FINAL SAFETY ANALYSIS REPORT

CHAPTER 15

TRANSIENT AND ACCIDENT ANALYSIS

15.0 TRANSIENT AND ACCIDENT ANALYSIS

This chapter of the U.S. EPR Final Safety Analysis Report (FSAR) is incorporated by reference with departures and supplements as identified in the following sections.

15.0.1 RADIOLOGICAL CONSEQUENCE ANALYSIS

No departures or supplements.

15.0.2 COMPUTER CODES USED IN ANALYSIS

No departures or supplements.

15.0.3 RADIOLOGICAL CONSEQUENCES OF DESIGN BASIS ACCIDENTS

15.0.3.1 {Introduction

BBNPP will depart from the U.S. EPR FSAR by utilizing the site-specific short-term atmospheric dispersion factors for the Exclusion Area Boundary (EAB) and the Low Population Zone (LPZ). U.S. EPR FSAR Table 5.0-1 and U.S. EPR FSAR Table 2.1-1 provide the Accident Atmospheric Dispersion Factors (χ/Q) for the EAB at 0.5 miles of 1.00E-03 sec/m^3 and provide for χ/Qs for the Low Population Zone (LPZ) at 1.5 miles during the following periods: 0-2 hours, 2-8 hours and 8-24 hours of 1.75E-04 sec/m^3, 1.35E-04 sec/m^3, and 1.00E-04 sec/m^3, respectively. The corresponding BBNPP site-specific EAB and LPZ χ/Q values are provided in Table 15.0-1.

The site-specific Accident Atmospheric Dispersion Factors, including the 0-2 hour (EAB at 0.43 mile) χ/Q of 1.029E-03 sec/m^3, the 0-2 hour (LPZ at 1.5 miles) χ/Q of 2.766E-04 sec/m^3, the 2-8 hour (LPZ at 1.5 miles) χ/Q of 1.648E-04 sec/m^3, and the 8-24 hour (LPZ at 1.5 miles) χ/Q of 1.038E-04 sec/m^3, were used in calculation of doses resulting from the accident scenarios specified in this Section. In each case, the resulting EAB and LPZ doses were determined to be below regulatory limits as shown in Table 15.0-2.

15.0.3.2 Event Categorization

No departures or supplements.

15.0.3.3 Analytical Assumptions

No departures or supplements.

15.0.3.3.1 Non-Safety-Related Systems Credited in the Analyses and Operator Action

No departures or supplements.

15.0.3.3.2 Loss of Offsite Power Assumptions

No departures or supplements.

15.0.3.3.3 Atmospheric Dispersion Factors

Table 15.0-1 provides the short-term atmospheric dispersion factors for the EAB and LPZ that are utilized to calculate the radioactive doses associated with the various design basis events for BBNPP.

15.0.3.3.4 Core Radionuclide Inventory Assumptions

No departures or supplements.

15.0.3.3.5 Iodine Appearance Rates

No departures or supplements.

15.0.3.3.6 Analytical Methods

No departures or supplements.

15.0.3.4 Receptor Variables

BBNPP will depart from the U.S. EPR FSAR EAB definition. The BBNPP EAB is 0.43 mile from the containment building centerline.

15.0.3.4.1 Main Control Room/Technical Support Center Modelling

No departures or supplements.

15.0.3.4.2 Offsite Receptors

Table 15.0-3 provides BBNPP offsite receptor variables.

15.0.3.5 Small Line Carrying Primary Coolant Break Outside of the Reactor Building Accident

No departures or supplements.

15.0.3.5.1 Sequence of Events and Systems Operations

No departures or supplements.

15.0.3.5.2 Input Parameters and Initial Conditions

No departures or supplements.

15.0.3.5.3 Results

BBNPP incorporates by reference the doses for the main control room presented in U.S. EPR FSAR Table 15.0-23 for the small line break outside of the Reactor Building. The BBNPP TEDE doses at the EAB and LPZ for the small line break outside of the Reactor Building are provided in Table 15.0-2. The BBNPP EAB and LPZ doses are below the regulatory limits.

15.0.3.6 Steam Generator Tube Rupture Accident

No departures or supplements.

15.0.3.6.1 Sequence of Events and Systems Operations

No departures or supplements.

15.0.3.6.2 Input Parameters and Initial Conditions

No departures or supplements.

15.0.3.6.3 Results

BBNPP incorporates by reference the doses for the main control room presented in U.S. EPR FSAR Table 15.0-29 for the steam generator tube rupture. The BBNPP TEDE doses at the EAB and LPZ for the steam generator tube rupture for both of the source terms are presented in Table 15.0-2. The BBNPP EAB and LPZ doses are below the regulatory limits.

15.0.3.7 Main Steam Line Break Outside of Reactor Building Accident

No departures or supplements.

15.0.3.7.1 Sequence of Events and Systems Operations

No departures or supplements.

15.0.3.7.2 Input Parameters and Initial Conditions

No departures or supplements.

15.0.3.7.3 Results

BBNPP incorporates by reference the doses for the main control room presented in U.S. EPR FSAR Table 15.0-29 for the main steam line break outside of reactor building. The BBNPP TEDE doses at the EAB and LPZ for the main steam line break outside of reactor building for each of the four source terms are presented in Table 15.0-2. The BBNPP EAB and LPZ doses are below the regulatory limits.

15.0.3.8 Locked Rotor Accident

No departures or supplements

15.0.3.8.1 Sequence of Events and Systems Operations

No departures or supplements.

15.0.3.8.2 Input Parameters and Initial Conditions

No departures or supplements.

15.0.3.8.3 Results

BBNPP incorporates by reference the doses for the main control room presented in U.S. EPR FSAR Table 15.0-38 for the locked rotor accident. The BBNPP TEDE doses at the EAB and LPZ for the locked rotor accident are provided in Table 15.0-2. The BBNPP EAB and LPZ doses are below the regulatory limits.

15.0.3.9 Rod Ejection Accident

No departures or supplements.

15.0.3.9.1 Sequence of Events and Systems Operations

No departures or supplements.

15.0.3.9.2 Input Parameters and Initial Conditions

No departures or supplements.

15.0.3.9.3 Results

BBNPP incorporates by reference the doses for the main control room presented in U.S. EPR FSAR Table 15.0-44 for the rod ejection accident. The BBNPP TEDE doses at the EAB and LPZ for the rod ejection accident are provided in Table 15.0-2. The BBNPP EAB and LPZ doses are below the regulatory limits.

15.0.3.10 Fuel Handling Accident

No departures or supplements.

15.0.3.10.1 Sequence of Events and Systems Operations

No departures or supplements.

15.0.3.10.2 Input Parameters and Initial Conditions

No departures or supplements.

15.0.3.10.3 Results

BBNPP incorporates by reference the doses for the main control room presented in U.S. EPR FSAR Table 15.0-48 for the fuel handling accident. The BBNPP TEDE doses at the EAB and LPZ for the fuel handling accident are provided in Table 15.0-2. The BBNPP EAB and LPZ doses are below the regulatory limits.

15.0.3.11 Loss of Coolant Accident

No departures or supplements.

15.0.3.11.1 Sequence of Events and Systems Operations

No departures or supplements.

15.0.3.11.2 Input Parameters and Initial Conditions

No departures or supplements.

15.0.3.11.3 Results

BBNPP incorporates by reference the doses for the main control room presented in U.S. EPR FSAR Table 15.0-53 for the LOCA. The BBNPP TEDE doses at the EAB and LPZ for the LOCA are provided in Table 15.0-2. The BBNPP EAB and LPZ doses are below the regulatory limits.

15.0.3.12 Postaccident Reactor Building Water Chemistry Control

No departures or supplements.

15.0.3.13 Control Room Radiological Habitability

No departures or supplements.}

15.0.4 PLANT COOLDOWN

No departures or supplements.

15.0.5 COMPLIANCE WITH SECTION C.I.15, "TRANSIENT AND ACCIDENT ANALYSES," OF REGULATORY GUIDE 1.206

No departures or supplements.

15.0.6 REFERENCES

No departures or supplements.

Table 15.0-1—{BBNPP Atmospheric Dispersion Factors}

Receptor Variables	Atmospheric dispersion factors (sec/m^3)
EAB (0.43 mi) (Worst 2 hours) 0 to 2 hr	1.029E-03
LPZ (1.5 mi) - 0 to 2 hr	2.766E-04
LPZ (1.5 mi) - 2 to 8 hr	1.648E-04
LPZ (1.5 mi) - 8 to 24 hr	1.038E-04
LPZ (1.5 mi) - 1 to 4 days	5.106E-05
LPZ (1.5 mi) - 4 to 30 days	1.845E-05

Table 15.0-2—{BBNPP Radiological Consequences of Design Basis Accidents (rem TEDE)}

Design Basis Accident		Offsite Dose BBNPP EAB rem (TEDE)	Offsite Dose BBNPP LPZ rem (TEDE)	Acceptance Criterion rem (TEDE)
LOCA		12.9	13.1	25
Small line break outside of Reactor Building		1.9	0.5	2.5
SGTR	Pre-incident spike	1.1	0.4	25
	Coincident spike	0.8	0.5	2.5
MSLB	Pre-incident spike	0.3	0.1	25
	Coincident spike	0.3	0.3	2.5
	Fuel rod clad failure	5.4	3.5	25
	Fuel overheat	6.0	3.7	25
RCP locked rotor/broken shaft		2.3	1.2	2.5
Rod ejection		5.8	4.6	6.3
Fuel handling accident		5.8	1.6	6.3

Table 15.0-3—{BBNPP Offsite Receptor Variables}

Description		Value	Remarks
Atmospheric dispersion (ground-level release)			See Section 2.3.4
Distance	EAB	0.43 mi	Measured from the containment building centerline
	LPZ	1.5 mi	Measured from the containment building centerline
Exposure Interval	EAB	2 hrs	RG 1.183, Section 4.1.5
	LPZ	30 days	RG 1.183, Section 4.1.6
Breathing Rate	EAB 0-2 hrs	3.5E-04 m^3/s	RG 1.183, Section 4.1.3
	LPZ 0-8hrs	3.5E-04 m^3/s	
	LPZ 8-24 hrs	1.8E-04 m^3/s	
	LPZ 1-30 days	2.3E-04 m^3/s	

15.1 INCREASE IN HEAT REMOVAL BY THE SECONDARY SYSTEM

This section of the U.S. EPR FSAR is incorporated by reference.

15.2 DECREASE IN HEAT REMOVAL BY THE SECONDARY SYSTEM

This section of the U.S. EPR FSAR is incorporated by reference.

15.3 DECREASE IN REACTOR COOLANT SYSTEM FLOW RATE

This section of the U.S. EPR FSAR is incorporated by reference.

15.4 REACTIVITY AND POWER DISTRIBUTION ANOMALIES

This section of the U.S. EPR FSAR is incorporated by reference.

15.5 INCREASE IN REACTOR COOLANT INVENTORY

This section of the U.S. EPR FSAR is incorporated by reference.

15.6 DECREASE IN REACTOR COOLANT INVENTORY EVENTS

This section of the U.S. EPR FSAR is incorporated by reference.

15.7 RADIOACTIVE RELEASE FROM A SUBSYSTEM OR COMPONENT

This section of the U.S. EPR FSAR is incorporated by reference.

15.8 ANTICIPATED TRANSIENTS WITHOUT SCRAM

This section of the U.S. EPR FSAR is incorporated by reference.

15.9 BOILING WATER REACTOR STABILITY

This section of the U.S. EPR FSAR is incorporated by reference.

15.10 SPENT FUEL POOL CRITICALITY AND BORON DILUTON ANALYSIS

This section of the U.S. EPR FSAR is incorporated by reference with the following supplements.

{The spent fuel pool criticality analysis will be incorporated into a future revision to the U.S. EPR FSAR, which will incorporate additional analyses to bound the site-specific conditions at BBNPP}.

15.10.1 REFERENCES

{No departures or supplements}