
CHAPTER 19—PRA AND SEVERE ACCIDENT TABLE OF CONTENTS

19.0	PROBABILISTIC RISK ASSESSMENT AND SEVERE ACCIDENT EVALUATION	19.0-1
19.0.1	NRC Regulatory Requirements and Related Policies	19.0-1
19.0.2	Uses of PRA and Severe Accident Evaluations	19.0-2
19.0.3	Structure of Chapter 19	19.0-3
19.0.4	References	19.0-4
19.1	Probabilistic Risk Assessment	19.1-1
19.1.1	Uses and Applications of the PRA.....	19.1-1
19.1.1.1	Design Phase	19.1-1
19.1.1.2	Combined License Application Phase.....	19.1-2
19.1.1.3	Construction Phase	19.1-2
19.1.1.4	Operational Phase.....	19.1-2
19.1.2	Quality of PRA	19.1-2
19.1.2.1	PRA Scope	19.1-3
19.1.2.2	PRA Level of Detail	19.1-4
19.1.2.3	PRA Technical Adequacy	19.1-5
19.1.2.4	PRA Maintenance and Upgrade	19.1-7
19.1.3	Special Design/Operational Features	19.1-11
19.1.3.1	Design/Operational Features for Preventing Core Damage	19.1-11
19.1.3.2	Design/Operational Features for Mitigating the Consequences of Core Damage and Preventing Releases from Containment.....	19.1-13
19.1.3.3	Design/Operational Features for Mitigating the Consequences of Releases from Containment	19.1-14
19.1.3.4	Uses of the PRA in the Design Process	19.1-14

19.1.4 Safety Insights from the Internal Events PRA for Operations at Power	19.1-16
19.1.4.1 Level 1 Internal Events PRA for Operations at Power	19.1-16
19.1.4.2 Level 2 Internal Events PRA for Operations at Power	19.1-61
19.1.5 Safety Insights from the External Events PRA for Operations at Power	19.1-106
19.1.5.1 Seismic Risk Evaluation	19.1-106
19.1.5.2 Internal Flooding Risk Evaluation.....	19.1-113
19.1.5.3 Internal Fires Risk Evaluation.....	19.1-133
19.1.5.4 Other Externals Risk Evaluation.....	19.1-151
19.1.6 Safety Insights from the PRA for Other Modes of Operation.....	19.1-154
19.1.6.1 Description of the Low-Power and Shutdown Operations PRA	19.1-154
19.1.6.2 Results from the Low-Power and Shutdown Operations PRA.	19.1-163
19.1.6.3 Low-Power and Shutdown Operations – Level 2 Assessment	19.1-169
19.1.6.4 Low Power and Shutdown Level 2 Risk Metrics (LRF).....	19.1-170
19.1.7 PRA-Related Input to Other Programs and Processes.....	19.1-172
19.1.7.1 PRA Input to Design Programs and Processes.....	19.1-172
19.1.7.2 PRA Input to the Maintenance Rule Implementation.....	19.1-172
19.1.7.3 PRA Input to the Reactor Oversight Process	19.1-172
19.1.7.4 PRA Input to the Reliability Assurance Program.....	19.1-172
19.1.7.5 PRA Input to the Regulatory Treatment of Non-Safety-Related Systems Program	19.1-173

19.1.8	Conclusions and Findings	19.1-173
19.1.8.1	Risk Metrics:.....	19.1-173
19.1.8.2	Risk Distribution:	19.1-173
19.1.8.3	Importance Ranking:	19.1-174
19.1.8.4	Sensitivity and Uncertainty:.....	19.1-174
19.1.9	References	19.1-175
19.2	Severe Accident Evaluations.....	19.2-1
19.2.1	Introduction.....	19.2-1
19.2.2	Severe Accident Prevention	19.2-1
19.2.2.1	Anticipated Transient Without Scram	19.2-1
19.2.2.2	Mid-Loop Operations.....	19.2-2
19.2.2.3	Station Blackout	19.2-2
19.2.2.4	Fire Protection	19.2-3
19.2.2.5	Intersystem Loss of Coolant Accident.....	19.2-3
19.2.2.6	Other Severe Accident Preventative Features	19.2-4
19.2.3	Severe Accident Mitigation	19.2-5
19.2.3.1	Overview of Containment Design.....	19.2-5
19.2.3.2	Severe Accident Progression.....	19.2-6
19.2.3.3	Severe Accident Mitigation Features.....	19.2-8
19.2.4	Containment Performance Capability.....	19.2-22
19.2.4.1	Introduction.....	19.2-22
19.2.4.2	Analytical Methodology	19.2-23
19.2.4.3	Assumptions.....	19.2-27
19.2.4.4	Severe Accident Evaluations.....	19.2-27
19.2.4.5	Conditional Containment Failure Probability	19.2-47
19.2.4.6	Summary	19.2-47
19.2.5	Accident Management	19.2-48
19.2.5.1	Accident Management through Design	19.2-49
19.2.5.2	OSSA Directed Actions	19.2-49
19.2.5.3	Interface with Emergency Procedures	19.2-49
19.2.5.4	Measurable Safety Objectives.....	19.2-50
19.2.5.5	RPV Integrity Management	19.2-50



19.2.5.6	Post-RPV Failure – Short-Term Response	19.2-51
19.2.5.7	Post RPV Failure – Long-Term Response	19.2-51
19.2.6	Consideration of Potential Design Improvements under 10 CFR 50.34(f).....	19.2-51
19.2.6.1	Introduction.....	19.2-51
19.2.6.2	Estimate of Risk for Design	19.2-51
19.2.6.3	Identification of Potential Design Improvements.....	19.2-52
19.2.6.4	Risk Reduction Potential of Design Improvements.....	19.2-54
19.2.6.5	Cost Impacts of Candidate Design Improvements.....	19.2-54
19.2.6.6	Cost-Benefit Comparison	19.2-55
19.2.6.7	Conclusions.....	19.2-55
19.2.7	References	19.2-55
19.3	Open, Confirmatory, and COL Action Items Identified as Unresolved19.3-1	
19.3.1	Resolution of Open Items	19.3-1
19.3.2	Resolution of Confirmatory Items	19.3-1
19.3.3	Resolution of COL Action Items	19.3-1
19A	EVENT TREES FOR CORE DAMAGE SEQUENCES INITIATED DURING POWER OPERATION	19.A-1
19B	EVENT TREES FOR CORE DAMAGE SEQUENCES INITIATED DURING LOW POWER OPERATION	19.B-1
19C	CONTAINMENT EVENT TREES (CET) FOR CONTAINMENT PERFORMANCE SEQUENCES INITIATED DURING POWER OPERATION.....	19.C-1