

BFN-26
PLANT SAFETY ANALYSIS
TABLE OF CONTENTS

	<u>Page No</u>
14.0 PLANT SAFETY ANALYSIS	14.1-1
14.1 Analytical Objective	14.1-1
14.2 Unacceptable Safety Results for Abnormal Operational Transients.....	14.2-1
14.3 Unacceptable Safety Results For Accidents.....	14.3-1
14.4 Approach to Safety Analysis.....	14.4-1
14.4.1 General	14.4-1
14.4.2 Abnormal Operational Transients	14.4-2
14.4.3 Accidents	14.4-4
14.4.4 Barrier Damage Evaluations	14.4-6
14.5 Analyses of Abnormal Operational Transients - Upated.....	14.5-1
14.5.1 Objective	14.5-1
14.5.2 Events Resulting in a Nuclear System Pressure Increase	14.5-9
14.5.3 Events Resulting in a Reactor Vessel Water Temperature Decrease	14.5-18
14.5.4 Events Resulting in a Positive Reactivity Insertion.....	14.5-18
14.5.5 Events Resulting in a Reactor Vessel Coolant Inventory Decrease	14.5-26
14.5.6 Events Resulting in a Core Coolant Flow Decrease	14.5-34
14.5.7 Events Resulting in a Core Coolant Flow Increase	14.5-38
14.5.8 Event Resulting in Excess of Coolant Inventory.....	14.5-42
14.5.9 Loss of Habitability of the Control Room.....	14.5-45
14.6 Analysis of Design Basis Accidents - Upated.....	14.6-1
14.6.1 Introduction	14.6-1
14.6.2 Control Rod Drop Accident (CRDA).....	14.6-2
14.6.3 Loss of Coolant Accident (LOCA)	14.6-10
14.6.4 Refueling Accident.....	14.6-26
14.6.5 Main Steam Line Break Accident	14.6-32
14.7 Conclusions.....	14.7-1
14.8 Analytical Methods	14.8-1
14.8.1 Nuclear Excursion Analysis.....	14.8-1
14.8.2 Reactor Vessel Depressurization Analysis.....	14.8-2
14.8.3 Reactor Core Heatup Analysis.....	14.8-9
14.8.4 Containment Response Analysis	14.8-13
14.8.5 Analytical Methods for Evaluating Radiological Effects.....	14.8-16

BFN-26

PLANT SAFETY ANALYSIS

TABLE OF CONTENTS (Cont'd)

	<u>Page No</u>
14.9 Dose Sensitivity Evaluation Using Assumptions Of The AEC/DRL (Incorporated with TID 14844)	14.9-1
14.9.1 Loss-of-Coolant Accident (183 meter release height)	14.9-1
14.9.2 Refueling Accident (183 meter release height)	14.9-2
14.9.3 Steam Line Break Accident (ground level release)	14.9-2
14.9.4 Control Rod Drop Accident (ground level release)	14.9-3
14.9.5 Radiological Consequences	14.9-3
14.9.6 Discussion of Assumptions	14.9-4
14.10 Analyses of Abnormal Operational Transients - Pre-uprated	14.10-1
14.10.1 Events Resulting in a Nuclear System Pressure Increase	14.10-1
14.10.2 Events Resulting in a Reactor Vessel Water Temperature Decrease	14.10-5
14.10.3 Events Resulting in a Positive Reactivity Insertion	14.10-7
14.10.4 Events Resulting in a Reactor Vessel Coolant Inventory Decrease	14.10-9
14.10.5 Events Resulting in a Core Coolant Flow Decrease	14.10-13
14.10.6 Events Resulting in a Core Coolant Flow Increase	14.10-15
14.10.7 Event Resulting in Excess of Coolant Inventory	14.10-17
14.10.8 Loss of Habitability of the Control Room	14.10-18
14.11 Analysis of Design Basis Accidents - Pre-Uprated	14.11-1
14.11.1 Introduction	14.11-1
14.11.2 Control Rod Drop Accident (CRDA)	14.11-2
14.11.3 Loss of Coolant Accident (LOCA)	14.11-15
14.11.4 Refueling Accident	14.11-28
14.11.5 Main Steam Line Break Accident	14.11-35

BFN-26

LIST OF TABLES

<u>Table</u>	<u>Title</u>
14.4-1	Summary of Abnormal Operational Transients
14.4-2	Results of Design Basis Accidents
14.5-1	Transient Analyses Power/Flow State Points
14.5-2	Transient Analyses Initial Conditions
14.6-1	Control Rod Drop Accident - Fission Product Release to Environment
14.6-2	(Deleted)
14.6-3	Summary of Power Uprate Input Parameters used for all Containment Analyses
14.6-4	Summary of Power Uprate Input Parameters used for DBA-LOCA Short Term Containment Response
14.6-5	Summary of Power Uprate Input Parameters used for DBA-LOCA Long Term Containment Response
14.6-6	DBA-LOCA Short Term Pressure and Temperature Response
14.6-7	Inventory in Primary Containment Available for Leakage
14.6-8	Values for X/Q for Accident Dose Calculations
14.6-9	(Deleted)
14.8-1	Characteristics of Nuclear Excursions - Water-Moderated Oxide Cores
14.8-2	Dose Computational Methods Wind Direction Persistence
14.8-3	Meteorology Applicable to Design Basis Accidents
14.8-4	Calculated Air Concentration for 183 Meter Release Height
14.8-5	Calculated Air Concentration for 183 Meter Release Height
14.8-6	Thyroid Dose Conversion Factors
14.9-1	Design Basis Accident Radiological Doses (REM)
14.9-2	Sensitivity of Doses to Variation of Assumptions
14.11-1	Control Rod Drop Accident - Fission Product Release Rate to Environs
14.11-2	Control Rod Drop Accident - Radiological Effects
14.11-3	Loss-of-Coolant Accident - Primary Containment Response Summary
14.11-4	Inventory in Primary Containment Available for Leakage
14.11-5	(Deleted)
14.11-6	(Deleted)
14.11-7	(Deleted)
14.11-8	Values for X/Q for Accident Dose Calculations
14.11-9	(Deleted)

BFN-26

LIST OF TABLES

<u>Table</u>	<u>Title</u>
14.11-10	(Deleted)
14.11-11	Steam Line Break Accident - Radiological Effects

BFN-26

PLANT SAFETY ANALYSIS

LIST OF ILLUSTRATIONS

<u>Figure</u>	<u>Title</u>
14.4-1	Plant Safety Analysis - Method for Identifying and Evaluating Abnormal Operational Transients
14.4-2	Plant Safety Analysis - Method for Identifying and Evaluating Accidents
14.5-1	(Deleted)
14.5-2	(Deleted)
14.5-3	(Deleted)
14.5-4	(Deleted)
14.5-5	Generator Trip (TCV Fast Closure) With Bypass Valve Failure 100P/105F
14.5-6	Load Rejection No Bypass with EOC-RPT-OOS 100P/105F
14.5-7a	Loss of Condenser Vacuum 102P/105F
14.5-7b	Loss of Condenser Vacuum 102P/105F
14.5-8	Turbine Stop Valve Closure/Turbine Trip 102P/105F
14.5-9	Bypass Failure Following Turbine Trip, High Power 100P/105F
14.5-10a	Bypass Failure Following Turbine Trip, Low Power 30P/50F
14.5-10b	Bypass Failure Following Turbine Trip, Low Power 30P/50F
14.5-11	Closure of All Main Steam Line Isolation Valves 102P/105F
14.5-12a	Closure of One Main Steam Line Isolation Valve 102P/105F
14.5-12b	Closure of One Main Steam Line Isolation Valve 102P/105F
14.5-13a	Loss of Feedwater Heater 102P/81F
14.5-13b	Loss of Feedwater Heater 102P/81F
14.5-14a	Inadvertent Pump Start 102P/81F
14.5-14b	Inadvertent Pump Start 102P/81F
14.5-15a	Pressure Regulator Failure Open 102P/100F
14.5-15b	Pressure Regulator Failure Open 102P/100F
14.5-16a	Inadvertent Opening of a Relief Valve 102P/100F
14.5-16b	Inadvertent Opening of a Relief Valve 102P/100F
14.5-17a	Loss of Feedwater Flow, Short Term 102P/100F
14.5-17b	Loss of Feedwater Flow, Short Term 102P/100F
14.5-17c	Loss of Feedwater Flow, Long Term 102P/100F
14.5-18a	Loss of Auxiliary Power Transformers 102P/100F
14.5-18b	Loss of Auxiliary Power Transformers 102P/100F
14.5-19a	Loss of Auxiliary Power - All Grid Connections 102P/105F
14.5-19b	Loss of Auxiliary Power - All Grid Connections 102P/105F
14.5-20a	Recirculation Flow Control Failure-Decreasing Flow 102P/100F

BFN-26

PLANT SAFETY ANALYSIS

LIST OF ILLUSTRATIONS

<u>Figure</u>	<u>Title</u>
14.5-20b	Recirculation Flow Control Failure-Decreasing Flow 102P/100F
14.5-21a	One Recirculation Pump Trip 102P/100F
14.5-21b	One Recirculation Pump Trip 102P/100F
14.5-22a	(Deleted)
14.5-22b	(Deleted)
14.5-22c	Two Recirculation Pump Trip with VFDs 100P/100F
14.5-22d	Two Recirculation Pump Trip with VFDs 100P/100F
14.5-22e	Two Recirculation Pump Trip with VFDs 100P/100F
14.5-22f	Two Recirculation Pump Trip with VFDs 100P/100F
14.5-23a	One Recirculation Pump Seizure 102P/100F
14.5-23b	One Recirculation Pump Seizure 102P/100F
14.5-24a	(Deleted)
14.5-24b	(Deleted)
14.5-24c	Recirculation Flow Control Failure-Increasing Flow 75P/52F - VFD Speed Control
14.5-24d	Recirculation Flow Control Failure-Increasing Flow 75P/52F - VFD Speed Control
14.5-24e	Recirculation Flow Control Failure-Increasing Flow 75P/52F - VFD Speed Control
14.5-24f	Recirculation Flow Control Failure-Increasing Flow 75P/52F - VFD Speed Control
14.5-25a	(Deleted)
14.5-25b	(Deleted)
14.5-25c	Idle Recirculation Loop Startup 75P/52F - VFD Speed Control
14.5-25d	Idle Recirculation Loop Startup 75P/52F - VFD Speed Control
14.5-25e	Idle Recirculation Loop Startup 75P/52F - VFD Speed Control
14.5-25f	Idle Recirculation Loop Startup 75P/52F - VFD Speed Control
14.5-26a	Idle Recirculation Loop Startup 75P/52F Coupler Position 11%
14.5-26b	Idle Recirculation Loop Startup 75P/52F Coupler Position 11%
14.5-27a	Idle Recirculation Loop Startup 30P/52F Coupler Position 19%
14.5-27b	Idle Recirculation Loop Startup 30P/52F Coupler Position 19%
14.5-28	Feedwater Control Failure-Maximum Demand 75P/108F
14.5-29	Feedwater Control Failure-Maximum Demand 100P/105F
14.5-30	Feedwater Control Failure-Maximum Demand. EOC-RPT-OOS 100P/105F
14.5-31	Feedwater Control Failure-Maximum Demand. TBP-OOS 100P/105F
14.6-1	DBA-LOCA Short Term Containment Temperature Response (102% of Up rated Power, 81% CF)

BFN-26

PLANT SAFETY ANALYSIS

LIST OF ILLUSTRATIONS

<u>Figure</u>	<u>Title</u>
14.6-2	DBA-LOCA Short Term Containment Pressure Response (102% of Uprated Power, 81% CF)
14.6-3	DBA-LOCA Long Term Wetwell Temperature Response (102% of Uprated Power, 100% CF)
14.6-4	DBA-LOCA Long Term Drywell Temperature Response (102% of Uprated Power, 100% CF)
14.6-5	DBA-LOCA Long Term Pressure Response (102% of Uprated Power, 100% CF)
14.6-6	Loss-of-Coolant Accident, Primary Containment Capability for Metal-Water Reaction
14.6-7	Main Steamline Break Accident, Break Location
14.6-8	Main Steamline Break Accident, Mass of Coolant Lost Through Break
14.6-9	Main Steamline Break Accident, Normalized Core Inlet Flow
14.6-10	Main Steamline Break Accident - Minimum Critical Heat Flux Ratio
14.6-11	(Deleted)
16.6-12	(Deleted)
14.6-13	(Deleted)
16.6-14	(Deleted)
14.6-15	(Deleted)
16.6-16	(Deleted)
16.6-17	(Deleted)
14.6-18	(Deleted)
14.8-1	Fuel Rod and Fuel Bundle Details
14.10-1	Transient Results, Turbine Trip from High Power without Bypass and Loss of Condenser Vacuum
14.10-2	Transient Results, Turbine Trip
14.10-3	Transient Results, Turbine Trip from Low Power without Bypass
14.10-4	Transient Results, Closure of all Main Steam Isolation Valves
14.10-5	Transient Results, Closure of One Main Steam Isolation Valve
14.10-6	Transient Results, Loss of Feedwater Heater
14.10-7	Transient Results, Continuous Rod Withdrawal During Power Range Operation
14.10-8	Transient Results, Pressure Regulator Failure
14.10-9	Transient Results, Inadvertent Opening of a Relief Valve or Safety Valve
14.10-10	Transient Results, Loss of Feedwater Flow
14.10-10a	Water Level Response with RCIC for Loss of Feedwater Flow Event
14.10-10b	Pressure Response with RCIC for Loss of Feedwater Flow Event
14.10-11	Transient Results, Loss of Auxiliary Power
14.10-12	Transient Results, Loss of Auxiliary Power - All Grid Connections

BFN-26

PLANT SAFETY ANALYSIS

LIST OF ILLUSTRATIONS

<u>Figure</u>	<u>Title</u>
14.10-13	Water Level vs. Time Following Loss of Auxiliary Power (RCIC Only)
14.10-14	Transient Results, Trip of One Recirculation System Generator Field Breaker
14.10-15	Transient Results, Trip of Two Recirculation Pump M-G Set Drive Motors
14.10-16	Transient Results, Recirculation Pump Seizure
14.10-17	Transient Results, Recirculation Flow Control Failure Increasing Flow
14.10-18	Transient Results, Startup of Idle Recirculation Pump
14.10-19	Transient Results, Feedwater Controller Failure Maximum Demand
14.10-20	Generator Load Rejection Without Bypass, EOC2,RPT
14.11-1	Maximum Rod Worth Versus Moderator Density
14.11-2	Maximum Rod Worth Versus Power Level
14.11-3	Rod Drop Accident (Cold, Critical) Peak Fuel Enthalpy
14.11-4	Rod Drop Accident (Hot, Critical) Peak Fuel Enthalpy
14.11-5	Rod Drop Accident (Power Range) Peak Fuel Enthalpy
14.11-6	(Deleted)
14.11-7	(Deleted)
14.11-8	(Deleted)
14.11-9	(Deleted)
14.11-10	Loss-of-Coolant Accident, Primary Containment Pressure Response
14.11-11	Loss-of-Coolant Accident, Drywell Temperature Response
14.11-12	Loss-of-Coolant Accident, Pressure Suppression Pool Temperature Response
14.11-13	(Deleted)
14.11-14	Loss-of-Coolant Accident, Primary Containment Capability for Metal-Water Reaction
14.11-15	Main Steamline Break Accident, Break Location
14.11-16	Main Steamline Break Accident, Mass of Coolant Lost Through Break
14.11-17	Main Steamline Break Accident, Normalized Core Inlet Flow
14.11-18	Main Steamline Break Accident - Minimum Critical Heat Flux Ratio