fail safe if the air system fails. This causes the loss of air event to be less important than in current plant PRAs.

59.9.3 Instrumentation and Control Design

Three instrumentation and control systems are modeled in the AP1000 PRA: protection and safety monitoring system, plant control system, and diverse actuation system. Both the protection and safety monitoring system and plant control system are microprocessor-based. Four trains of redundancy are provided for the protection and safety monitoring system; 2-out-of-4 actuation logic in the protection and safety monitoring system reduces the potential for spurious trips due to testing and allows for better testing. Automatic testing for the protection and safety monitoring system, and diagnostic self-testing for the protection and safety monitoring system and the plant control system, provide higher reliability in these systems. Both the protection and safety monitoring system and the plant control system use fiber-optic cables (with fire separation) for data transmission. Unlike current plants, there is no cable spreading room, thus eliminating a potential fire hazard. Additional fault tolerance is built into the plant control system so that one failure does not prevent the operation of important functions.

Improvements in the plant control system and the protection and safety monitoring system are coupled with an improved control room and man-machine interfaces; these include improvements in the form and contents of the information provided to control room operators

for decision making to limit commission errors. In addition, the remote shutdown workstation is designed to have functions similar to the control room.

The diverse actuation system provides a diverse automatic and manual backup function to the protection and safety monitoring system and reduces risk from anticipated transients without scram events. The diverse actuation system also compensates for common cause failures in the protection and safety monitoring system.

59.9.4 Plant Layout

The plant layout minimizes the consequences of fire and flooding by maximizing the separation of electrical and mechanical equipment areas in the non-radiologically controlled area of the auxiliary building. This separation is designed to minimize the potential for propagation of leaks from the piping areas and the mechanical equipment areas to the Class 1E electrical and Class IE instrumentation and control equipment rooms. The potential flooding sources and volumes in areas of the plant that contain safety-related electrical and I&C equipment are limited to minimize the consequences of internal flooding.

AP1000 is designed to provide better separation between divisions of safety-related equipment.

59.9.5 Containment Design

The containment pressure boundary is the final barrier to the release of fission products to the environment. The AP1000 containment has provisions that help to maintain containment integrity in the event of a severe accident.

59.9.5.1 Containment Isolation and Leakage

Failure of the containment isolation system prior to a severe accident will lead to a direct release pathway from the containment volume to the environment. AP1000 has approximately 55 percent fewer piping penetrations and a lower percentage of normally open penetrations compared to current generation plants. Normally open penetrations are closed by automatic valves, and diverse actuation is provided for valves on penetrations with significant leakage potential. All isolation valves have control room indication to inform the operator of the current valve position.

Similarly to containment isolation failure, leakage of closed containment isolation valves in excess of technical specifications may result in larger releases to the environment. Valves that historically have the greatest leakage problems have been eliminated, or their number significantly reduced in the design. Large purge valves have been replaced by smaller more reliable valves, and check valves have only been used in mild service where wear and service conditions would not be a challenge to successful operation.

Equipment and personnel hatches have the capability of being tested individually to ensure a leak-tight seal. Hatch seals can easily be verified.

Therefore, AP1000 provides significant protection against the failure to isolate the containment and against failure of isolation valves to fully close.

59.9.5.2 Containment Bypass

Historically, containment bypass, an accident in which the fission products are released directly to the environment from the reactor coolant system, is the leading contributor to risk in a nuclear power plant. Typically the containment bypass accident class consists of two types of accident sequences: interfacing systems loss-of-coolant accidents and steam generator tube ruptures.

An interfacing systems loss-of-coolant accident is the failure of valves that separate the high pressure reactor coolant system with a lower pressure interfacing system, which extends outside the containment pressure boundary. The failure of the valve causes the reactor coolant system to pressurize the interfacing system beyond its ultimate capacity and can result in a loss-of-coolant accident outside the containment. Reactor coolant is lost outside the containment, providing a pathway for the direct release of fission products to the environment. In AP1000, systems connected to the reactor coolant system are designed with higher design pressure, which reduces the likelihood of a pipe rupture in the event of the failure of the interfacing valves. This results in a very low interfacing systems loss-of-coolant-accident contribution to core damage to containment bypass.

Steam generator tube ruptures release coolant from the reactor coolant system to the secondary system. The AP1000 has multiple and diverse automatically actuated systems to reduce the reactor coolant system pressure and mitigate the steam generator tube rupture. The passive residual heat removal subsystem is actuated automatically on the S-signal and effectively reduces the reactor coolant system pressure to stop the break flow. If the passive residual heat removal does not stop the loss of coolant, the secondary relief valve can open to keep the secondary system pressure below the opening pressure of the steam generator safety valve. If the loss of reactor coolant continues, the RCS automatic depressurization system will actuate and depressurize the system. No operator actions are required to mitigate the accident, and the secondary system remains sealed against releases to the environment after the relief valve or its block valve are closed.

To create a containment bypass release pathway from a steam generator tube rupture, the accident scenario must include multiple system failures such that the steam generator tube rupture is not mitigated, and the secondary system pressure increases enough to open a safety valve. The safety valve must fail to reseat, thereby providing a containment bypass pathway for the loss of coolant and for the possible release of fission products to the environment.

Multiple, diverse systems act to mitigate steam generator tube rupture. Therefore, the likelihood of a steam generator tube rupture progressing to containment bypass has been significantly reduced in AP1000.

59.9.5.3 Passive Containment Cooling

The passive containment cooling system provides protection to the containment pressure boundary by removing the decay and chemical heat that slowly pressurize the containment.

The heat is transferred to the environment through the steel pressure boundary. The heat transfer on the outside of the steel shell is enhanced by an annular flow path, which creates a convective air flow across the shell and by the evaporation of water that is directed onto the top of the containment in the event of an accident. The evaporative heat transfer prevents the containment from pressurizing above the design conditions during design basis accidents.

In some postulated multiple-failure accident scenarios, the water flow may fail. The heat removal is limited to convection heat transfer to the air flow and radiation to the annulus baffle. With no water film on the containment shell to provide evaporative cooling, the containment pressurizes above the design pressure to remove decay heat. Containment failure within 24 hours is highly unlikely.

59.9.5.4 High-Pressure Core Melt Scenarios

The automatic depressurization system and the passive residual heat removal heat exchanger provide reliable and diverse reactor coolant system depressurization, which significantly reduces the likelihood of high pressure core damage. High-pressure core damage sequences have the potential to fail steam generator tubes and create a containment bypass release, or to cause severe accident phenomena at the time of vessel failure which may threaten the containment pressure boundary. Reducing the reactor coolant system pressure during a severe accident significantly lowers the likelihood of phenomena that may induce large fission product releases early in the accident sequence.

59.9.5.5 In-Vessel Retention of Molten Core Debris

The AP1000 reactor vessel and containment configuration has features that enhance the design's ability to maintain molten core debris in the reactor vessel. The AP1000 automatic depressurization system provides reliable pressure reduction in the reactor coolant system to reduce the stresses on the vessel wall. The reactor vessel lower head has no vessel penetrations, thus eliminating penetration failure as a potential vessel failure mode. The containment configuration directs water to the reactor cavity and allows the in-containment refueling water storage tank water to be drained into the cavity to submerge the vessel to cool the external surface of the lower head. Cooling the vessel and reducing the stresses prevents the creep rupture failure of the vessel wall. The reactor vessel reflective insulation has been designed with provisions to allow water inside the insulation panel to cool the vessel surface, and with vents to allow steam to exit the insulation without failing the insulation support structures. The insulation is designed so that it promotes the cooling of the external surface of the vessel.

Preventing the relocation of molten core debris to the containment eliminates the occurrence of several severe accident phenomena, such as ex-vessel fuel-coolant interactions and core-concrete interaction, which may threaten the containment integrity. Through the prevention of core debris relocation to the containment, the AP1000 design significantly reduces the likelihood of containment failure.

59.9.5.6 Combustible Gases Generation and Burning

In severe accident sequences, high temperature metal oxidation, particularly zirconium, results in the rapid generation of hydrogen and possibly carbon monoxide. The first combustible gas release occurs in the accident sequence during core uncovery when the oxidation of the zircaloy cladding by passing steam generates hydrogen. A second release may occur if the vessel fails and ex-vessel debris degrades the concrete basemat. Steam and carbon dioxide are liberated from the concrete and are reduced to hydrogen and carbon monoxide as they pass through the molten metal in the debris. These gases are highly combustible and in high concentrations in the containment may lead to detonable mixtures.

The AP1000 uses a nonsafety-related hydrogen igniter system for severe releases of combustible gases. The igniters are powered from ac buses from either of the nonsafety-related diesel generators or from the non-Class 1E batteries. Multiple glow plugs are located in each compartment. The igniters burn the gases at the lower flammability limit. At this low concentration, the containment pressure increase from the burning is small and the likelihood of detonation is negligible. The igniters are spaced such that the distance between them will not allow the burn to transition from deflagration to detonation. The combustible gases are removed with no threat to the containment integrity.

There is little threat of the failure of the system power in the event that it is required to operate. The igniters are needed only in core damage accidents, and the AP1000 is designed to mitigate loss of power events without the sequence evolving into a severe accident. Loss of ac power is a small contributor to the core damage frequency.

The reliability of reactor coolant system depressurization reduces the threat to the containment from sudden releases of hydrogen from the reactor coolant system. Low pressure release of in-vessel hydrogen enhances the ability of the igniter system to maintain the containment atmosphere at the lower flammability limit.

During a severe accident, hydrogen that could be injected from the reactor coolant system into the containment through the spargers in the in-containment refueling water storage tank or into the core makeup tank room has the potential to produce a diffusion flame. A diffusion flame is produced when a combustible gas plume that is too rich to burn enters an oxygen-rich atmosphere and is ignited by a glow plug or a random ignition source. The plume is ignited into a standing flame which lasts as long as there is a fuel source. Via convection and radiation, the flame can heat the containment wall to high temperatures, increasing the likelihood of creep rupture failure of the containment pressure boundary. The AP1000 uses a defense-in-depth approach to release hydrogen in benign locations away from the containment shell and penetrations. Therefore, the potential for containment failure from the formation of a diffusion flame at the in-containment refueling water storage tank vents is considered to be very low.

There is little threat to the containment integrity from severe accident hydrogen releases, and hydrogen combustion events. The igniter system maintains the hydrogen concentration at the lower flammability limit.

59.9.5.7 Intermediate and Long-Term Containment Failure

The passive containment cooling system reduces the potential for decay heat pressurization of the containment. However, containment failure can also occur as a result of combustion. Due to the high likelihood of in-vessel retention of core debris, the potential for ex-vessel combustible gas generation from core-concrete interaction is very low. The frequency of containment failures due to hydrogen combustion events is very low given the high reliability of the hydrogen igniters.

59.9.5.8 Fission-Product Removal

AP1000 relies on the passive, natural removal of aerosol fission products from the containment atmosphere, primarily from gravitational settling, diffusiophoresis and thermophoresis. Natural removal is enhanced by the passive containment cooling system, which provides a large, cold surface area for condensation of steam. This increases the diffusiophoretic and thermophoretic removal processes. Accident offsite doses at the site boundary that could exist in the first 24 hours after a severe accident are either less than 25 rem, or for those releases that are greater than 25 rem, have a frequency of much less than 1E-06. Minimal credit is taken for deposition of fission products in the auxiliary building. The site boundary dose and large release frequency are much less than the established goals.

59.10 PRA Input to Design Certification Process

The AP1000 PRA was used in the design certification process to identify important safety insights and assumptions to support certification requirements, such as the reliability assurance program (RAP).

59.10.1 PRA Input to Reliability Assurance Program

The AP1000 RAP identifies those systems, structures, and components (SSC) that should be given priority in maintaining their reliability through surveillance, maintenance, and quality control actions during plant operation. The PRA importance and sensitivity analyses identify those systems and components important in plant risk in terms of either risk increase (for example, what happens to plant risk if a system or component, or a train is unavailable), or in terms of risk decrease (for example, what happens to plant risk if a component or a train is perfectly reliable/available). This ranking of components and systems in such a way provides an input for the reliability assurance program. For more information on the AP1000 reliability assurance program, refer to AP1000 DCD Section 17.4.

59.10.2 PRA Input to Tier 1 Information

AP1000 DCD Section 14.3 summarizes the design material contained in AP1000 that has been incorporated into the AP1000 DCD Tier 1 Information from the PRA.

59.10.3 PRA Input to MMI/Human Factors/Emergency Response Guidelines

The PRA models, including modeling of operator actions in response to severe accident sequences, follow the ERGs. The most risk-important of these actions is manual actuation of

systems in the highly unlikely event of automatic actuation failure. These operator actions and the main human reliability analysis (HRA) model assumptions are reviewed by human factors engineers for insights that they may provide to the human system interface (HSI) and human factors areas. For more information on the AP1000 HSI, refer to AP1000 DCD Chapter 18.

In addition, the human reliability analysis models and operator actions modeled in the PRA were reviewed by the engineers writing the ERGs for consistency between the PRA models and the actual ERGs.

The PRA results and sensitivity studies show that the AP1000 design has no critical operator actions and few risk-important actions. A critical operator action is defined as that action when assumed to fail would result in a plant core damage frequency of greater than 1.0E-04 per year; there are no such operator actions in the AP1000 PRA.

59.10.4 Summary of PRA Based Insights

The use of the PRA in the design process is discussed in Section 59.2. A summary of the overall PRA results is provided in Sections 59.3 through 59.8. A discussion of the AP1000 plant features important to reducing risk is provided in Section 59.9. PRA-based insights are developed from this information and are summarized in Table 59-18.

59.10.5 Combined License Information

The Combined License applicant referencing the AP1000 certified design will review differences between the as-built plant and the design used as the basis for the AP1000 seismic margins analysis. A verification walkdown will be performed with the purpose of identifying differences between the as-built plant and the design. Any differences will be evaluated to determine if there is significant adverse effect on the seismic margins analysis results. Spacial interactions are addressed by COL information item 3.7-3. Details of the process will be developed by the Combined License applicant.

The Combined License applicant referencing the AP1000 certified design should compare the as-built SSC HCLPFs to those assumed in the AP1000 seismic margin evaluation. Deviations from the HCLPF values or assumptions in the seismic margin evaluation should be evaluated to determine if vulnerabilities have been introduced.

The Combined License applicant referencing the AP1000 certified design will review differences between the as-built plant and the design used as the basis for the AP1000 PRA and Table 59-18. If the effects of the differences are shown, by a screening analysis, to potentially result in a significant increase in core damage frequency or large release frequency, the PRA will be updated to reflect these differences.

The Combined License applicant referencing the AP1000 certified design will review differences between the as-built plant and the design used as the basis for the AP1000 internal fire and internal flood analysis. Differences will be evaluated to determine if there is significant adverse effect on the internal fire and internal flood analysis results.

The Combined License applicant referencing the AP1000 certified design will develop and implement severe accident management guidance using the suggested framework provided in WCAP-13914, "Framework for AP600 Severe Accident Management Guidance," (Reference 59-1).

The Combined License applicant referencing the AP1000 certified design will perform a thermal lag assessment of the as-built equipment required to mitigate severe accidents (hydrogen igniters and containment penetrations) to provide additional assurance that this equipment can perform its severe accident functions during environmental conditions resulting from hydrogen burns associated with severe accidents. This assessment is required only for equipment used for severe accident mitigation that has not been tested at severe accident conditions. The Combined License applicant will assess the ability of the as-built equipment to perform during severe accident hydrogen burns, using the Environment Enveloping method or the Test Based Thermal Analysis method discussed in EPRI NP-4354 (Reference 59-2).

59.11 References

59-1 "Framework for AP600 Severe Accident Management Guidance," WCAP-13914, Revision 3, January 1998.

59-2 "Large Scale Hydrogen Burn Equipment Experiments," EPRI-NP-4354, December 1985.

Table 59-1

CONTRIBUTION OF INITIATING EVENTS TO CORE DAMAGE

	Core Damage Contribution	Initiating Event Category	Percent Contribution	Initiating Event Frequency
1	9.50E-08	SAFETY INJECTION LINE BREAK INITIATING EVENT	39.4%	2.12E-04
2	4.50E-08	LARGE LOCA INITIATING EVENT	18.7%	5.00E-06
3	2.96E-08	SPURIOUS ADS INITIATING EVENT	12.3%	5.40E-05
4	1.81E-08	SMALL LOCA INITIATING EVENT	7.5%	5.00E-04
5	1.61E-08	MEDIUM LOCA INITIATING EVENT	6.7%	4.36E-04
6	1.00E-08	REACTOR VESSEL RUPTURE INITIATING EVENT	4.2%	1.00E-08
7	6.79E-09	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT	2.8%	3.88E-03
8	3.68E-09	CMT LINE BREAK INITIATING EVENT	1.5%	9.31E-05
9	3.61E-09	ATWS PRECURSOR WITH NO MFW INITIATING EVENT	1.5%	4.81E-01(*)
10	3.08E-09	TRANSIENT WITH MFW INITIATING EVENT	1.3%	1.40E+00
11	1.71E-09	RCS LEAK INITIATING EVENT	0.7%	6.20E-03
12	1.66E-09	CORE POWER EXCURSION INITIATING EVENT	0.7%	4.50E-03
13	1.24E-09	LOSS OF CONDENSER INITIATING EVENT	0.5%	1.12E-01
14	9.58E-10	LOSS OF OFFSITE POWER INITIATING EVENT	0.4%	1.20E-01
15	8.70E-10	LOSS OF MAIN FEEDWATER INITIATING EVENT	0.4%	3.35E-01
16	7.12E-10	ATWS PRECURSOR WITH MFW AVAILABLE INITIATING EVENT	0.3%	1.17E+00(*)
17	6.72E-10	LOSS OF COMPRESSED AIR INITIATING EVENT	0.3%	3.48E-02
18	6.06E-10	MAIN STEAM LINE STUCK-OPEN SV INITIATING EVENT	0.3%	2.39E-3
19	5.02E-10	PASSIVE RHR TUBE RUPTURE INITIATING EVENT	0.2%	1.34E-04
20	4.53E-10	LOSS OF MFW TO ONE SG INITIATING EVENT	0.2%	1.92E-01
21	3.23E-10	LOSS OF CCW/SW INITIATING EVENT	0.1%	1.44E-01
22	1.31E-10	MAIN STEAM LINE BREAK UPSTREAM OF MSIV INITIATING EVENT	0.1%	3.72E-04
23	1.11E-10	ATWS PRECURSOR WITH SI SIGNAL INITIATING EVENT	0.1%	1.48E-02(*)
24	5.00E-11	INTERFACING SYSTEMS LOCA INITIATING EVENT	0.0%	5.00E-11
25	3.52E-11	LOSS OF RCS FLOW INITIATING EVENT	0.0%	1.80E-02
26	9.15E-12	MAIN STEAM LINE BREAK DOWNSTREAM OF MSIV INITIATING EVENT	0.0%	5.96E-04
	2.41E-07	Totals	100.0%	2.38(*)

(*) Note that the ATWS precursor frequencies are not included in the total initiating event frequency, since they are already accounted for in the other categories.

Table 59-2

CONDITIONAL CORE DAMAGE PROBABILITY OF INITIATING EVENTS

	Core Damage Contribution	Initiating Event Category	Initiating Event Frequency	Conditional CD Prob.
6	1.00E-08	REACTOR VESSEL RUPTURE INITIATING EVENT	1.00E-08	1.00E+00
24	5.00E-11	INTERFACING SYSTEMS LOCA INITIATING EVENT	5.00E-11	1.00E+00
2	4.50E-08	LARGE LOCA INITIATING EVENT	5.00E-06	8.99E-03
3	2.96E-08	SPURIOUS ADS INITIATING EVENT	5.40E-05	5.48E-04
1	9.50E-08	SAFETY INJECTION LINE BREAK INITIATING EVENT	2.12E-04	4.48E-04
8	3.68E-09	CMT LINE BREAK INITIATING EVENT	9.31E-05	3.95E-05
5	1.61E-08	MEDIUM LOCA INITIATING EVENT	4.36E-04	3.70E-05
4	1.81E-08	SMALL LOCA INITIATING EVENT	5.00E-04	3.62E-05
19	5.02E-10	PASSIVE RHR TUBE RUPTURE INITIATING EVENT	1.34E-04	3.74E-06
7	6.79E-09	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT	3.88E-03	1.75E-06
18	6.06E-10	MAIN STEAM LINE STUCK-OPEN SV INITIATING EVENT	2.39E-03	2.54E-07
12	1.66E-09	CORE POWER EXCURSION INITIATING EVENT	4.50E-03	3.69E-07
22	1.31E-10	MAIN STEAM LINE BREAK UPSTREAM OF MSIV INITIATING EVENT	3.72E-04	3.51E-07
11	1.71E-09	RCS LEAK INITIATING EVENT	6.20E-03	2.75E-07
17	6.72E-10	LOSS OF COMPRESSED AIR INITIATING EVENT	3.48E-02	1.93E-08
26	9.15E-12	MAIN STEAM LINE BREAK DOWNSTREAM OF MSIV INITIATING EVENT	5.96E-04	1.54E-08
13	1.24E-09	LOSS OF CONDENSER INITIATING EVENT	1.12E-01	1.11E-08
14	9.58E-10	LOSS OF OFFSITE POWER INITIATING EVENT	1.20E-01	7.98E-09
9	3.61E-09	ATWS PRECURSOR WITH NO MFW INITIATING EVENT	4.81E-01	7.49E-09
23	1.11E-10	ATWS PRECURSOR WITH SI SIGNAL INITIATING EVENT	1.48E-02	7.48E-09
15	8.70E-10	LOSS OF MAIN FEEDWATER INITIATING EVENT	3.35E-01	2.60E-09
20	4.53E-10	LOSS OF MFW TO ONE SG INITIATING EVENT	1.92E-01	2.36E-09
21	3.23E-10	LOSS OF CCW/SW INITIATING EVENT	1.44E-01	2.24E-09
10	3.08E-09	TRANSIENT WITH MFW INITIATING EVENT	1.40E+00	2.20E-09
25	3.52E-11	LOSS OF RSC FLOW INITIATING EVENT	1.80E-02	1.96E-09
16	7.12E-10	ATWS PRECURSOR WITH MFW AVAILABLE INITIATING EVENT	1.17E+00	6.09E-10
	2.41E-07	Totals	2.38E+00	

Table 59-3 (Sheet 1 of 4)

INTERNAL INITIATING EVENTS AT POWER DOMINANT CORE DAMAGE SEQUENCES

	Sequence Frequency	Percent Contrib	Cumulative % Contrib	Sequence Identifier	Sequence Description
1	6.88E-08	28.52	28.52	2esil-07	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS RCPS TRIP AND CMT INJECTION IS SUCCESSFUL – 1 OF 2 CMT TRAINS SUCCESS OF FULL ADS DEPRESSURIZATION FAILURE OF ONE OF ONE IRWST INJECTION LINE
2	4.26E-08	17.66	46.18	2rllo-09	LARGE LOCA INITIATING EVENT OCCURS ANY ONE OF TWO ACCUMULATOR TRAINS FAIL
3	2.13E-08	8.82	55.00	3dsad-08	SPURIOUS ADS INITIATING EVENT OCCURS SUCCESS OF 1/2 OR 2/2 ACCUMULATORS FAILURE OF ADS OR CMT
4	1.98E-08	8.23	63.23	3dsil-08	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS RCPS TRIP AND CMT INJECTION IS SUCCESSFUL – 1 OF 2 CMT TRAINS FAILURE OF FULL ADS DEPRESSURIZATION
5	1.00E-08	4.15	67.38	3crvr-02	REACTOR VESSEL RUPTURE INITIATING EVENT OCCURS
6	8.44E-09	3.5	70.88	2lslo-05	SMALL LOCA INITIATING EVENT OCCURS SUCCESS OF CMT & RCP TRIP SUCCESS OF PASSIVE RHR SYSTEM SUCCESS OF FULL ADS DEPRESSURIZATION FAILURE OF NORMAL RHR IN INJECTION MODE SUCCESS OF TWO OF TWO IRWST INJECTION LINES SUCCESS OF CIS & PRE-EXISTING CONTAINMENT OPENING FAILURE OF RECIRCULATION

Table 59-3 (Sheet 2 of 4)

INTERNAL INITIATING EVENTS AT POWER DOMINANT CORE DAMAGE SEQUENCES

	Sequence Frequency	Percent Contrib	Cumulative % Contrib	Sequence Identifier	Sequence Description
7	7.35E-09	3.05	73.93	2lmlo-05	MEDIUM LOCA INITIATING EVENT OCCURS SUCCESS OF CMT & RCP TRIP SUCCESS OF FULL ADS DEPRESSURIZATION FAILURE OF NORMAL RHR IN INJECTION MODE SUCCESS OF TWO OF TWO IRWST INJECTION LINES SUCCESS OF CIS & PRE-EXISTING CONTAINMENT OPENING FAILURE OF RECIRCULATION
8	5.11E-09	2.12	76.05	3dslo-12	SMALL LOCA INITIATING EVENT OCCURS SUCCESS OF CMT & RCP TRIP SUCCESS OF PASSIVE RHR SYSTEM FAILURE OF FULL ADS DEPRESSURIZATION SUCCESS OF PARTIAL ADS DEPRESSURIZATION FAILURE OF NORMAL RHR IN INJECTION MODE
9	4.46E-09	1.85	77.90	3dmlo-12	MEDIUM LOCA INITIATING EVENT OCCURS SUCCESS OF CMT & RCP TRIP FAILURE OF FULL ADS DEPRESSURIZATION SUCCESS OF PARTIAL ADS DEPRESSURIZATION FAILURE OF NORMAL RHR IN INJECTION MODE
10	3.72E-09	1.54	79.44	2rsad-09	SPURIOUS ADS INITIATING EVENT OCCURS FAILURE OF 2/2 ACCUMULATORS
11	3.67E-09	1.52	80.96	2esad-07	SPURIOUS ADS INITIATING EVENT OCCURS SUCCESS OF 1/2 OR 2/2 ACCUMULATORS SUCCESS OF ADS & CMT FAILURE OF IRW OR CMT

Table 59-3 (Sheet 3 of 4)

INTERNAL INITIATING EVENTS AT POWER DOMINANT CORE DAMAGE SEQUENCES

	Sequence Frequency	Percent Contrib	Cumulative % Contrib	Sequence Identifier	Sequence Description
12	3.57E-09	1.48	82.44	2lsil-03	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS RCPS TRIP AND CMT INJECTION IS SUCCESSFUL – 1 OF 2 CMT TRAINS SUCCESS OF FULL ADS DEPRESSURIZATION IRWST INJECTION IS SUCCESSFUL – 1 OF 1 TRAINS SUCCESS OF CIS & PRE-EXISTING CONTAINMENT OPENING FAILURE OF RECIRCULATION
13	3.55E-09	1.47	83.91	6esgt-41	SGTR EVENT SEQUENCE CONTINUES FAILURE OF CMT OR RCP TRIP SUCCESS OF PASSIVE RHR SYSTEM FAILURE OF FULL ADS DEPRESSURIZATION FAILURE OF PARTIAL ADS DEPRESSURIZATION
14	3.31E-09	1.37	85.28	3aatw-23	ATWS PRECURSOR WITH NO MFW EVENT SEQUENCE CONTINUES SUCCESS OF SFW OR PRHR SYSTEM SUCCESS OF MANUAL REACTOR TRIP FAILURE OF MANUAL BORATION BY CVS FAILURE OF CMT OR RCP TRIP
15	3.30E-09	1.37	86.65	2eslo-09	SMALL LOCA INITIATING EVENT OCCURS SUCCESS OF CMT & RCP TRIP SUCCESS OF PASSIVE RHR SYSTEM SUCCESS OF FULL ADS DEPRESSURIZATION FAILURE OF NORMAL RHR IN INJECTION MODE FAILURE OF TWO OF TWO IRWST INJECTION LINES

Table 59-3 (Sheet 4 of 4)

INTERNAL INITIATING EVENTS AT POWER DOMINANT CORE DAMAGE SEQUENCES

	Sequence Frequency	Percent Contrib	Cumulative % Contrib	Sequence Identifier	Sequence Description
16	2.88E-09	1.19	87.84	2emlo-09	MEDIUM LOCA INITIATING EVENT OCCURS SUCCESS OF CMT & RCP TRIP SUCCESS OF FULL ADS DEPRESSURIZATION FAILURE OF NORMAL RHR IN INJECTION MODE FAILURE OF TWO OF TWO IRWST INJECTION LINES
17	2.19E-09	0.91	88.75	6esgt-13	SGTR EVENT SEQUENCE CONTINUES SUCCESS OF CMT & RCP TRIP SUCCESS OF PASSIVE RHR SYSTEM FAILURE OF FULL ADS DEPRESSURIZATION FAILURE OF PARTIAL ADS DEPRESSURIZATION
18	1.97E-09	0.82	89.57	3dllo-08	LARGE LOCA INITIATING EVENT OCCURS ACCUMULATOR INJECTION IS SUCCESSFUL – 2 OF 2 TRAINS FAILURE OF ADS OR CMT
19	1.57E-09	0.65	90.22	2lcmt-05	CMT LINE BREAK INITIATING EVENT OCCURS RCPS TRIP AND CMT INJECTION IS SUCCESSFUL – 1 OF 2 CMT TRAINS SUCCESS OF FULL ADS DEPRESSURIZATION FAILURE OF NORMAL RHR IN INJECTION MODE SUCCESS OF TWO OF TWO IRWST INJECTION LINES SUCCESS OF CIS & PRE-EXISTING CONTAINMENT OPENING FAILURE OF RECIRCULATION

Table 59-4 (Sheet 1 of 3)

SEQUENCE 1 – SAFETY INJECTION LINE BREAK DOMINANT CUTSETS (SI-LB-07)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
1	5.09E-08	74.04	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			IWRST DISCHARGE LINE "A" STRAINER PLUGGED	2.40E-04	IWA-PLUG
2	6.36E-09	9.25	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CCF OF 4 GRAVITY INJECTION CVs	3.00E-05	IWX-CV-AO
3	5.51E-09	8.01	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	2.60E-05	IWX-EV-SA
4	1.23E-09	1.79	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CCF OF 2 GRAVITY INJECTION SQUIB VALVES IN 1/1 LINES TO OPEN	5.80E-06	IWX-EV1-SA
5	6.49E-10	.94	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CHECK VALVE 122A FAILS TO OPEN	1.75E-03	IWACV122AO
			CHECK VALVE 124A FAILS TO OPEN	1.75E-03	IWACV124AO
6	5.42E-10	.79	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CHECK VALVE 122A FAILS TO OPEN	1.75E-03	IWACV122AO
			HARDWARE FAILURE OF VALVE 125A	1.46E-03	IRWMOD06
7	5.42E-10	.79	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			HARDWARE FAILURE OF VALVE 123A	1.46E-03	IRWMOD05
			CHECK VALVE 124A FAILS TO OPEN	1.75E-03	IWACV124AO
8	4.52E-10	.66	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			HARDWARE FAILURE OF VALVE 123A	1.46E-03	IRWMOD05
			HARDWARE FAILURE OF VALVE 125A	1.46E-03	IRWMOD06
9	3.25E-10	.47	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CHECK VALVE 122A FAILS TO OPEN	1.75E-03	IWACV122AO
			RELAY FAILS TO OPERATE	8.76E-04	IWDRS125AFA
10	3.25E-10	.47	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CHECK VALVE 124A FAILS TO OPEN	1.75E-03	IWACV124AO
			RELAY FAILS TO OPERATE	8.76E-04	IWBRS123AFA
11	2.71E-10	.39	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			HARDWARE FAILURE OF VALVE 123A	1.46E-03	IRWMOD05
			RELAY FAILS TO OPERATE	8.76E-04	IWDRS125AFA

Table 59-4 (Sheet 2 of 3)

SEQUENCE 1 – SAFETY INJECTION LINE BREAK DOMINANT CUTSETS (SI-LB-07)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
12	2.71E-10	.39	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			HARDWARE FAILURE OF VALVE 125A	1.46E-03	IRWMOD06
			RELAY FAILS TO OPERATE	8.76E-04	IWBRS123AFA
13	1.63E-10	.24	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			RELAY FAILS TO OPERATE	8.76E-04	IWBRS123AFA
			RELAY FAILS TO OPERATE	8.76E-04	IWDRS125AFA
14	1.14E-10	.17	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CCF OF GRAVITY INJECTION CVs IN 1/1 LINES TO OPEN	5.40E-07	IWX-CV1-AO
15	1.11E-10	.16	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CHECK VALVE 122A FAILS TO OPEN	1.75E-03	IWACV122AO
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDDBSDS1TM
16	1.11E-10	.16	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CHECK VALVE 122A FAILS TO OPEN	1.75E-03	IWACV122AO
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDDBSDD1TM
17	1.11E-10	.16	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CHECK VALVE 124A FAILS TO OPEN	1.75E-03	IWACV124AO
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDBBSDS1TM
18	1.11E-10	.16	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CHECK VALVE 124A FAILS TO OPEN	1.75E-03	IWACV124AO
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDBBSDD1TM
19	9.29E-11	.14	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			HARDWARE FAILURE OF VALVE 123A	1.46E-03	IRWMOD05
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDDBSDS1TM
20	9.29E-11	.14	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			HARDWARE FAILURE OF VALVE 123A	1.46E-03	IRWMOD05
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDDBSDD1TM
21	9.29E-11	.14	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			HARDWARE FAILURE OF VALVE 125A	1.46E-03	IRWMOD06
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDBBSDS1TM

Table 59-4 (Sheet 3 of 3)

SEQUENCE 1 – SAFETY INJECTION LINE BREAK DOMINANT CUTSETS (SI-LB-07)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
22	9.29E-11	.14	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			HARDWARE FAILURE OF VALVE 125A	1.46E-03	IRWMOD06
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDBBSDD1TM
23	5.57E-11	.08	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			RELAY FAILS TO OPERATE	8.76E-04	IWDRS125AFA
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDBBSDS1TM
24	5.57E-11	.08	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			RELAY FAILS TO OPERATE	8.76E-04	IWDRS125AFA
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDBBSDD1TM
25	5.57E-11	.08	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			RELAY FAILS TO OPERATE	8.76E-04	IWBRS123AFA
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDDBSDS1TM

Table 59-5

SEQUENCE 2 – LARGE LOCA DOMINANT CUTSETS (LLOCA-09)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
1	8.75E-09	20.55	LARGE LOCA INITIATING EVENT OCCURS CHECK VALVE 029A FAILS TO OPEN	5.00E-06 1.75E-03	IEV-LLOCA ACACV029GO
2	8.75E-09	20.55	LARGE LOCA INITIATING EVENT OCCURS CHECK VALVE 028A FAILS TO OPEN	5.00E-06 1.75E-03	IEV-LLOCA ACACV028GO
3	8.75E-09	20.55	LARGE LOCA INITIATING EVENT OCCURS CHECK VALVE 029B FAILS TO OPEN	5.00E-06 1.75E-03	IEV-LLOCA ACBCV029GO
4	8.75E-09	20.55	LARGE LOCA INITIATING EVENT OCCURS CHECK VALVE 028B FAILS TO OPEN	5.00E-06 1.75E-03	IEV-LLOCA ACBCV028GO
5	3.64E-09	8.55	LARGE LOCA INITIATING EVENT OCCURS FLOW TUNING ORIFICE PLUGS	5.00E-06 7.27E-04	IEV-LLOCA ACAOR001SP
6	3.64E-09	8.55	LARGE LOCA INITIATING EVENT OCCURS FLOW TUNING ORIFICE PLUGS	5.00E-06 7.27E-04	IEV-LLOCA ACBOR001SP
7	2.55E-10	.60	LARGE LOCA INITIATING EVENT OCCURS COMMON CAUSE FAILURE OF 2 ACCUMULATOR CHECK VALVES	5.00E-06 5.10E-05	IEV-LLOCA ACX-CV-GO
8	1.20E-11	.03	LARGE LOCA INITIATING EVENT OCCURS ACCUMULATOR TANK A (T001A) RUPTURES	5.00E-06 2.40E-06	IEV-LLOCA ACATK001AF
9	1.20E-11	.03	LARGE LOCA INITIATING EVENT OCCURS ACCUMULATOR TANK B (T001B) RUPTURES	5.00E-06 2.40E-06	IEV-LLOCA ACBTK001AF
10	3.60E-12	.01	LARGE LOCA INITIATING EVENT OCCURS FLOW TUNING ORIFICE RUPTURE	5.00E-06 7.20E-07	IEV-LLOCA ACAOR001EB
11	3.60E-12	.01	LARGE LOCA INITIATING EVENT OCCURS FLOW TUNING ORIFICE RUPTURE	5.00E-06 7.20E-07	IEV-LLOCA ACBOR001EB
12	6.00E-13	.00	LARGE LOCA INITIATING EVENT OCCURS COMMON CAUSE FAILURE OF ACCUMULATOR TANKS	5.00E-06 1.20E-07	IEV-LLOCA ACX-TK-AF

Table 59-6 (Sheet 1 of 3)

SEQUENCE 3 – SPURIOUS ADS ACTUATION DOMINANT CUTSETS (SPADS-08)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
1	5.56E-09	26.14	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CCF OF ESF INPUT LOGIC (HARDWARE)	1.03E-04	CCX-INPUT-LOGIC
2	3.35E-09	15.75	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			COMMON CAUSE FAILURE OF 4 AOVS TO OPEN	6.20E-05	CCX-AV-LA
3	3.19E-09	15.00	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
4	2.75E-09	12.93	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	5.10E-05	CMX-CV-GO
5	2.07E-09	9.73	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CCF OF RTD LEVEL TRANSMITTERS	3.84E-05	CMX-VS-FA
6	1.62E-09	7.62	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.00E-05	ADX-EV-SA
7	5.94E-10	2.79	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CCF OF ESF INPUT LOGIC SOFTWARE	1.10E-05	CCX-IN-LOGIC-SW
8	5.94E-10	2.79	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CCF OF PMS ESF ACTUATION LOGIC SOFTWARE	1.10E-05	CCX-PMXMOD2-SW
9	5.94E-10	2.79	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-05	CCX-PMXMOD1-SW
10	4.65E-10	2.19	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CCF OF EPO BOARDS IN PMS	8.62E-06	CCX-EP-SAM
11	6.48E-11	.30	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
12	2.85E-11	.13	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			FLOW TUNING ORIFICE PLUGS	7.27E-04	CMA-PLUG
			FLOW TUNING ORIFICE PLUGS	7.27E-04	CMB-PLUG
13	1.82E-11	.09	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			HARDWARE FAILURE OF ST. #4 LINE 3	5.80E-04	AD4MOD09
			HARDWARE FAILURE OF ST. #4 LINE 4	5.80E-04	AD4MOD10

Table 59-6 (Sheet 2 of 3)

SEQUENCE 3 – SPURIOUS ADS ACTUATION DOMINANT CUTSETS (SPADS-08)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
14	1.82E-11	.09	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			HARDWARE FAILURE OF ST. #4 LINE 2	5.80E-04	AD4MOD08
			HARDWARE FAILURE OF ST. #4 LINE 4	5.80E-04	AD4MOD10
15	1.82E-11	.09	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			HARDWARE FAILURE OF ST. #4 LINE 2	5.80E-04	AD4MOD08
			HARDWARE FAILURE OF ST. #4 LINE 3	5.80E-04	AD4MOD09
16	1.82E-11	.09	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			HARDWARE FAILURE OF ST. #4 LINE 1	5.80E-04	AD4MOD07
			HARDWARE FAILURE OF ST. #4 LINE 4	5.80E-04	AD4MOD10
17	1.82E-11	.09	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			HARDWARE FAILURE OF ST. #4 LINE 1	5.80E-04	AD4MOD07
			HARDWARE FAILURE OF ST. #4 LINE 3	5.80E-04	AD4MOD09
18	1.82E-11	.09	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			HARDWARE FAILURE OF ST. #4 LINE 1	5.80E-04	AD4MOD07
			HARDWARE FAILURE OF ST. #4 LINE 2	5.80E-04	AD4MOD08
19	6.85E-12	.03	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			UNAVAILABILITY OF BUS ECS ES 2 DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC2BS002TM
20	6.85E-12	.03	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC2BS022TM
21	6.85E-12	.03	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC2BS221TM
22	6.85E-12	.03	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			UNAVAILABILITY OF BUS ECS ES 1 DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS001TM
23	6.85E-12	.03	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS012TM

Table 59-6 (Sheet 3 of 3)

SEQUENCE 3 – SPURIOUS ADS ACTUATION DOMINANT CUTSETS (SPADS-08)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
24	6.85E-12	.03	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS121TM
25	6.83E-12	.03	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			PMBMOD32	5.02E-03	PMBMOD32
			PMCMOD33	5.02E-03	PMCMOD33
			PMDMOD34	5.02E-03	PMDMOD34

Table 59-7 (Sheet 1 of 3)

SEQUENCE 4 – SAFETY INJECTION LINE BREAK DOMINANT CUTSETS (SI-LB-08)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
1	1.25E-08	63.00	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
2	6.36E-09	32.06	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.00E-05	ADX-EV-SA
3	7.13E-11	.36	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			HARDWARE FAILURE OF ST. #4 LINE 3	5.80E-04	AD4MOD09
			HARDWARE FAILURE OF ST. #4 LINE 4	5.80E-04	AD4MOD10
4	7.13E-11	.36	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			HARDWARE FAILURE OF ST. #4 LINE 2	5.80E-04	AD4MOD08
			HARDWARE FAILURE OF ST. #4 LINE 4	5.80E-04	AD4MOD10
5	7.13E-11	.36	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			HARDWARE FAILURE OF ST. #4 LINE 2	5.80E-04	AD4MOD08
			HARDWARE FAILURE OF ST. #4 LINE 3	5.80E-04	AD4MOD09
6	7.13E-11	.36	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			HARDWARE FAILURE OF ST. #4 LINE 1	5.80E-04	AD4MOD07
			HARDWARE FAILURE OF ST. #4 LINE 4	5.80E-04	AD4MOD10
7	7.13E-11	.36	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			HARDWARE FAILURE OF ST. #4 LINE 1	5.80E-04	AD4MOD07
			HARDWARE FAILURE OF ST. #4 LINE 3	5.80E-04	AD4MOD09
8	7.13E-11	.36	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			HARDWARE FAILURE OF ST. #4 LINE 1	5.80E-04	AD4MOD07
			HARDWARE FAILURE OF ST. #4 LINE 2	5.80E-04	AD4MOD08
9	3.65E-11	.18	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING MLOCA	3.30E-03	LPM-MAN02
			CCF OF ESF INPUT LOGIC (HARDWARE)	1.03E-04	CCX-INPUT-LOGIC
10	3.34E-11	.17	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	3.02E-03	ADN-MAN01
			CCF OF ESF INPUT LOGIC (HARDWARE)	1.03E-04	CCX-INPUT-LOGIC

Table 59-7 (Sheet 2 of 3)

SEQUENCE 4 – SAFETY INJECTION LINE BREAK DOMINANT CUTSETS (SI-LB-08)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
11	2.71E-11	.14	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-05	CCX-PMXMOD1-SW
12	2.69E-11	.14	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			UNAVAILABILITY OF BUS ECS ES 2 DUE TO UNSCHEDUL MAINTENANCE	2.70E-03	EC2BS002TM
13	2.69E-11	.14	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC2BS022TM
14	2.69E-11	.14	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC2BS221TM
15	2.69E-11	.14	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			UNAVAILABILITY OF BUS ECS ES 1 DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS001TM
16	2.69E-11	.14	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS012TM
17	2.69E-11	.14	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS121TM
18	2.33E-11	.12	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-05	CCX-PMXMOD1-SW
19	2.12E-11	.11	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS
			CCF OF EPO BOARDS IN PMS	8.62E-06	CCX-EP-SAM
20	1.91E-11	.10	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDDBSDS1TM
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDBBSDS1TM

Table 59-7 (Sheet 3 of 3)

SEQUENCE 4 – SAFETY INJECTION LINE BREAK DOMINANT CUTSETS (SI-LB-08)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
21	1.91E-11	.10	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDDBSDS1TM
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDBBSDD1TM
22	1.91E-11	.10	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDDBSDD1TM
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDBBSDS1TM
23	1.91E-11	.10	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDDBSDD1TM
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDBBSDD1TM
24	1.91E-11	.10	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDCBSDS1TM
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDABSDS1TM
25	1.91E-11	.10	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDCBSDS1TM
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDABSDD1TM

Table 59-8

SEQUENCE 5 – REACTOR VESSEL RUPTURE CUTSET (RV-RP-02)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
1	1.00E-08	100.00	REACTOR VESSEL RUPTURE INITIATING EVENT OCCURS	1.00E-08	IEV-RV-RP

Table 59-9 (Sheet 1 of 3)

SEQUENCE 6 – SMALL LOCA DOMINANT CUTSETS (SLOCA-05)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
1	6.00E-09	71.10	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	1.20E-05	REX-FL-GP
2	2.39E-09	28.32	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILUR	1.00E-02	REN-MAN04
3	2.88E-11	.34	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			SUMP SCREEN A PLUGS AND PREVENTS FLOW	2.40E-04	REA-PLUG
			SUMP SCREEN B PLUGS AND PREVENTS FLOW	2.40E-04	REB-PLUG
4	9.18E-12	.11	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
			CCF OF CMT LEVEL SWITCHES	3.84E-05	CCX-VS-FA
5	2.63E-12	.03	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-05	CCX-PMXMOD1-SW
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
6	2.63E-12	.03	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCX-PMXMOD4-SW	1.10E-05	CCX-PMXMOD4-SW
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
7	2.06E-12	.02	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF EPO BOARDS IN PMS	8.62E-06	CCX-EP-SAM
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
8	3.07E-13	.00	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			HARDWARE FAILURE CAUSE RECIRC. CV 119A FAILS TO OPEN	1.75E-03	REACV119GO
			SUMP SCREEN B PLUGS AND PREVENTS FLOW	2.40E-04	REB-PLUG
			HARDWARE FAILURE OF SQUIB VALVE 118A	1.46E-03	IRWMOD09
9	3.07E-13	.00	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			HARDWARE FAILURE CAUSE RECIRC. CV 119B FAILS TO OPEN	1.75E-03	REBCV119GO
			SUMP SCREEN A PLUGS AND PREVENTS FLOW	2.40E-04	REA-PLUG
			HARDWARE FAILURE OF SQUIB VALVE 118B	1.46E-03	IRWMOD11
10	2.87E-13	.00	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR

Table 59-9 (Sheet 2 of 3)

SEQUENCE 6 – SMALL LOCA DOMINANT CUTSETS (SLOCA-05)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
11	2.56E-13	.00	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			HARDWARE FAILURE OF SQUIB VALVE 120A	1.46E-03	IRWMOD10
			SUMP SCREEN B PLUGS AND PREVENTS FLOW	2.40E-04	REB-PLUG
			HARDWARE FAILURE OF SQUIB VALVE 118A	1.46E-03	IRWMOD09
12	2.56E-13	.00	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			HARDWARE FAILURE OF SQUIB VALVE 120B	1.46E-03	IRWMOD12
			SUMP SCREEN A PLUGS AND PREVENTS FLOW	2.40E-04	REA-PLUG
			HARDWARE FAILURE OF SQUIB VALVE 118B	1.46E-03	IRWMOD11
13	2.39E-13	.00	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			INDICATION FAILURE	1.00E-06	ALL-IND-FAIL
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
14	1.84E-13	.00	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			HARDWARE FAILURE CAUSE RECIRC. CV 119A FAILS TO OPEN	1.75E-03	REACV119GO
			SUMP SCREEN B PLUGS AND PREVENTS FLOW	2.40E-04	REB-PLUG
			RELAY FAILS TO OPERATE	8.76E-04	IWBRS118AFA
15	1.84E-13	.00	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			HARDWARE FAILURE CAUSE RECIRC. CV 119B FAILS TO OPEN	1.75E-03	REBCV119GO
			SUMP SCREEN A PLUGS AND PREVENTS FLOW	2.40E-04	REA-PLUG
			RELAY FAILS TO OPERATE	8.76E-04	IWARS118BFA
16	1.68E-13	.00	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 OUT 2 LOW PRESSURE RECIRCULATION SQUIB VALVES	5.80E-05	IWX-EV4-SA
			CCF OF MOV 120A AND 120B	5.80E-06	IWX-EV2-SA
17	1.53E-13	.00	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			HARDWARE FAILURE OF SQUIB VALVE 120A	1.46E-03	IRWMOD10
			SUMP SCREEN B PLUGS AND PREVENTS FLOW	2.40E-04	REB-PLUG
			RELAY FAILS TO OPERATE	8.76E-04	IWBRS118AFA
18	1.53E-13	.00	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			HARDWARE FAILURE OF SQUIB VALVE 118A	1.46E-03	IRWMOD09
			SUMP SCREEN B PLUGS AND PREVENTS FLOW	2.40E-04	REB-PLUG
			RELAY FAILS TO OPERATE	8.76E-04	IWDRS120AFA

Table 59-9 (Sheet 3 of 3)

SEQUENCE 6 – SMALL LOCA DOMINANT CUTSETS (SLOCA-05)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
19	1.53E-13	.00	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			HARDWARE FAILURE OF SQUIB VALVE 120B	1.46E-03	IRWMOD12
			SUMP SCREEN A PLUGS AND PREVENTS FLOW	2.40E-04	REA-PLUG
			RELAY FAILS TO OPERATE	8.76E-04	IWARS118BFA
20	1.53E-13	.00	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			HARDWARE FAILURE OF SQUIB VALVE 118B	1.46E-03	IRWMOD11
			SUMP SCREEN A PLUGS AND PREVENTS FLOW	2.40E-04	REA-PLUG
			RELAY FAILS TO OPERATE	8.76E-04	IWCRS120BFA
21	9.21E-14	.00	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			RELAY FAILS TO OPERATE	8.76E-04	IWDRS120AFA
			SUMP SCREEN B PLUGS AND PREVENTS FLOW	2.40E-04	REB-PLUG
			RELAY FAILS TO OPERATE	8.76E-04	IWBRS118AFA
22	9.21E-14	.00	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			RELAY FAILS TO OPERATE	8.76E-04	IWCRS120BFA
			SUMP SCREEN A PLUGS AND PREVENTS FLOW	2.40E-04	REA-PLUG
			RELAY FAILS TO OPERATE	8.76E-04	IWARS118BFA
23	8.88E-14	.00	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			HARDWARE FAILURE CAUSE RECIRC. CV 119B FAILS TO OPEN	1.75E-03	REBCV119GO
			CCF OF 2 OUT 2 LOW PRESSURE RECIRCULATION SQUIB VALVES	5.80E-05	IWX-EV4-SA
			HARDWARE FAILURE CAUSE RECIRC. CV 119A FAILS TO OPEN	1.75E-03	REACV119GO
24	7.41E-14	.00	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			HARDWARE FAILURE CAUSE RECIRC. CV 119B FAILS TO OPEN	1.75E-03	REBCV119GO
			CCF OF 2 OUT 2 LOW PRESSURE RECIRCULATION SQUIB VALVES	5.80E-05	IWX-EV4-SA
			HARDWARE FAILURE OF SQUIB VALVE 120A	1.46E-03	IRWMOD10
25	7.41E-14	.00	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			HARDWARE FAILURE CAUSE RECIRC. CV 119A FAILS TO OPEN	1.75E-03	REACV119GO
			CCF OF 2 OUT 2 LOW PRESSURE RECIRCULATION SQUIB VALVES	5.80E-05	IWX-EV4-SA
			HARDWARE FAILURE OF SQUIB VALVE 120B	1.46E-03	IRWMOD12

Table 59-10 (Sheet 1 of 3)

SEQUENCE 7 – MEDIUM LOCA DOMINANT CUTSETS (MLOCA-05)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
1	5.23E-09	71.13	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	1.20E-05	REX-FL-GP
2	2.08E-09	28.29	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILUR	1.00E-02	REN-MAN04
3	2.51E-11	.34	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			SUMP SCREEN A PLUGS AND PREVENTS FLOW	2.40E-04	REA-PLUG
			SUMP SCREEN B PLUGS AND PREVENTS FLOW	2.40E-04	REB-PLUG
4	8.00E-12	.11	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
			CCX-VS-FA	3.84E-05	CCX-VS-FA
5	2.29E-12	.03	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-05	CCX-PMXMOD1-SW
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
6	2.29E-12	.03	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCX-PMXMOD4-SW	1.10E-05	CCX-PMXMOD4-SW
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
7	1.80E-12	.02	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF EPO BOARDS IN PMS	8.62E-06	CCX-EP-SAM
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
8	2.67E-13	.00	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			HARDWARE FAILURE CAUSE RECIRC. CV 119A FAILS TO OPEN	1.75E-03	REACV119GO
			SUMP SCREEN B PLUGS AND PREVENTS FLOW	2.40E-04	REB-PLUG
			HARDWARE FAILURE OF SQUIB VALVE 118A	1.46E-03	IRWMOD09
9	2.67E-13	.00	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			HARDWARE FAILURE CAUSE RECIRC. CV 119B FAILS TO OPEN	1.75E-03	REBCV119GO
			SUMP SCREEN A PLUGS AND PREVENTS FLOW	2.40E-04	REA-PLUG
			HARDWARE FAILURE OF SQUIB VALVE 118B	1.46E-03	IRWMOD11
10	2.50E-13	.00	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			SOFTWARE CCF OF ALL CARDS	1.20E-06	CCX-SFTW
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR

Table 59-10 (Sheet 2 of 3)

SEQUENCE 7 – MEDIUM LOCA DOMINANT CUTSETS (MLOCA-05)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
11	2.23E-13	.00	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			HARDWARE FAILURE OF SQUIB VALVE 120A	1.46E-03	IRWMOD10
			SUMP SCREEN B PLUGS AND PREVENTS FLOW	2.40E-04	REB-PLUG
			HARDWARE FAILURE OF SQUIB VALVE 118A	1.46E-03	IRWMOD09
12	2.23E-13	.00	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			HARDWARE FAILURE OF SQUIB VALVE 120B	1.46E-03	IRWMOD12
			SUMP SCREEN A PLUGS AND PREVENTS FLOW	2.40E-04	REA-PLUG
			HARDWARE FAILURE OF SQUIB VALVE 118B	1.46E-03	IRWMOD11
13	2.08E-13	.00	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			INDICATION FAILURE	1.00E-06	ALL-IND-FAIL
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
14	1.60E-13	.00	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			HARDWARE FAILURE CAUSE RECIRC. CV 119A FAILS TO OPEN	1.75E-03	REACV119GO
			SUMP SCREEN B PLUGS AND PREVENTS FLOW	2.40E-04	REB-PLUG
			RELAY FAILS TO OPERATE	8.76E-04	IWBRS118AFA
15	1.60E-13	.00	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			HARDWARE FAILURE CAUSE RECIRC. CV 119B FAILS TO OPEN	1.75E-03	REBCV119GO
			SUMP SCREEN A PLUGS AND PREVENTS FLOW	2.40E-04	REA-PLUG
			RELAY FAILS TO OPERATE	8.76E-04	IWARS118BFA
16	1.47E-13	.00	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 OUT 2 LOW PRESSURE RECIRCULATION SQUIB VALVES	5.80E-05	IWX-EV4-SA
			CCF OF MOV 120A AND 120B	5.80E-06	IWX-EV2-SA
17	1.34E-13	.00	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			HARDWARE FAILURE OF SQUIB VALVE 120A	1.46E-03	IRWMOD10
			SUMP SCREEN B PLUGS AND PREVENTS FLOW	2.40E-04	REB-PLUG
			RELAY FAILS TO OPERATE	8.76E-04	IWBRS118AFA
18	1.34E-13	.00	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			HARDWARE FAILURE OF SQUIB VALVE 118A	1.46E-03	IRWMOD09
			SUMP SCREEN B PLUGS AND PREVENTS FLOW	2.40E-04	REB-PLUG
			RELAY FAILS TO OPERATE	8.76E-04	IWDRS120AFA

Table 59-10 (Sheet 3 of 3)

SEQUENCE 7 – MEDIUM LOCA DOMINANT CUTSETS (MLOCA-05)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
19	1.34E-13	.00	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			HARDWARE FAILURE OF SQUIB VALVE 120B	1.46E-03	IRWMOD12
			SUMP SCREEN A PLUGS AND PREVENTS FLOW	2.40E-04	REA-PLUG
			RELAY FAILS TO OPERATE	8.76E-04	IWARS118BFA
20	1.34E-13	.00	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			HARDWARE FAILURE OF SQUIB VALVE 118B	1.46E-03	IRWMOD11
			SUMP SCREEN A PLUGS AND PREVENTS FLOW	2.40E-04	REA-PLUG
			RELAY FAILS TO OPERATE	8.76E-04	IWCRS120BFA
21	8.03E-14	.00	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			RELAY FAILS TO OPERATE	8.76E-04	IWDRS120AFA
			SUMP SCREEN B PLUGS AND PREVENTS FLOW	2.40E-04	REB-PLUG
			RELAY FAILS TO OPERATE	8.76E-04	IWBRS118AFA
22	8.03E-14	.00	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			RELAY FAILS TO OPERATE	8.76E-04	IWCRS120BFA
			SUMP SCREEN A PLUGS AND PREVENTS FLOW	2.40E-04	REA-PLUG
			RELAY FAILS TO OPERATE	8.76E-04	IWARS118BFA
23	7.74E-14	.00	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			HARDWARE FAILURE CAUSE RECIRC. CV 119B FAILS TO OPEN	1.75E-03	REBCV119GO
			CCF OF 2 OUT 2 LOW PRESSURE RECIRCULATION SQUIB VALVES	5.80E-05	IWX-EV4-SA
			HARDWARE FAILURE CAUSE RECIRC. CV 119A FAILS TO OPEN	1.75E-03	REACV119GO
24	6.46E-14	.00	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			HARDWARE FAILURE CAUSE RECIRC. CV 119B FAILS TO OPEN	1.75E-03	REBCV119GO
			CCF OF 2 OUT 2 LOW PRESSURE RECIRCULATION SQUIB VALVES	5.80E-05	IWX-EV4-SA
			HARDWARE FAILURE OF SQUIB VALVE 120A	1.46E-03	IRWMOD10
25	6.46E-14	.00	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			HARDWARE FAILURE CAUSE RECIRC. CV 119A FAILS TO OPEN	1.75E-03	REACV119GO
			CCF OF 2 OUT 2 LOW PRESSURE RECIRCULATION SQUIB VALVES	5.80E-05	IWX-EV4-SA
			HARDWARE FAILURE OF SQUIB VALVE 120B	1.46E-03	IRWMOD12

Table 59-11 (Sheet 1 of 3)

SEQUENCE 8 – SMALL LOCA DOMINANT CUTSETS (SLOCA-12)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
1	4.16E-10	8.14	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			MECHANICAL FAILURE OF RNS MOV V055	1.41E-02	RN55MOD1
2	4.16E-10	8.14	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			HARDWARE FAILURE OF ISOLATION MOV 011	1.41E-02	RN11MOD3
3	4.16E-10	8.14	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			HARDWARE FAILS TO OPEN MOV V022/CB FTC/RELAY FTC	1.41E-02	RN22MOD4
4	4.16E-10	8.14	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			HARDWARE FAILS TO OPEN MOV V023/CB FTC/RELAY FTC	1.41E-02	RN23MOD5
5	2.95E-10	5.77	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS	1.00E-02	CLP-UNAVAILABLE
6	2.11E-10	4.13	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.00E-05	ADX-EV-SA
			MECHANICAL FAILURE OF RNS MOV V055	1.41E-02	RN55MOD1
7	2.11E-10	4.13	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.00E-05	ADX-EV-SA
			HARDWARE FAILURE OF ISOLATION MOV 011	1.41E-02	RN11MOD3
8	2.11E-10	4.13	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.00E-05	ADX-EV-SA
			HARDWARE FAILS TO OPEN MOV V022/CB FTC/RELAY FTC	1.41E-02	RN22MOD4
9	2.11E-10	4.13	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.00E-05	ADX-EV-SA
			HARDWARE FAILS TO OPEN MOV V023/CB FTC/RELAY FTC	1.41E-02	RN23MOD5
10	1.50E-10	2.93	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.00E-05	ADX-EV-SA
			CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS	1.00E-02	CLP-UNAVAILABLE

Table 59-11 (Sheet 2 of 3)

SEQUENCE 8 – SMALL LOCA DOMINANT CUTSETS (SLOCA-12)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
11	1.45E-10	2.84	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			CCF OF STOP CHECK VALVES V015A/B TO OPEN	4.90E-03	RNX-KV1-GO
12	8.55E-11	1.67	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			OPERATOR FAILS TO ALIGN AND ACTUATE THE RNS	2.90E-03	RHN-MAN01
13	7.97E-11	1.56	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			UNAVAILABILITY OF BUS ECS ES 1 DUE TO UNSCHEDUL MAINTENANCE	2.70E-03	EC1BS001TM
14	7.97E-11	1.56	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS012TM
15	7.97E-11	1.56	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS122TM
16	7.58E-11	1.48	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			HARDWARE FAILURE OF VALVES ON DVI LINE A (V015A & 017	5.07E-02	RNAMOD09
			HARDWARE FAILURE OF VALVES ON DVI LINE B (V015B & 017	5.07E-02	RNBMOD10
17	7.35E-11	1.44	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.00E-05	ADX-EV-SA
			CCF OF STOP CHECK VALVES V015A/B TO OPEN	4.90E-03	RNX-KV1-GO
18	6.35E-11	1.24	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			UNAVAILABILITY OF BUS ECS ES 2 DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC2BS002TM
19	6.35E-11	1.24	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC2BS022TM
20	6.35E-11	1.24	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC2BS221TM

Table 59-11 (Sheet 3 of 3)

SEQUENCE 8 – SMALL LOCA DOMINANT CUTSETS (SLOCA-12)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
21	6.35E-11	1.24	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			UNAVAILABILITY OF BUS ECS ES 1 DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS001TM
22	6.35E-11	1.24	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS012TM
23	6.35E-11	1.24	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS121TM
24	5.16E-11	1.01	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			CHECK VALVE V013 FAILURE TO OPEN	1.75E-03	RNNCV013GO
25	4.50E-11	.88	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDBBSDS1TM
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDDBSDS1TM

Table 59-12 (Sheet 1 of 3)

SEQUENCE 9 – MEDIUM LOCA DOMINANT CUTSETS (MLOCA-12)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
1	3.63E-10	8.14	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			MECHANICAL FAILURE OF RNS MOV V055	1.41E-02	RN55MOD1
2	3.63E-10	8.14	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			HARDWARE FAILURE OF ISOLATION MOV 011	1.41E-02	RN11MOD3
3	3.63E-10	8.14	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			HARDWARE FAILS TO OPEN MOV V022/CB FTC/RELAY FTC	1.41E-02	RN22MOD4
4	3.63E-10	8.14	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			HARDWARE FAILS TO OPEN MOV V023/CB FTC/RELAY FTC	1.41E-02	RN23MOD5
5	2.57E-10	5.77	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS	1.00E-02	CLP-UNAVAILABLE
6	1.84E-10	4.13	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.00E-05	ADX-EV-SA
			MECHANICAL FAILURE OF RNS MOV V055	1.41E-02	RN55MOD1
7	1.84E-10	4.13	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.00E-05	ADX-EV-SA
			HARDWARE FAILURE OF ISOLATION MOV 011	1.41E-02	RN11MOD3
8	1.84E-10	4.13	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.00E-05	ADX-EV-SA
			HARDWARE FAILS TO OPEN MOV V022/CB FTC/RELAY FTC	1.41E-02	RN22MOD4
9	1.84E-10	4.13	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.00E-05	ADX-EV-SA
			HARDWARE FAILS TO OPEN MOV V023/CB FTC/RELAY FTC	1.41E-02	RN23MOD5
10	1.31E-10	2.94	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.00E-05	ADX-EV-SA
			CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS	1.00E-02	CLP-UNAVAILABLE

Table 59-12 (Sheet 2 of 3)

SEQUENCE 9 – MEDIUM LOCA DOMINANT CUTSETS (MLOCA-12)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
11	1.26E-10	2.83	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			CCF OF STOP CHECK VALVES V015A/B TO OPEN	4.90E-03	RNX-KV1-GO
12	7.46E-11	1.67	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			OPERATOR FAILS TO ALIGN AND ACTUATE THE RNS	2.90E-03	RHN-MAN01
13	6.95E-11	1.56	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			UNAVAILABILITY OF BUS ECS ES 1 DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS001TM
14	6.95E-11	1.56	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS012TM
15	6.95E-11	1.56	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS122TM
16	6.61E-11	1.48	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			HARDWARE FAILURE OF VALVES ON DVI LINE A (V015A & 017)	5.07E-02	RNAMOD09
			HARDWARE FAILURE OF VALVES ON DVI LINE B (V015B & 017)	5.07E-02	RNBMOD10
17	6.41E-11	1.44	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.00E-05	ADX-EV-SA
			CCF OF STOP CHECK VALVES V015A/B TO OPEN	4.90E-03	RNX-KV1-GO
18	5.53E-11	1.24	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			UNAVAILABILITY OF BUS ECS ES 2 DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC2BS002TM
19	5.53E-11	1.24	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC2BS022TM

Table 59-12 (Sheet 3 of 3)

SEQUENCE 9 – MEDIUM LOCA DOMINANT CUTSETS (MLOCA-12)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
20	5.53E-11	1.24	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC2BS221TM
21	5.53E-11	1.24	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			UNAVAILABILITY OF BUS ECS ES 1 DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS001TM
22	5.53E-11	1.24	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS012TM
23	5.53E-11	1.24	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS121TM
24	4.50E-11	1.01	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	5.90E-05	ADX-EV-SA2
			CHECK VALVE V013 FAILURE TO OPEN	1.75E-03	RNNCV013GO
25	3.92E-11	.88	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDDBSDS1TM
			BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	3.00E-04	IDBBSDS1TM

Table 59-13 (Sheet 1 of 3)

SEQUENCE 10 – SPURIOUS ADS ACTUATION DOMINANT CUTSETS (SPADS-09)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
1	2.75E-09	73.90	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			COMMON CAUSE FAILURE OF 2 ACCUMULATOR CHECK VALVES	5.10E-05	ACX-CV-GO
2	1.65E-10	4.43	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CHECK VALVE 029B FAILS TO OPEN	1.75E-03	ACBCV029GO
			CHECK VALVE 029A FAILS TO OPEN	1.75E-03	ACACV029GO
3	1.65E-10	4.43	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CHECK VALVE 029B FAILS TO OPEN	1.75E-03	ACBCV029GO
			CHECK VALVE 028A FAILS TO OPEN	1.75E-03	ACACV028GO
4	1.65E-10	4.43	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CHECK VALVE 028B FAILS TO OPEN	1.75E-03	ACBCV028GO
			CHECK VALVE 029A FAILS TO OPEN	1.75E-03	ACACV029GO
5	1.65E-10	4.43	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CHECK VALVE 028B FAILS TO OPEN	1.75E-03	ACBCV028GO
			CHECK VALVE 028A FAILS TO OPEN	1.75E-03	ACACV028GO
6	6.87E-11	1.85	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			FLOW TUNING ORIFICE PLUGS	7.27E-04	ACBOR001SP
			CHECK VALVE 029A FAILS TO OPEN	1.75E-03	ACACV029GO
7	6.87E-11	1.85	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			FLOW TUNING ORIFICE PLUGS	7.27E-04	ACBOR001SP
			CHECK VALVE 028A FAILS TO OPEN	1.75E-03	ACACV028GO
8	6.87E-11	1.85	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CHECK VALVE 029B FAILS TO OPEN	1.75E-03	ACBCV029GO
			FLOW TUNING ORIFICE PLUGS	7.27E-04	ACAOR001SP
9	6.87E-11	1.85	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CHECK VALVE 028B FAILS TO OPEN	1.75E-03	ACBCV028GO
			FLOW TUNING ORIFICE PLUGS	7.27E-04	ACAOR001SP
10	2.85E-11	.77	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			FLOW TUNING ORIFICE PLUGS	7.27E-04	ACBOR001SP
			FLOW TUNING ORIFICE PLUGS	7.27E-04	ACAOR001SP

Table 59-13 (Sheet 2 of 3)

SEQUENCE 10 – SPURIOUS ADS ACTUATION DOMINANT CUTSETS (SPADS-09)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
11	6.48E-12	.17	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			COMMON CAUSE FAILURE OF ACCUMULATOR TANKS	1.20E-07	ACX-TK-AF
12	2.27E-13	.01	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			ACCUMULATOR TANK B (T001B) RUPTURES	2.40E-06	ACBTK001AF
			CHECK VALVE 029A FAILS TO OPEN	1.75E-03	ACACV029GO
13	2.27E-13	.01	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			ACCUMULATOR TANK B (T001B) RUPTURES	2.40E-06	ACBTK001AF
			CHECK VALVE 028A FAILS TO OPEN	1.75E-03	ACACV028GO
14	2.27E-13	.01	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CHECK VALVE 029B FAILS TO OPEN	1.75E-03	ACBCV029GO
			ACCUMULATOR TANK A (T001A) RUPTURES	2.40E-06	ACATK001AF
15	2.27E-13	.01	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CHECK VALVE 028B FAILS TO OPEN	1.75E-03	ACBCV028GO
			ACCUMULATOR TANK A (T001A) RUPTURES	2.40E-06	ACATK001AF
16	9.42E-14	.00	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			ACCUMULATOR TANK B (T001B) RUPTURES	2.40E-06	ACBTK001AF
			FLOW TUNING ORIFICE PLUGS	7.27E-04	ACAOR001SP
17	9.42E-14	.00	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			FLOW TUNING ORIFICE PLUGS	7.27E-04	ACBOR001SP
			ACCUMULATOR TANK A (T001A) RUPTURES	2.40E-06	ACATK001AF
18	6.80E-14	.00	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			FLOW TUNING ORIFICE RUPTURE	7.20E-07	ACBOR001EB
			CHECK VALVE 029A FAILS TO OPEN	1.75E-03	ACACV029GO
19	6.80E-14	.00	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			FLOW TUNING ORIFICE RUPTURE	7.20E-07	ACBOR001EB
			CHECK VALVE 028A FAILS TO OPEN	1.75E-03	ACACV028GO
20	6.80E-14	.00	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CHECK VALVE 029B FAILS TO OPEN	1.75E-03	ACBCV029GO
			FLOW TUNING ORIFICE RUPTURE	7.20E-07	ACAOR001EB

Table 59-13 (Sheet 3 of 3)

SEQUENCE 10 – SPURIOUS ADS ACTUATION DOMINANT CUTSETS (SPADS-09)

NUMBER	CUTSET PROB.	PERCENTAGE	BASIC EVENT NAME		
21	6.80E-14	.00	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CHECK VALVE 028B FAILS TO OPEN	1.75E-03	ACBCV028GO
			FLOW TUNING ORIFICE RUPTURE	7.20E-07	ACAOR001EB
22	2.83E-14	.00	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			FLOW TUNING ORIFICE RUPTURE	7.20E-07	ACBOR001EB
			FLOW TUNING ORIFICE PLUGS	7.27E-04	ACAOR001SP
23	2.83E-14	.00	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			FLOW TUNING ORIFICE PLUGS	7.27E-04	ACBOR001SP
			FLOW TUNING ORIFICE RUPTURE	7.20E-07	ACAOR001EB

Table 59-14

TYPICAL SYSTEM FAILURE PROBABILITIES, SHOWING HIGHER RELIABILITIES FOR SAFETY SYSTEMS

Failure System/Function	Probability	Fault Tree Name	
CMT Valve Signal	5.7E-07	CMT-IC11	(one train; auto and manual actuation)
PRHR Valve Signal	1.1E-06	RHR-IC01	(one train; auto and manual actuation)
Passive Cont. Cool.	1.8E-06	PCT	
Reactor Trip by PMS	1.2E-05	RTPMS	(including operator actions)
Accumulators	6.9E-05	AC2AB	
IRWST Inj.	6.9E-05	IW2AB	
ADS	9.3E-05	ADS	(including operator actions)
Passive PRHR	2.0E-04	PRT	
Core Makeup Tanks	1.1E-04	CM2SL	
125 vdc 1E Bus	3.1E-04	IDADS1	(one bus only)
DC Bus (Non-1E)	3.4E-04	ED1DS1	(one bus only)
RC Pump Trip	5.9E-04	RCT	
Hydrogen Control	1.0E-01	VLH	
Chilled Water	1.4E-03	VWH	
Containment Isol.	1.6E-03	CIC	
Reactor Trip by DAS	1.7E-03	DAS	(including operator action; excluding MGSET failure)
6900 vac Bus	3.2E-03	ECES1	(one bus only)
CVS	3.4E-03	CVS1	
480 vac Bus	5.9E-03	ECEK11	(one bus only)
Service Water	6.2E-03	SWT	
Comp. Cooling Water	6.3E-03	CCT	
Diesel Generators	1.0E-02	DGEN	
Startup Feedwater	1.7E-02	SFWT	
Compressed Air	1.3E-02	CAIR	
Condenser	2.4E-02	CDS	
Main Feedwater	2.8E-02	FWT	(including condenser)
RNS	9.1E-02	RNR	
Hydrogen Control	1.0E-01	VLH	

Table 59-15

SUMMARY OF AP1000 PRA RESULTS

Events	Core Damage Frequency (per year)		Large Release Frequency (per year)	
	At-Power	**Shutdown**	**At-Power**	**Shutdown**
Internal Events	2.41E-07	1.23E-07	1.95E-08	2.05E-08
Internal Flood	8.82E-10	3.22E-09	7.14E-11	5.37E-10
Internal Fire	5.61E-08	8.5E-08(1)	4.54E-09	1.43E-08
Sum =	2.97E-07	2.11E-07	2.41E-08	3.53E-08

Note:

1. Internal fire during shutdown is evaluated quantitatively as a response to an NRC question and is not reported elsewhere in this document.

Table 59-16

SITE BOUNDARY WHOLE BODY EDE DOSE RISK – 24 HOURS

Release Category	Release Frequency (/reactor year)	Mean Dose (sieverts)	Dose (REM)	Risk (REM/reactor year)	Percent Contribution to Total Risk
CFI	1.89E-10	2.59E+01	2.59E+03	4.90E-07	0.3
CFE	7.47E-09	4.23E+01	4.23E+03	3.16E-05	17.3
IC	2.21E-07	1.82E-02	1.82E+00	4.02E-07	0.2
BP	1.05E-08	1.37E+02	1.37E+04	1.44E-04	78.6
CI	1.33E-09	5.10E+01	5.10E+03	6.78E-06	3.7
CFL	3.45E-13	3.84E-02	3.84E+00	1.32E-12	0.0
	2.4E-07		Total Risk =	1.83E-04	100.0

Table 59-17

COMPARISON OF AP1000 PRA RESULTS TO RISK GOALS

Plant/Goal	Core Damage Frequency	Large Release Frequency	Containment Success Probability
Current PWR[1]	6.7E-05	5.3E-06	92%
NRC Safety Goal	1E-04	1E-06	90%
AP600	1.7E-07	1.8E-08	89%
AP1000	2.41E-07	1.95E-08	92%

Note:

1. Selected IPE result (two-loop Westinghouse PWR – internal at-power events and at-power flooding only). Note that there is no shutdown PRA requirement for currently operating plants.

Table 59-18 (Sheet 1 of 24)

AP1000 PRA-BASED INSIGHTS

Insight	Disposition
1. The passive core cooling system (PXS) is composed of the following: - Accumulator subsystem - Core makeup tank (CMT) subsystem - In-containment refueling water storage tank (IRWST) subsystem - Passive residual heat removal (PRHR) subsystem. The automatic depressurization system (ADS), which is part of the reactor coolant system (RCS), also supports passive core cooling functions.	
1a. The accumulators provide a safety-related means of safety injection of borated water to the RCS.	6.3.2
The following are some important aspects of the accumulator subsystem as represented in the PRA:	
- There are two accumulators, each with an injection line to the reactor vessel/direct vessel injection (DVI) nozzle. Each injection line has two check valves in series.	Tier 1 Information
- The reliability of the accumulator subsystem is important. The accumulator subsystem is included in the D-RAP.	17.4
- Diversity between the accumulator check valves and the CMT check valves minimizes the potential for common cause failures.	6.3.2
1b. ADS provides a safety-related means of depressurizing the RCS.	Tier 1 Information
The following are some important aspects of ADS as represented in the PRA:	
ADS has four stages. Each stage is arranged into two separate groups of valves and lines. - Stages 1, 2, and 3 discharge from the top of the pressurizer to the IRWST - Stage 4 discharges from the hot leg to the RCS loop compartment.	Tier 1 Information
Each stage 1, 2, and 3 line contains two motor-operated valves (MOVs).	Tier 1 Information
Each stage 4 line contains an MOV valve and a squib valve.	Tier 1 Information
The valve arrangement and positioning for each stage is designed to reduce spurious actuation of ADS. - Stage 1, 2, and 3 MOVs are normally closed and have separate controls. - Each stage 4 squib valve actuation requires signals from two separate PMS cabinets. - Stage 4 is blocked from opening at high RCS pressures.	6.3.2 & 7.3

Table 59-18 (Sheet 2 of 24)

AP1000 PRA-BASED INSIGHTS

Insight	Disposition
1b. (cont.)	
The ADS valves are automatically and manually actuated via the protection and safety monitoring system (PMS), and manually actuated via the diverse actuation system (DAS).	Tier 1 Information
The ADS valves are powered from Class 1E power.	Tier 1 Information
The ADS valve positions are indicated and alarmed in the control room.	6.3.7
Stage 1, 2, and 3 valves are stroke-tested every cold shutdown. Stage 4 squib valve actuators are tested every 2 years for 20% of the valves.	3.9.6
Because of the potential for counter-current flow limitation in the surgeline, it is essential to establish and maintain venting capability with ADS Stage 4 for gravity injection and containment recirculation following an extended loss of RNS when the RCS is open during shutdown operations.	6.3.3.4.3
ADS 4th stage squib valves receive a signal to open during shutdown conditions using PMS low hot leg level logic.	6.3.3.4.3
The reliability of the ADS is important. The ADS is included in the D-RAP.	17.4
ADS is required by the Technical Specifications to be available in Modes 1 through 6 without the cavity flooded.	16.1
Stages 1, 2, and 3, connected to the top of the pressurizer, provide a vent path to preclude pressurization of the RCS during shutdown conditions if decay heat removal is lost.	16.1
Depressurization of the RCS through ADS minimizes the potential for high-pressure melt ejection events.	
- Procedures will be provided for use of the ADS for depressurization of the RCS after core uncovery.	Emergency Response Guidelines
The ADS mitigates high pressure core damage events which can produce challenges to containment integrity due to the following severe accident phenomena: - High pressure melt ejection - Direct containment heating - Induced steam generator tube rupture - Induced RCS piping rupture and rapid hydrogen release to containment	19.36

Table 59-18 (Sheet 3 of 24)

AP1000 PRA-BASED INSIGHTS

Insight	Disposition
1c. The CMTs provide safety-related means of high-pressure safety injection of borated water to the RCS.	6.3.1
The following are some important aspects of CMT subsystem as represented in the PRA:	
There are two CMTs, each with an injection line to the reactor vessel/DVI nozzle..	6.3.2
- Each CMT has a normally open pressure balance line from an RCS cold leg.	
- Each injection line is isolated with a parallel set of air-operated valves (AOVs).	
- These AOVs open on loss of Class 1E dc power, loss of air, or loss of the signal from the PMS.	
- The injection line for each CMT also has two normally open check valves in series.	
The CMT AOVs are automatically and manually actuated from PMS and DAS.	Tier 1 Information
CMT level instrumentation provides an actuation signal to initiate automatic ADS and provides the actuation signal for the IRWST squib valves to open.	6.3.1 & 7.3.1
The CMT AOV positions are indicated and alarmed in the control room.	6.3.7
CMT AOVs are stroke-tested quarterly.	3.9.6
The CMTs are risk-important for power conditions because the level indicators in the CMTs provide an open signal to ADS and to the IRWST squib valves as the CMTs empty.	
- The CMT subsystem is included in the D-RAP.	17.4
CMT is required by the Technical Specifications to be available in Modes 1 through 5 with RCS pressure boundary intact.	16.1

Table 59-18 (Sheet 4 of 24)

AP1000 PRA-BASED INSIGHTS

Insight	Disposition
1d. IRWST subsystem provides a safety-related means of performing the following functions: - Low-pressure safety injection following ADS actuation - Long-term core cooling via containment recirculation - Reactor vessel cooling through the flooding of the reactor cavity by draining the IRWST into the containment. The following are some important aspects of the IRWST subsystem as represented in the PRA:	6.3
IRWST subsystem has the following flowpaths: - Two (redundant) injection lines from IRWST to reactor vessel/DVI nozzle. Each line is isolated with a parallel set of valves; each set with a check valve in series with a squib valve. - Two (redundant) recirculation lines from the containment to the reactor vessel/DVI injection line. Each recirculation line has two paths: one path contains a squib valve and a MOV, the other path contains a squib valve and a check valve. - The two MOV/squib valve lines also provide the capability to flood the reactor cavity.	Tier 1 Information
There are screens for each IRWST injection line and recirculation line.	Tier 1 Information
Squib valves provide the pressure boundary and prevent the check valves from normally seeing a high delta-P.	6.3.3
Squib valves and MOVs are powered by Class 1E power.	Tier 1 Information
The squib valves and MOVs for injection and recirculation are automatically and manually actuated via PMS, and manually actuated via DAS.	Tier 1 Information
The squib valves and MOVs for reactor cavity flooding are manually actuated via PMS and DAS from the control room.	Tier 1 Information
The injection squib valves and the recirculation squib valves in series with check valves are diverse from the other recirculation squib valves in order to minimize the potential for common cause failure between injection and recirculation/reactor cavity flooding.	6.3.2
Automatic IRWST injection at shutdown conditions is provided using PMS low hot leg level logic.	6.3.3.4.3 & 7.3.1

Table 59-18 (Sheet 5 of 24)

AP1000 PRA-BASED INSIGHTS

Insight	Disposition
1d. (cont.)	
The positions of the squib valves and MOVs are indicated and alarmed in the control room.	6.3.7
IRWST injection and recirculation check valves are exercised at each refueling. IRWST injection and recirculation squib valve actuators are tested every 2 years for 20% of the valves (This does not require valve actuation). IRWST recirculation MOVs are stroke-tested quarterly.	3.9.6
The reliability of the IRWST subsystem is important. The IRWST subsystem is included in the D-RAP.	17.4
IRWST injection and recirculation are required by Technical Specifications to be available in Modes 1 through 6 without the cavity flooded.	16.1
The operator action to flood the reactor cavity is determined in Emergency Response Guideline AFR-C.1, which instructs the operator to flood the reactor cavity when the core-exit thermocouples reach 1200°F.	Emergency Response Guidelines
PXS recirculation valves are automatically actuated by a low IRWST level signal or manually from the control room, if automatic actuation fails.	6.3
1e. Passive residual heat removal (PRHR) provides a safety-related means of performing the following functions:	6.3.1 & 6.3.3
- Removes core decay heat during accidents	
- Allows automatic termination of RCS leak during a steam generator tube rupture (SGTR) without ADS	
- Allows plant to ride out an ATWS event without rod insertion.	PRA App. A4
The following are some important aspects of the PRHR subsystem as represented in the PRA:	
PRHR is actuated by opening redundant parallel air-operated valves. These air-operated valves open on loss of Class 1E power, loss of air, or loss of the signal from PMS.	6.3.2
The PRHR air-operated valves are automatically actuated and manually actuated from the control room by either PMS or DAS.	Tier 1 Information
Diversity of the PRHR air-operated valves from the CMT air-operated valves minimizes the probability for common cause failure of both PRHR and CMT air-operated valves.	6.3.2

Table 59-18 (Sheet 6 of 24)

AP1000 PRA-BASED INSIGHTS

Insight	Disposition
1e. (cont.)	
Long-term cooling of PRHR will result in steaming to the containment. The steam will normally condense on the containment shell and return to the IRWST by safety-related features. Connections are provided to IRWST from the spent fuel system (SFS) and chemical and volume control system (CVS) to extend PRHR operation. A safety-related makeup connection is also provided from outside the containment through the normal residual heat removal system (RNS) to the IRWST.	6.3.1 & system drawings
Capability exists and guidance is provided for the control room operator to identify a leak in the PRHR HX of 500 gpd. This limit is based on the assumption that a single crack leaking this amount would not lead to a PRHR HX tube rupture under the stress conditions involving the pressure and temperature gradients expected during design basis accidents, which the PRHR HX is designed to mitigate.	6.3.3 & 16.1
The positions of the inlet and outlet PRHR valves are indicated and alarmed in the control room.	6.3.7
PRHR air-operated valves are stroke-tested quarterly. The PRHR HX is tested to detect system performance degradation every 10 years.	3.9.6
PRHR is required by Technical Specifications to be available from Modes 1 through 5 with RCS pressure boundary intact.	16.1
The PRHR HX, in conjunction with the PCS, can provide core cooling for an indefinite period of time. After the IRWST water reaches its saturation temperature, the process of steaming to the containment initiates. Condensation occurs on the steel containment vessel, and the condensate is collected in a safety-related gutter arrangement, which returns the condensate to the IRWST. The gutter normally drains to the containment sump, but when the PRHR HX actuates, safety-related isolation valves in the gutter drain line shut and the gutter overflow returns directly to the IRWST. The following design features provide proper re-alignment for the gutter system valves to direct water to the IRWST:	6.3.2.1.1 & 6.3.7.6
- IRWST gutter and its drain isolation valves are safety-related	
- These isolation valves are designed to fail closed on loss of compressed air, loss of Class 1E dc power, or loss of the PMS signal	
- These isolation valves are actuated automatically by PMS and DAS.	7.3.1.2.7
The PRHR subsystem provides a safety-related means of removing decay heat following loss of RNS cooling during shutdown conditions with the RCS intact.	16.1

Table 59-18 (Sheet 7 of 24)

AP1000 PRA-BASED INSIGHTS

Insight	Disposition
2. The protection and safety monitoring system (PMS) provides a safety-related means of performing the following functions: - Initiates automatic and manual reactor trip - Automatic and manual actuation of engineered safety features (ESF).	Tier 1 Information
PMS monitors the safety-related functions during and following an accident as required by Regulatory Guide 1.97.	7.1.1
PMS initiates an automatic reactor trip and an automatic actuation of ESF. PMS provides manual initaition of reactor trip. PMS 2-out-of-4 initiation logic reverts to a 2-out-of-3 coincidence logic if one of the 4 channels is bypassed. PMS does not allow simultaneous bypass of 2 redundant channels.	Tier 1 Information
PMS has redundant divisions of safety-related post-accident parameter display.	7.5.2.2.1 & 7.5.4
Each PMS division is powered from its respective Class 1E dc and UPS division.	Tier 1 Information
PMS provides fixed position controls in the control room.	Tier 1 Information
Reliability of the PMS is provided by the following:	
- The reactor trip functions are divided into two subsystems.	7.1.2.1.1
- The ESF functions are processed by two microprocessor-based subsystems that are functionally identical in both hardware and software.	7.1.2.2
Four sensors normally monitor variables used for an ESF actuation. These sensors may monitor the same variable for a reactor trip function.	7.3.1
Continuous automatic PMS system monitoring and failure detection/alarm is provided.	7.1.2
PMS equipment is designed to accommodate a loss of the normal heating, ventilation, and air conditioning (HVAC). PMS equipment is protected by the passive heat sinks upon failure or degradation of the active HVAC.	3.11 & 6.4
The reliability of the PMS is important. The PMS is included in the D-RAP.	17.4
The PMS software is designed, tested, and maintained to be reliable under a controlled verification and validation program written in accordance with IEEE 7-4.3.2 (1993) that has been endorsed by Regulatory Guide 1.152. Elements that contribute to a reliable software design include:	App 1A (Compliance with Reg. Guide 1.152)
- A formalized development, modification, and acceptance process in accordance with an approved software QA plan (paraphrased from IEEE standard, section 5.3, "Quality")	

Table 59-18 (Sheet 8 of 24)

AP1000 PRA-BASED INSIGHTS

Insight	Disposition
2. (cont.)	
- A verification and validation program prepared to confirm the design implemented will function as required (IEEE standard, section 5.3.4, "Verification and Validation")	
- Equipment qualification testing performed to demonstrate that the system will function as required in the environment it is intended to be installed in (IEEE standard, section 5.4, "Equipment Qualification")	
- Design for system integrity (performing its intended safety function) when subjected to all conditions, external or internal, that have significant potential for defeating the safety function (abnormal conditions and events) (IEEE standard, section 5.5, "System Integrity")	
- Software configuration management process (IEEE standard, section 5.3.5, "Software Configuration Management").	
3. The diverse actuation system (DAS) provides a nonsafety-related means of performing the following functions:	Tier 1 Information
- Initiates automatic and manual reactor trip	
- Automatic and manual actuation of selected engineered safety features.	
Diversity is assumed in the PRA that eliminates the potential for common cause failures between PMS and DAS.	
- The DAS automatic actuation signals are generated in a diverse manner from the PMS signals. Diversity between DAS and PMS is achieved by the use of different architecture, different hardware implementations, and different software.	Tier 1 Information
DAS provides control room displays and fixed position controls to allow the operators to take manual actions.	7.7.1
DAS actuates using 2-out-of-2 logic. Actuation signals are output to the loads in the form of normally de-energized, energize-to-actuate signals. The normally de-energized output state, along with the dual 2-out-of-2 redundancy, reduces the probability of inadvertent actuation.	7.7.1.11
The actuation devices of DAS and PMS are capable of independent operation that is not affected by the operation of the other. The DAS is designed to actuate components only in a manner that initiates the safety function.	7.7.1.11
The DAS reactor trip function is to trip the control rods by deenergizing the motor-generator set.	7.7.1.11

Table 59-18 (Sheet 9 of 24)

AP1000 PRA-BASED INSIGHTS

Insight	Disposition
3. (cont.)	
In the PRA it is assumed the following eliminates the potential for common cause failures between automatic and manual DAS functions.	
- DAS manual initiation functions are implemented in a manner that bypasses the signal processing equipment of the DAS automatic logic.	Tier 1 Information
The DAS, including the M-G set field breakers, is included in the D-RAP.	17.4
4. The plant control system (PLS) provides a nonsafety-related means of controlling nonsafety-related equipment.	7.1.3 & 7.7.1
- Automatic and manual control of nonsafety-related functions, including "defense-in-depth" functions.	
- Provides control room indication for monitoring overall plant and nonsafety-related system performance.	
PLS has appropriate redundancy to minimize plant transients.	7.1.3 & 7.7.1.12
PLS provides capability for both automatic control and manual control.	7.1.3
Signal selector algorithmes provide the PLS with the ability to obtain inputs from the PMS. The signal selector algorithms select those protection system signals that represent the actual status of the plant and reject erroneous signals.	7.1.3.2
PLS control functions are distributed across multiple distributed controllers so that single failures within a controller do not degrade the performance of control functions performed by other controllers.	7.1.3.1
5. The onsite power system consists of the main ac power system and the dc power system. The main ac power system is a non-Class 1E system. The dc power system consists of two independent systems: the Class 1E dc system and the non-Class 1E dc system.	
5a. The onsite main ac power system is a non-Class 1E system comprised of a normal, preferred, and standby power supplies.	8.3.1.1
The main ac power system distributes power to the reactor, turbine, and balance of plant auxiliary electrical loads for startup, normal operation, and normal/emergency shutdown.	8.3.1.1.1
The arrangement of the buses permits feeding functionally redundant pumps or groups of loads from separate buses and enhances the plant operational reliability.	8.3.1.1.1

Table 59-18 (Sheet 10 of 24)

AP1000 PRA-BASED INSIGHTS

Insight	Disposition
5a. (cont.)	
During power generation mode, the turbine generator normally supplies electric power to the plant auxiliary loads through the unit auxiliary transformers. During plant startup, shutdown, and maintenance, the main ac power is provided from the high-voltage switchyard. The onsite standby power system powered by the two onsite standby diesel generators supplies power to selected loads in the event of loss of normal and preferred ac power supplies.	8.3.1.1.1
Two onsite standby diesel generator units, each furnished with its own support subsystems, provide power to the selected plant nonsafety-related ac loads.	8.3.1.1.2.1
On loss of power to a 6900 V diesel-backed bus, the associated diesel generator automatically starts and produces ac power. The normal source circuit breaker and bus load circuit breakers are opened, and the generator is connected to the bus. Each generator has an automatic load sequencer to enable controlled loading on the associated buses.	Tier 1 Information
5b. The Class 1E dc and uninterruptible power supply (UPS) system (IDS) provides reliable power for the safety-related equipment required for the plant instrumentation, control, monitoring, and other vital functions needed for shutdown of the plant.	8.3.2.1
There are four independent, Class 1E 125 Vdc divisions. Divisions A and D each consists of one battery bank, one switchboard, and one battery charger. Divisions B and C are each composed of two battery banks, two switchboards, and two battery chargers. The first battery bank in the four divisions is designated as the 24-hour battery bank. The second battery bank in Divisions B and C is designated as the 72-hour battery bank.	Tier 1 Information
The 24-hour battery banks provide power to the loads required for the first 24 hours following an event of loss of all ac power sources concurrent with a design basis accident. The 72-hour battery banks provide power to those loads requiring power for 72 hours following the same event.	Tier 1 Information
Battery chargers are connected to dc switchboard buses. The input ac power for the Class 1E dc battery chargers is supplied from non-Class 1E 480 Vac diesel-generator-backed motor control centers.	8.3.2.1.1.1
The 24-hour and the 72-hour battery banks are housed in ventilated rooms apart from chargers and distribution equipment.	8.3.2.1.3
Each of the four divisions of dc systems are electrically isolated and physically separated to prevent an event from causing the loss of more than one division.	8.3.2.1.3
The Class 1E batteries are included in the D-RAP.	17.4

Table 59-18 (Sheet 11 of 24)

AP1000 PRA-BASED INSIGHTS

Insight	Disposition
5c. The non-Class 1E dc and UPS system (EDS) consists of the electric power supply and distribution equipment that provide dc and uninterruptible ac power to nonsafety-related loads.	Tier 1 Information
The non-Class 1E dc and UPS system consists of two subsystems representing two separate power supply trains.	8.3.2.1.2
EDS load groups 1, 2, and 3 provide 125 Vdc power to the associated inverter units that supply the ac power to the non-Class 1E uninterruptible power supply ac system.	Tier 1 Information
The onsite standby diesel-generator-backed 480 Vac distribution system provides the normal ac power to the battery chargers.	Tier 1 Information
The batteries are sized to supply the system loads for a period of at least two hours after loss of all ac power sources.	8.3.2.1.2
6. The normal residual heat removal system (RNS) provides a safety-related means of performing the following functions:	Tier 1 Information
- Containment isolation for the RNS lines that penetrate the containment.	
- Isolation of the reactor coolant system at the RNS suction and discharge lines.	
- Pathway for long-term, post-accident makeup of containment inventory.	
RNS provides a nonsafety-related means of core cooling through:	5.4.7
- RCS recirculation cooling during shutdown conditions.	
- Low pressure pumped makeup flow from the SFS cask loading pit and long-term recirculation from the IRWST and the containment.	
- Heat removal from IRWST during PRHR operation.	
The RNS has redundant pumps and heat exchangers. The pumps are powered by non-Class 1E power with backup connections from the diesel generators.	5.4.7 & 8.3
RNS is manually aligned from the control room to perform its core cooling functions. The performance of the RNS is indicated in the control room.	5.4.7
The RNS containment isolation and pressure boundary valves are safety-related. The motor-operated valves are powered by Class 1E dc power.	Tier 1 Information
The RNS containment isolation MOVs are automatically and manually actuated via PMS.	7.3.1.2.20

Table 59-18 (Sheet 12 of 24)

AP1000 PRA-BASED INSIGHTS

Insight	Disposition
6. (cont.)	
Interfacing system loss-of-coolant accident (LOCA) between the RNS and the RCS is prevented by:	5.4.7.2.2
- Each RNS line is isolated by at least three valves.	
- The RNS equipment outside containment is capable of withstanding the operating pressure of the RCS.	
- The RCS isolation valves are interlocked to prevent their opening at RCS pressures above its design pressure.	
CCS provides cooling to the RNS heat exchanger.	Tier 1 Information
Planned maintenance affecting the RNS cooling function and its support systems CCS and SWS should be performed in modes 1, 2, and 3, when the RNS is not normally operating.	16.3
7. The component cooling water system (CCS) is a nonsafety-related system that removes heat from various components and transfers the heat to the service water system.	Tier 1 Information
The CCS has redundant pumps and heat exchanger.	Tier 1 Information
During normal operation, one CCS pump is operating. The standby pump is aligned to automatically start in case of a failure of the operating CCS pump.	9.2.2.4.2
The CCS pumps are automatically loaded on the standby diesel generator in the event of a loss of normal ac power. The CCS, therefore, continues to provide cooling of required components if normal ac power is lost.	9.2.2.4.5.4
8. The service water system (SWS) is a nonsafety-related system that transfers heat from the component cooling water heat exchangers to the atmosphere.	Tier 1 Information
The SWS has redundant pumps, strainers, and cooling tower cells.	9.2.1.2.1
During normal operation, one SWS train of equipment is operating. The standby train is aligned to automatically start in case of a failure of the operating SWS pump.	9.2.1.2.3.3
The SWS pumps and cooling tower fans are automatically loaded onto their associated diesel bus in the event of a loss of normal ac power. Both pumps and cooling tower fans automatically start after power from the diesel generator is available.	9.2.1.2.3.6

Table 59-18 (Sheet 13 of 24)

AP1000 PRA-BASED INSIGHTS

	Insight	Disposition
9.	The chemical and volume control system (CVS) provides a safety-related means to terminate inadvertent RCS boron dilution and to preserve containment integrity by isolation of the CVS lines penetrating the containment.	Tier 1 Information
	The CVS provides a nonsafety-related means to perform the following functions:	Tier 1 Information
	- Makeup water to the RCS during normal plant operation.	
	- Boration following a failure of reactor trip	
	- Makeup water to the pressurizer auxiliary spray line.	
	Two makeup pumps are provided. Each pump provides capability for normal makeup.	9.3.6.3.1
	Two safety-related air-operated valves provide isolation of normal CVS letdown during shutdown operation on low hot leg level.	9.3.6.7
10.	The operation of RNS and its support systems (CCS, SWS, main ac power and onsite power) is RTNSS-important for shutdown decay heat removal during reduced RCS inventory operations.	16.3
	- These systems are included in the D-RAP.	17.4
	Short-term availability controls for the RNS during at-power conditions reduce PRA uncertainties.	16.3
11.	The information used by the COL regarding critical human actions (if any) and risk-important tasks from the PRA, as presented in Chapter 18 of the DCD on human factors engineering, is important in developing and implementing procedures, training, and other human reliability related programs.	18
12.	Sufficient instrumentation and control is provided at the remote shutdown workstation to bring the plant to safe shutdown conditions in case the control room must be evacuated.	7.4.3
	There are no differences between the main control room and remote shutdown workstation controls and monitoring that would be expected to affect safety system redundancy and reliability.	7.4.3.1.1
13.	Separation or protection of the equipment and cabling among the divisions of safety-related equipment and separation of safety-related from nonsafety-related equipment minimizes the probability that a fire or flood would affect more than one safety-related system or train, except in some areas inside containment where equipment will be capable of achieving safe shutdown prior to damage.	3.4.1.1.2 & 9.5.1.1.1, 9.5.1.2.1.1 & 9A
	Although the containment is a single fire area, adequate design features exist for separation (structural or space), suppression, lack of combustibles, or operator action to ensure the plant can achieve safe shutdown.	9A

Table 59-18 (Sheet 14 of 24)

AP1000 PRA-BASED INSIGHTS

Insight	Disposition
13. (cont.)	
To prevent flooding in a radiologically controlled area (RCA) in the Auxiliary Building from propagating to non-radiologically controlled areas, the non-RCAs are separated from the RCAs by 2 and 3-foot walls and floor slabs. In addition, electrical penetrations between RCAs and non-RCAs in the Auxiliary Building are located above the maximum flood level.	3.4.1.2.2.2
14. The following minimizes the probability for fire and flood propagation from one area to another and helps limit risk from internal fires and floods:	
- Fire barriers are sealed, to the extent possible (i.e., doors).	9.5.1.2.1.1
- Structural barriers which function as flood barriers are watertight below the maximum flood level.	3.4.1.1.2
- Establishing administrative controls to maintain the performance of the fire protection system is the responsibility of the COL applicant.	Table 9.5.1-1, Item 29
15. Fire detection and suppression capability is provided in the design. Flooding control features and sump level indication are provided in the design.	3.4.1, 9.5.1.2.1.2, & 9.5.1.8
Establishing administrative controls to maintain the performance of the fire protection system is the responsibility of the COL applicant.	Table 9.5.1-1, Item 29
16. AP1000 main control room fire ignition frequency is limited as a result of the use of low-voltage, low-current equipment and fiber optic cables.	7.1.2 & 7.1.3
There is no cable spreading room in the AP1000 design.	Table 9.5.1-1
17. Redundancy in control room operations is provided within the control room itself for fires in which control room evacuation is not required.	9.5.1.2.1.1
18. The remote shutdown workstation provides redundancy of control and monitoring for safe shutdown functions in the event that main control room evacuation is required.	7.4.3 & 9.5
The remote shutdown workstation is in a fire and flood area separate from the main control room.	3.4.1.2.2.2, 7.1.2, 7.4.3.1.1. & 9A.3.1.2.5
19. Although a main control room fire may defeat manual actuation of equipment from the main control room, it will not affect the automatic functioning of safe shutdown equipment via PMS or manual operation from the remote shutdown workstation. This is because the PMS cabinets, in which the automatic functions are housed, are located in fire areas separate from the main control room.	7.1.2.7 & 9A.3

Table 59-18 (Sheet 15 of 24)

AP1000 PRA-BASED INSIGHTS

	Insight	Disposition
20.	The main control room has its own ventilation system, and is pressurized. This prevents smoke, hot gases, or fire suppressants originating in areas outside the control room from entering the control room via the ventilation system.	9.4.1
	There are separate ventilation systems for safety-related equipment divisions (A & C and B & D). This prevents smoke, hot gases, or fire suppressants originating from one fire area to another to the extent that they could adversely affect safe shutdown capabilities.	9.4.1 9.5.1.1.1
	The ventilation system for the remote shutdown workstation is independent of the ventilation system for the main control room.	9.4.1
21.	AP1000 does not rely on ac power sources for safe shutdown capability since the safety-related passive systems do not require ac power sources for operation. Individual fires resulting in loss of offsite power or affecting onsite standby diesel generator operability do not affect safe shutdown capability.	8.1.4.2
22.	Containment isolation functions are not compromised by internal fire or flood. Redundant containment isolation valves in a given line are located in separate fire and flood areas or zones and, if powered, are served by different control and electrical divisions.	6.2.3
	One isolation component in a given line is located inside containment, while the other is located outside containment, and the containment wall is a fire/flood barrier.	6.2.3, 9.5 & 9A
23.	The AP1000 design minimizes potential flooding sources in safety-related equipment areas, to the extent possible. The design also minimizes the number of penetrations through enclosure or barrier walls below the probable maximum flood level. Walls, floors, and penetrations are designed to withstand the maximum anticipated hydrodynamic loads.	3.4.1
24.	The Combined License applicant will confirm the AP1000 certified design will review differences between the as-built plant and the basis for the AP1000 seismic margin analysis.	19.59.10.5
25.	The depressurization of the reactor coolant system below 150 psi facilitates in-vessel retention of molten core debris.	19.36
26.	The reflective reactor vessel insulation provides an engineered flow path to allow the ingression of water and venting of steam for externally cooling the vessel in the event of a severe accident involving core relocation to the lower plenum.	19.39, 5.3.5 & Tier 1 Information
	The reflective insulation panels and support members can withstand pressure differential loading due to the IVR boiling phenomena.	
	Water inlets and steam vents are provided at the entrance and exit of the insulation boundary.	
	The reactor vessel insulation is included in the D-RAP.	17.4

Table 59-18 (Sheet 16 of 24)

AP1000 PRA-BASED INSIGHTS

Insight	Disposition
27. The reactor cavity design provides a reasonable balance between the regulatory requirements for sufficient ex-vessel debris spreading area and the need to quickly submerge the reactor vessel for the in-vessel retention of core debris.	19.39 & Appendix 19B
28. The design can withstand a best-estimate ex-vessel steam explosion without failing the containment integrity.	Appendix 19B
29. The containment design incorporates defense-in-depth for mitigating direct containment heating by providing no significant direct flow path for the transport of particulated molten debris from the reactor cavity to the upper containment regions.	Appendix 19B
30. The hydrogen control system is comprised of passive autocatalytic recombiners (PARs) and hydrogen igniters to limit the concentration of hydrogen in the containment during accidents and beyond design basis accidents, respectively.	Tier 1 Information
Operability of the hydrogen igniters is addressed by short-term availability controls during modes 1, 2, 5 (with RCS pressure boundary open), and 6 (with upper internals in place or cavity levels less than full).	16.3
The operator action to activate the igniters is the first step in ERG AFR.C-1 to ensure that the igniter activation occurs prior to rapid cladding oxidation.	Emergency Response Guidelines
31. Mitigation of the effects of a diffusion flames on the containment shell are addressed by the following containment layout features:	1.2, General Arrangement Drawings
- Vents from the PXS and CVS compartments (where hydrogen releases can be postulated) to the CMT room are located well away from the containment shell and containment penetrations. The access hatch to the PXS-B compartment is located near the containment wall and is normally closed to adress severe accident considerations. The access hatch to the PXS-B compartment is accessible from Room 11300 on elevation 107'-2".	3.4.1.2.2.1 & 19.41.7
- IRWST vents are designed so that those located away from the containment wall open to vent hydrogen releases. In this situation IRWST vents located close to the containment wall would not open because flow of hydrogen through the other vents would not result in a IRWST pressure sufficient to open them.	6.2.4.5.1
32. The containment structure can withstand the pressurization from a LOCA and the global combustion of hydrogen released in-vessel (10 CFR 50.34(f)).	19.41
33. The steam generator should not be depressurized to cool down the RCS if water is not available to the secondary side. This action protects the tubes from large pressure differential and minimizes the potential for creep rupture. The COL will develop and implement severe accident management guidance using the suggested framework provided in WCAP-13914.	19.59.10

Table 59-18 (Sheet 17 of 24)

AP1000 PRA-BASED INSIGHTS

Insight	Disposition
34. Depressurizing the RCS and maintaining a water level covering the SG tubes on the secondary side can mitigate fission product releases from a steam generator tube rupture accident. The COL will develop and implement severe accident management guidance using the suggested framework provided in WCAP-13914.	19.59.10
35. Loss of ac power does not contribute significantly to the core damage frequency. - Nonsafety-related containment spray does not need to be ac independent.	19.59
36. AP1000 has a nonsafety-related containment spray system.	6.5.2
Containment spray is not credited in the PRA. Failure of the nonsafety-related containment spray does not prevent the plant achieving the safety goals.	19.59
The COL will develop and implement severe accident management guidance for operation of the nonsafety-related containment spray system using the suggested framework provided in WCAP-13914.	19.59.10
37. Passive containment can withstand severe accidents without PCS water cooling the containment shell. Air cooling alone is sufficient to maintain containment pressure below failure pressure with high probability.	19.40
38. Operation of ADS stage 4 provides a vent path for the severe accident hydrogen to the steam generator compartments, bypassing the IRWST, and mitigating the conditions required to produce a diffusion flame near the containment wall.	19.41
39. Containment isolation valves controlled by DAS are important in limiting offsite releases following core melt accidents. The containment isolation valves are included in the D-RAP.	17.4
Operability of DAS for selected containment isolation actuations is addressed by short-term availability controls.	16.3
40. Reflooding the reactor pressure vessel through the break can have a significant effect on a severe accident by quenching core debris, achieving a controlled stable state, and producing hydrogen.	19.38 & 19.41
41. The type of concrete used in the basemat is not important.	Appendix 19B
The reactor cavity design incorporates features that extend the time to basemat melt-through in the event of RPV failure. The cavity design includes: - A minimum floor area of 48 m^2 available for spreading of the molten core debris - A minimum thickness of concrete above the embedded containment liner of 0.85 m	Appendix 19B

Table 59-18 (Sheet 18 of 24)

AP1000 PRA-BASED INSIGHTS

Insight	Disposition
41. (cont.) - There is no piping buried in the concrete beneath the reactor cavity; sump drain lines are not enclosed in either of the reactor cavity floor or reactor cavity sump concrete. Thus, there is no direct pathway from the reactor cavity to outside the containment in the event of core-concrete interactions. - The openings between the reactor cavity and cavity sump are small diameter openings in which core debris in the cavity will solidify. Thus, there is no direct pathway for core debris to enter the sump, except in the case where it might spill over the sump curbing.	
42. No safety-related equipment is located outside the Nuclear Island.	1.2 & 3.4.1
43. Capability exists to vent the containment. The COL will develop and implement severe accident management guidance for venting containment using the suggested framework provided in WCAP-13914.	Appendix 19D 19.59.10
44. A list of risk-important systems, structures, and components (SSCs) has been provided in the D-RAP. The risk-significant SSCs are included in the D-RAP.	17.4 17.4
45. The Combined License applicant referencing the AP1000 certified design will review differences between the as-built plant and the design used as the basis for the AP1000 PRA and Table 15.59-29. If the effects of the differences are shown, by a screening analysis, to potentially result in a significant increase in core damage frequency or large release frequency, the PRA will be updated to reflect these differences.	19.59.10
46. There are no watertight doors used for flood protection in the AP1000 design. Plugging of the drain headers is minimized by designing them large enough to accommodate more than the design flow and by making the flow path as straight as possible.	3.4.1.1.2 9.3.5.1.2
47. The maintenance guidelines as described in the Shutdown Evaluation Report (WCAP-14837) should be considered when developing the plant specific operations procedures.	13.5.1
48. Transient combustibles should be controlled.	Table 9.5.1-1, Items 77-83

Table 59-18 (Sheet 19 of 24)

AP1000 PRA-BASED INSIGHTS

	Insight	Disposition
49.	There are two compartments inside containment (PXS-A and PXS-B) containing safe shutdown equipment that normally do not flood although they are below the maximum flood height. Each of these two compartments contains redundant and essentially identical equipment (one accumulator with associated isolation valves as well as isolation valves for one CMT, one IRWST injection line, and one containment recirculation line). A pipe break in one of these compartments can cause that room to flood. These two compartments are physically separated to ensure that a flood in one compartment does not propagate to the other. Drain lines from the PXS-A and PXS-B compartments to the reactor vessel cavity and steam generator compartment are protected from backflow by redundant backflow preventers.	3.4.1.2.2.1
50.	There are seven automatically actuated containment isolation valves inside containment subject to flooding. These seven normally closed containment isolation valves would not fail open as a result of the compartment flooding. Also, there is a redundant, normally closed, containment isolation valve located outside containment in series with each of these valves.	3.4.1.2.2.1
51.	The passive containment cooling system (PCS) cooling water not evaporated from the vessel wall flows down to the bottom of the containment annulus. Two 100-percent drain openings, located in the side wall of the Shield Building, are always open with screens provided to prevent entry of small animals into the drains.	19.40
52.	The major rooms housing divisional cabling and equipment (the battery rooms, dc equipment rooms, I&C rooms, and penetration rooms) are separated by 3-hour fire rated walls. Separate ventilation subsystems are provided for A and C and for B and D division rooms. In order for a fire to propagate from one divisional room to another, it must move past a 3-hour barrier (e.g., a door) into a common corridor and enter the other room through another 3-hour barrier (e.g., another door).	9.5.1 & 9A.3
53.	An access bay in the turbine building is provided to protect the north end of the Auxiliary Building, from potential debris produced by a postulated seismic damage of the adjacent Turbine Building.	1.2
54.	There are no normally open connections to sources of "unlimited" quantity of water in the electrical and I&C portions of the Auxiliary Building such as that it could affect safe shutdown capabilities.	Figure 9.5.1-1
55.	To prevent flooding in a radiologically controlled area (RCA) in the Auxiliary Building from propagating to non-RCAs, the non-RCAs are separated from the RCAs by 2- and 3-foot walls and floor slabs. In addition, electrical penetrations between RCAs and non-RCAs in the Auxiliary Building are located above the maximum flood level.	3.4.1.2.2.2
56.	The two 72-hour rated Class 1E division B and C batteries are located above the maximum flood height in the Auxiliary Building considering all possible flooding sources.	3.4.1.2.2.2

Table 59-18 (Sheet 20 of 24)

AP1000 PRA-BASED INSIGHTS

	Insight	Disposition
57.	Flood water in the Turbine Building drains to the yard and does not affect the Auxiliary Building. The presence of watertight walls and floor of the Auxiliary Building valve/penetration room prevents flooding from propagating beyond this area.	3.4.1.2.2.2
58.	The mechanical equipment and electrical equipment in the Auxiliary Building are separated to prevent propagation of leaks from the piping and mechanical equipment areas to the Class 1E equipment and Class 1E I&C equipment rooms.	3.4.1.2.2.2
59.	Connections to sources of "large" quantity of water are located in the Turbine Building. They are the service water system, which interfaces with the component cooling water system; and the circulating water system, which interfaces with the Turbine Building closed cooling system and the condenser. Features that minimize the flood propagation to other buildings are: - Flow from any postulated ruptures above grade level (elevation 100') in the Turbine Building flows down to grade level via floor grating and stairwells. This grating in the floors also prevents any significant propagation of water to the Auxiliary Building via flow under the doors. - A relief panel in the Turbine Building west wall at grade level directs the water outside the building to the yard and limits the maximum flood level in the Turbine Building to less than 6 inches. Flooding propagation to areas of the adjacent Auxiliary Building, via flow under doors or backflow through the drains, is possible but is bounded by a postulated break in those areas.	3.4.1.2.2.3
60.	Flood water in the Annex Building grade level is directed by the sloped floor to drains and to the yard area through the door of the Annex Building. Flow from postulated ruptures above grade level in the Annex Building is directed by floor drains to the Annex Building sump, which discharges to the Turbine Building drain tank. Alternate paths include flow to the Turbine Building via flow under access doors and down to grade level via stairwells and elevator shaft. The floors of the Annex Building are sloped away from the access doors to the Auxiliary Building in the vicinity of the access doors to prevent migration of flood water to the non-RCAs of the Nuclear Island where all safety-related equipment is located.	3.4.1.2.2.3
61.	There are no connections to sources of "unlimited" quantity of water, except for fire protection, in the Annex Building.	Figure 9.5.1-1

Table 59-18 (Sheet 21 of 24)

AP1000 PRA-BASED INSIGHTS

	Insight	Disposition
62.	To prevent overdraining, the RCS hot and cold legs are vertically offset, which permits draining of the steam generators for nozzle dam insertion with a hot leg level much higher than traditional designs.	7.2.1
	To lower the RCS hot leg level at which a vortex occurs in the RNS suction line, a step nozzle connection between the RCS hot leg and the RNS suction line is used.	5.4.7.2.1 & Figure 5.1-5
	Should vortexing occur, air entrainment into the RNS pump suction is limited.	5.4.7.2.1
	There are two safety-related RCS hot leg level channels, one located in each hot leg. These level instruments are independent and do not share instrument lines. These level indicators are provided primarily to monitor RCS level during midloop operations. One level tap is at the bottom of the hot leg, and the other tap is on the top of the hot leg close to the steam generator.	Tier 1 Information Figure 5.1-5 19E.2.1.1
	Wide range pressurizer level indication (cold calibrated) is provided that can measure RCS level to the bottom of the hot legs. This nonsafety-related pressurizer level indication can be used as an alternative way of monitoring level and can be used to identify inconsistencies in the safety-related hot leg level instrumentation.	Tier 1 Information Figure 5.1-5 19E.2.1.1
	The RNS pump suction line is sloped continuously upward from the pump to the reactor coolant system hot leg with no local high points. This design eliminates potential problems in refilling the pump suction line if an RNS pump is stopped when cavitating due to excessive air entrainment. This self-venting suction line allows the RNS pumps to be immediately restarted once an adequate level in the hot leg is re-established.	5.4.7.2.1
	It is important to maximize the availability of the nonsafety-related wide range pressurizer level indication during RCS draining operations during cold shutdown. The Combined License applicant is responsible for developing procedures and training that encompass this item.	13.5
63.	Solid-state switching devices and electro-mechanical relays resistant to relay chatter will be used in the AP1000 safety-related I&C system.	19.55.2.3
64.	The annulus drains will have the same or higher HCLPF value as the Shield Building so that the drain system will not fail at lower acceleration levels causing water blocking of the PCS air baffle.	19.59.10
65.	The ability to close containment hatches and penetrations during Modes 5 & 6 prior to steaming to containment is important. The COL is responsible for developing procedures and training that encompass this item.	13.5 & 16.1
66.	Spurious actuation of squib valves is prevented by the use of a squib valve controller circuit which requires multiple hot shorts for actuation, physical separation of potential hot short locations (e.g., routing of ADS cables in low voltage cable trays, and, in the case of PMS, the use of arm and fire signals from separate PMS cabinets), and provisions for operator action to remove power from the fire zone.	9A.2.7.1

Table 59-18 (Sheet 22 of 24)

AP1000 PRA-BASED INSIGHTS

	Insight	Disposition
67.	For long-term recirculation operation, the RNS pumps can take suction from one of the two sump recirculation lines. Unrestricted flow through both parallel paths is required for success of the sump recirculation function when both RNS pumps are running. If one of the two parallel paths fails to open, operator action is required to manually throttle the RNS discharge valve to prevent pump cavitation.	Emergency Response Guidelines
	The containment isolation valves in the RNS piping automatically close via PMS with a high radiation signal. The actuation setpoint was established consistent with a DBA non-mechanistic source term associated with a large LOCA. The containment radiation level for other accidents is expected to be below the point that would cause the RNS MOVs to automatically close.	6.2.3 & 7.3.1.2.20
	With the RNS pumps aligned either to the IRWST or the containment sump, the pumps' net positive suction head is adequate to prevent pump cavitation and failure even when the IRWST or sump inventory is saturated.	5.4.7
	Emergency response guidelines are provided for aligning the RNS from the control room for RCS injection and recirculation.	Emergency Response Guidelines
	The following are additional AP1000 features which contribute to the low likelihood of interfacing system LOCAs between the RNS and the RCS: - A relief valve located in the common RNS discharge line outside containment provides protection against excess pressure. - Two remotely operated MOVs connecting the suction and discharge headers to the IRWST are interlocked with the isolation valves connecting the RNS pumps to the hot leg. This prevents inadvertent opening of these two MOVs when the RNS is aligned for shutdown cooling and potential diversion and draining of reactor coolant system. - Power to the four isolation MOVs connecting the RNS pumps to the RCS hot leg is administratively blocked at their motor control centers during normal power operation.	5.4.7.2
	Per the Shutdown Evaluation, operability of the RNS is tested, via connections to the IRWST, before its alignment to the RCS hot leg for shutdown cooling.	19E
	Inadvertent opening of RNS valve V024 results in a draindown of RCS inventory to the IRWST and requires gravity injection from the IRWST. The COL applicant is responsible for developing administrative controls to ensure that inadvertent opening of this valve is unlikely.	13.5
	The reliability of the IRWST suction isolation valve (V023) to open on demand is important. The IRWST suction isolation valve is included in the D-RAP.	17.4

Table 59-18 (Sheet 23 of 24)

AP1000 PRA-BASED INSIGHTS

	Insight	Disposition
68.	The startup feedwater system pumps provide feedwater to the steam generator. This capability provides an alternate core cooling mechanism to the PRHR heat exchangers for non-LOCA or steam generator tube ruptures. The startup feedwater pumps are included in the D-RAP.	17.4
69.	Capability is provided for on-line testing and calibration of the DAS channels, including sensors.	7.7.1.11
	Short-term availability controls of the DAS during at-power conditions reduce PRA uncertainties.	16.3
70.	One CVS pump is configured to operate on demand while the other CVS pump is in standby. The operation of these pumps will alternate periodically.	9.3.6.3.1 & 19.15
	The safety-related PMS boron dilution signal automatically re-aligns CVS pump suction to the boric acid tank. This signal also closes the two safety-related CVS demineralized water supply valves. This signal actuates on reactor trip signal (interlock P-4), source range flux doubling signal, or low input voltage to the Class 1E dc power system battery chargers.	7.3.1.2.14
71.	The COL applicant will maintain procedures to respond to low hot leg level alarms.	Emergency Response Guidelines
72.	The containment recirculation screens are configured such that the chance of clogging is minimized during operation following accidents at power and at shutdown. The configuration features that reduce the chance of clogging include: - Redundant screens are provided and located in separate locations. - Bottom of screens are located well above the lowest containment level as well as the floors around them. - Top of screens are located well below the containment floodup level. - Screens have protective plates that are located close to the top of the screens and extend out in front and to the side of the screens. - Screens have conservative flow areas to account for plugging. Adequate PXS performance can be supported by one screen with at least 90 percent of its surface area completely blocked. - During recirculation operation, the velocities approaching the screens are very low which limits the transport of debris.	6.3.2
73.	A COL applicant cleanliness program controls foreign debris from being introduced into the IRWST tank and into the containment during maintenance and inspection operations.	6.3.2.2.7.2, 6.3.2.2.7.3, & 6.3.8.1

Table 59-18 (Sheet 24 of 24)

AP1000 PRA-BASED INSIGHTS

Insight	Disposition
74. For floor drains, from the reactor cavity PXS-A and PXS-B rooms, appropriate precautions such as check valves, back flow preventers, and siphon breaks are assumed to prevent back flow from a flooded space to a nonflooded space.	3.4.1.2.2
75. Plant ventilation systems include features to prevent smoke originating from one fire area to another to the extent that they could adversely affect safe shutdown capabilities.	9.4.2.2
76. An alternative gravity injection path is provided through RNS V-023 during cold shutdown and refueling conditions with the RCS open.	Emergency Response Guidelines
The COL applicant is responsible for developing administrative controls to maximize the likelihood that RNS valve V-023 will be able to open if needed during Mode 5 when the RCS is open, and PRHR cannot be used for core cooling.	13.5
77. The IRWST suction isolation valve (V023) and the RCS pressure boundary isolation valves (V001A/B, V002A/B) are environmentally qualified to perform their safety functions.	Tier 1 Information
78. Following an extended loss of RNS during safe/cold shutdown with the RCS intact and PRHR unavailable, it is essential to establish and maintain venting capability with ADS Stage 4 for gravity injection and containment recirculation.	19.59.5

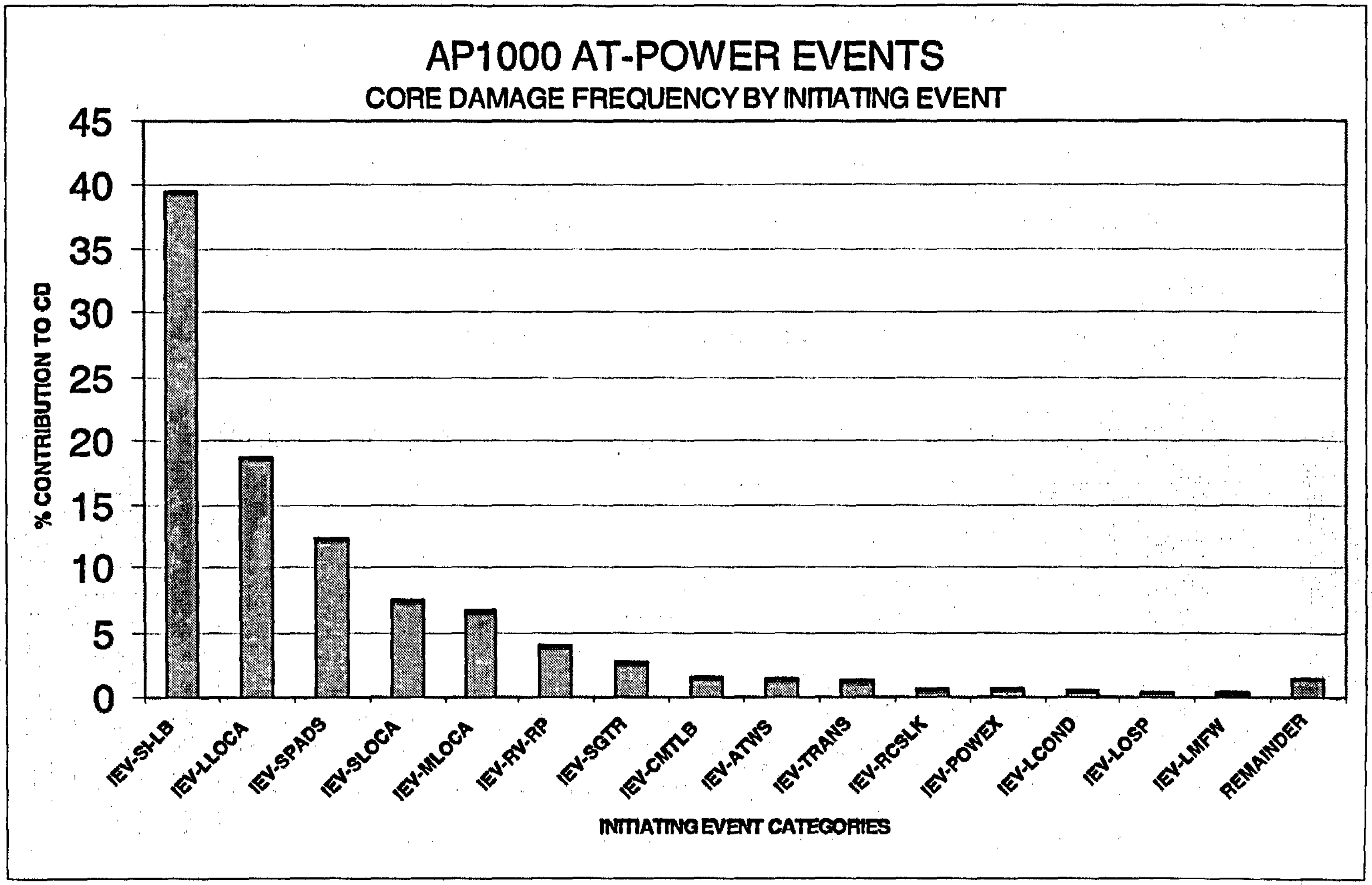

Figure 59-1

Contribution of Initiating Events to Core Damage

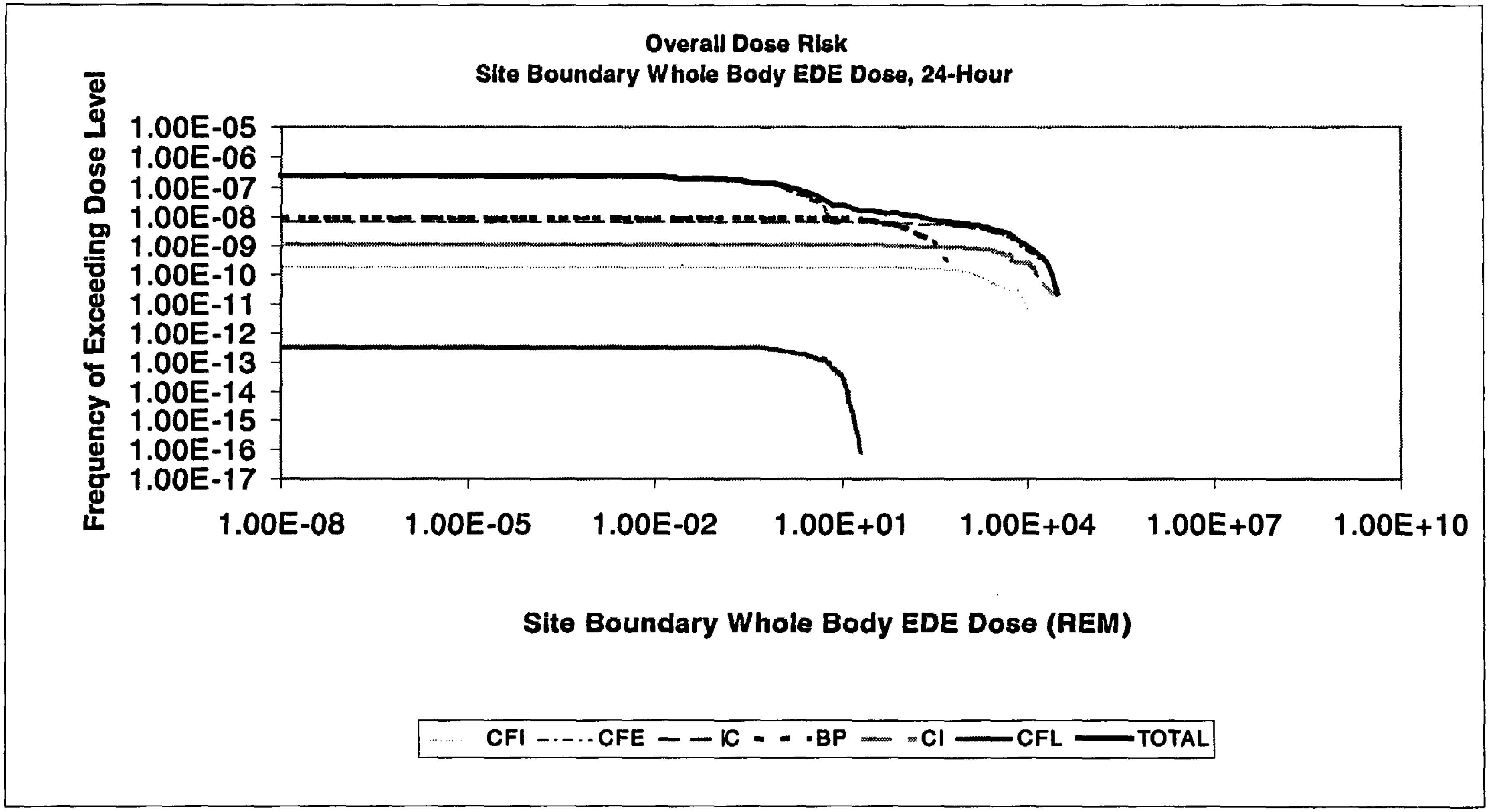

Figure 59-2

24-Hour Site Boundary Dose Cumulative Frequency Distribution