

Bell Bend Nuclear Power Plant

Combined License Application

Part 2: Final Safety Analysis Report

Revision 3 |

COPYRIGHT © 2007-2012

©UniStar Nuclear Services, LLC in and to the Reference COLA, namely all text not in brackets.

All rights reserved.
COPYRIGHT PROTECTED

This document has been prepared by, or on behalf of UniStar Nuclear Services, LLC, in connection with the Bell Bend Nuclear Power Plant Combined License (COL) Application. No use of, or right to copy, any of this information, other than by the U.S. Nuclear Regulatory Commission (NRC) and its contractors in support of the COL application review, is authorized.

For additional Copyright information contact:

Mr. Mark T. Finley
Senior Vice President, Regulatory Affairs and Engineering
UniStar Nuclear Services, LLC
750 E. Pratt Street
Baltimore, Maryland 21202

Table of Contents

1.0	Introduction And General Description of the Plant	1-1
1.1	Introduction	1-2
1.1.1	Plant Location	1-3
1.1.2	Containment Type	1-4
1.1.3	Reactor Type	1-4
1.1.4	Power Output	1-4
1.1.5	Schedule	1-5
1.1.6	Format and Content	1-5
1.1.7	References	1-6
1.2	General Plant Description	1-17
1.2.1	Principal Design Criteria, Operating Characteristics, and Safety Considerations	1-17
1.2.2	Site Description	1-17
1.2.3	Plant Description	1-18
1.3	Comparisons with Similar Facility Designs	1-21
1.4	Identification of Agents and Contractors	1-22
1.4.1	Applicant – Program Manager	1-22
1.4.2	Other Contractors and Participants	1-23
1.5	Requirements for Further Technical Information	1-25
1.6	Material Referenced	1-26
1.7	Drawings and Other Detailed Information	1-28
1.7.1	Electrical and Instrumentation and Control Drawings	1-28
1.7.2	Piping and Instrumentation Diagrams	1-28
1.8	Interfaces with Standard Designs and Early Site Permits	1-31
1.8.1	COL Information Items	1-31
1.8.2	Departures	1-32
1.9	Conformance with Regulatory Criteria	1-57
1.9.1	Conformance with Regulatory Guides	1-57
1.9.2	Conformance with the Standard Review Plan	1-58
1.9.3	Generic Issues	1-58
1.9.4	Operational Experience (Generic Communications)	1-58
1.9.5	Advanced and Evolutionary Light-Water Reactor Design Issues	1-59
1.9.6	References	1-59
2.0	Site Characteristics	2-1
2.1	Geography and Demography	2-10
2.1.1	Site Location and Description	2-10
2.1.2	Exclusion Area Authority and Control	2-12
2.1.3	Population Distribution	2-12
2.1.4	References	2-18
2.2	Nearby Industrial, Transportation And Military Facilities	2-68
2.2.1	Location and Routes	2-68
2.2.2	Descriptions	2-70
2.2.3	Evaluation of Potential Accidents	2-76
2.2.4	References	2-91

2.3	Meteorology	2-113
2.3.1	Regional Climatology	2-113
2.3.2	Local Meteorology	2-127
2.3.3	Onsite Meteorological Measurement Program	2-136
2.3.4	Short Term Atmospheric Dispersion Estimates for Accident Releases	2-142
2.3.5	Long-term Atmospheric Dispersion Estimates For Routine Releases	2-145
2.3.6	References	2-149
2.4	Hydrologic Engineering	2-1129
2.4.1	Hydrologic Description	2-1129
2.4.2	Floods	2-1140
2.4.3	Probable Maximum Flood (PMF) on Streams and Rivers	2-1147
2.4.4	Potential Dam Failures	2-1153
2.4.5	Probable Maximum Surge and Seiche Flooding	2-1157
2.4.6	Probable Maximum Tsunami Flooding	2-1160
2.4.7	Ice Effects	2-1162
2.4.8	Cooling Water Canals and Reservoirs	2-1168
2.4.9	Channel Diversions	2-1174
2.4.10	Flooding Protection Requirements	2-1180
2.4.11	Low Water Considerations	2-1182
2.4.12	GroundWater	2-1187
2.4.13	Pathways of Liquid Effluents in Ground and Surface Waters	2-1214
2.4.14	Technical Specification and Emergency Operation Requirements	2-1227
2.5	Geology, Seismology, and Geotechnical Engineering	2-1480
2.5.1	Basic Geologic and Seismic Information	2-1487
2.5.2	Vibratory Ground Motion	2-1602
2.5.3	Surface Faulting	2-1654
2.5.4	Stability of Subsurface Materials and Foundations	2-1668
2.5.5	Stability of Slopes	2-1718
2.5.6	References	2-1724
3.0	Design of Structures, Components, Equipment and Systems	3-1
3.1	Compliance with Nuclear Regulatory Commission General Design Criteria	3-2
3.1.1	Overall Requirements	3-2
3.1.2	Protection by Multiple Fission Product Barriers	3-3
3.1.3	Protection and Reactivity Control Systems	3-3
3.1.4	Fluid Systems	3-3
3.1.5	Reactor Containment	3-3
3.1.6	Fuel and Reactivity Control	3-3
3.1.7	References	3-3
3.2	Classification of Structures, Systems, and Components	3-4
3.2.1	Seismic Classification	3-4
3.2.2	System Quality Group Classification	3-5
3.2.3	References	3-5
3.3	Wind and Tornado Loadings	3-17
3.3.1	Wind Loadings	3-17
3.3.2	Tornado Loadings	3-18
3.3.3	References	3-19
3.4	Water Level (Flood) Design	3-20
3.4.1	Internal Flood Protection	3-20
3.4.2	External Flood Protection	3-21

3.4.3	Analysis of Flooding Events	3-21
3.4.4	Analysis Procedures	3-23
3.4.5	References	3-23
3.5	Missile Protection	3-24
3.5.1	Missile Selection and Description	3-24
3.5.2	Structures, Systems, and Components to Be Protected From Externally Generated Missiles	3-31
3.5.3	Barrier Design Procedures	3-31
3.5.4	References	3-31
3.6	Protection Against Dynamic Effects Associated with Postulated Rupture of Piping	3-32
3.6.1	Plant Design for Protection Against Postulated Piping Failures in Fluid Systems Outside of Containment	3-32
3.6.2	Determination of Rupture Locations and Dynamic Effects Associated with the Postulated Rupture of Piping	3-32
3.6.3	Leak-Before-Break Evaluation Procedures	3-33
3.7	Seismic Design	3-35
3.7.1	Seismic Design Parameters	3-35
3.7.2	Seismic System Analysis	3-44
3.7.3	Seismic Subsystem Analysis	3-56
3.7.4	Seismic Instrumentation	3-58
3.8	Design of Category I Structures	3-223
3.8.1	Concrete Containment	3-223
3.8.2	Steel Containment	3-224
3.8.3	Concrete and Steel Internal Structures of Concrete Containment	3-224
3.8.4	Other Seismic Category I Structures	3-225
3.8.5	Foundations	3-235
3.8.6	References	3-242
3.9	Mechanical Systems and Components	3-250
3.9.1	Special Topics for Mechanical Components	3-250
3.9.2	Dynamic Testing and Analysis of Systems, Components, and Equipment	3-250
3.9.3	ASME Code Class 1, 2, and 3 Components, Component Supports, and Core Support Structures	3-252
3.9.4	Control Rod Drive System	3-255
3.9.5	Reactor Pressure Vessel Internals	3-255
3.9.6	Functional Design, Qualification, and Inservice Testing Programs for Pumps, Valves, and Dynamic Restraints	3-256
3.10	Seismic and Dynamic Qualification of Mechanical And Electrical Equipment	3-263
3.10.1	Seismic Qualification Criteria	3-264
3.10.2	Methods and Procedures for Qualifying Mechanical, Electrical and I&C Equipment	3-265
3.10.3	Methods and Procedures for Qualifying Supports of Mechanical and Electrical Equipment and Instrumentation	3-265
3.10.4	Test and Analysis Results and Experience Database	3-266
3.10.5	References	3-266
3.11	Environmental Qualification Of Mechanical And Electrical Equipment	3-278
3.11.1	Equipment Identification and Environmental Conditions	3-278
3.11.2	Qualification Tests and Analysis	3-279
3.11.3	Qualification Test Results	3-280
3.11.4	Loss of Ventilation	3-282
3.11.5	Estimated Chemical and Radiation Environment	3-282

3.11.6 Qualification of Mechanical Equipment	3-282
3.11.7 References	3-282
3.12 ASME Code Class 1, 2, And 3 Piping Systems, Piping Components, And Their Associated Supports	3-289
3.12.1 Introduction	3-289
3.12.2 Codes and Standards	3-289
3.12.3 Piping Analysis Methods	3-289
3.12.4 PIPING MODELING TECHNIQUES	3-289
3.12.5 Piping Stress Analysis Criteria	3-290
3.12.6 Piping Support Design Criteria	3-292
3.12.7 References	3-292
3.13 Threaded Fasteners (ASME Code Class 1, 2, and 3)	3-293
3.13.1 Design Considerations	3-293
3.13.2 Inservice Inspection Requirements	3-293
3.13.3 References	3-293
3A Criteria for Distribution System Analysis and Support	3-1
3B Dimensional Arrangement Drawings	3-1
3C Reactor Coolant System Structural Analysis Methods	3-1
3D Methodology for Qualifying Safety-Related Electrical and Mechanical Equipment	3-1
3E Design Details and Critical Sections for Safety-Related Category I Structures	3-1
3E.1 Nuclear Island Structures	3-2
3E.2 Emergency Power Generating Buildings	3-3
3E.3 Essential Service Water Buildings	3-4
3E.4 {ESWEMS PUMPHOUSE and ESWEMS RETENTION POND	3-5
3E.4.E. References	3-9
4.1	
4.0 Reactor	4-1
4.1 Summary Description	4-2
4.2 Fuel System Design	4-3
4.3 Nuclear Design	4-4
4.4 Thermal-Hydraulic Design	4-5
4.5 Reactor Materials	4-6
4.6 Functional Design of Reactivity Control Systems	4-7
5.0 Reactor Coolant System and Connected Systems	5-1
5.1 Summary Description	5-2
5.2 Integrity of the Reactor Coolant Pressure Boundary	5-3
5.2.1 Compliance with Codes and Code Cases	5-3
5.2.2 Overpressure Protection	5-3
5.2.3 Reactor Coolant Pressure Boundary Materials	5-3
5.2.4 Inservice Inspection and Testing of the RCPB	5-3
5.2.5 RCPB Leakage Detection	5-4
5.2.6 References	5-4
5.3 Reactor Vessel	5-5
5.3.1 Reactor Vessel Materials	5-5

5.3.2	Pressure-Temperature Limits, Pressurized Thermal Shock, and Charpy Upper-Shelf Energy Data and Analyses	5-6
5.3.3	Reactor Vessel Integrity	5-6
5.3.4	References	5-6
5.4	Component and Subsystem Design	5-7
5.4.1	Reactor Coolant Pumps	5-7
5.4.2	Steam Generators (PWR)	5-7
5.4.3	Reactor Coolant Piping	5-8
5.4.4	Not Used in U.S. EPR Design	5-9
5.4.5	Not Used in U.S. EPR Design	5-9
5.4.6	Not Used in U.S. EPR Design	5-9
5.4.7	Residual Heat Removal System	5-9
5.4.8	Not Used in U.S. EPR Design	5-9
5.4.9	Not Used in U.S. EPR Design	5-9
5.4.10	Pressurizer	5-9
5.4.11	Pressurizer Relief Tank	5-9
5.4.12	Reactor Coolant System High Point Vents	5-9
5.4.13	Safety and Relief Valves	5-9
5.4.14	Component Supports	5-9
5.4.15	References	5-9
6.0	Engineered Safety Features	6-1
6.1	Engineered Safety Features Materials	6-2
6.1.1	Metallic Materials	6-2
6.1.2	Organic Materials	6-2
6.1.3	References	6-4
6.2	Containment Systems	6-5
6.2.1	Containment Functional Design	6-5
6.2.2	Containment Heat Removal Systems	6-5
6.2.3	Secondary Containment Functional Design	6-5
6.2.4	Containment Isolation System	6-5
6.2.5	Combustible Gas Control in Containment	6-5
6.2.6	Containment Leakage Testing	6-5
6.2.7	Fracture Prevention of Containment Pressure Vessel	6-5
6.2.8	References	6-5
6.3	Emergency Core Cooling System	6-6
6.3.1	Design Bases	6-6
6.3.2	System Design	6-6
6.3.3	Performance Evaluation	6-7
6.3.4	Tests and Inspections	6-7
6.3.5	Instrumentation Requirements	6-7
6.3.6	References	6-8
6.4	Habitability Systems	6-9
6.4.1	Design Basis	6-9
6.4.2	System Design	6-9
6.4.3	System Operational Procedures	6-9
6.4.4	Design Evaluations	6-10
6.4.5	Testing and Inspection	6-11
6.4.6	Instrumentation Requirements	6-11
6.4.7	References	6-11

6.5	Fission Product Removal and Control Systems	6-12
6.6	Inservice Inspection of Class 2 and 3 Components	6-13
6.6.1	Components Subject to Examination	6-13
6.6.2	Accessibility	6-13
6.6.3	Examination Techniques and Procedures	6-13
6.6.4	Inspection Intervals	6-13
6.6.5	Examination Categories and Requirements	6-14
6.6.6	Evaluation of Examination Results	6-14
6.6.7	System Pressure Tests	6-14
6.6.8	Augmented ISI to Protect Against Postulated Piping Failures	6-14
6.6.9	References	6-14
6.7	Main Steamline Isolation Valve Leakage Control System (BWRS)	6-16
6.8	Extra Borating System	6-17
7.0	Instrumentation and Controls	7-1
7.1	Introduction	7-2
7.2	Reactor Trip System	7-3
7.3	Engineered Safety Features Systems	7-4
7.4	Systems Required for Safe Shutdown	7-5
7.5	Information Systems Important to Safety	7-6
7.5.1	Description	7-6
7.5.2	Analysis	7-6
7.5.3	References	7-7
7.6	Interlock Systems Important to Safety	7-8
7.7	Control Systems Not Required For Safety	7-9
7.7.1	Description	7-9
7.8	Diverse I&C Systems	7-10
7.9	Data Communication Systems	7-11
8.0	Electric Power	8-1
8.1	Introduction	8-2
8.1.1	Offsite Power Description	8-2
8.1.2	Onsite Power System Description	8-2
8.1.3	Safety-Related Loads	8-2
8.1.4	Design Bases	8-3
8.1.5	References	8-3
8.2	Offsite Power System	8-9
8.2.1	Description	8-9
8.2.2	Analysis	8-15
8.2.3	References	8-26
8.3	Onsite Power System	8-34
8.3.1	Alternating Current Power Systems	8-34
8.3.2	DC Power Systems	8-38
8.3.3	References	8-38
8.4	Station Blackout	8-49
8.4.1	Description	8-49
8.4.2	Analysis	8-49

8.4.3	References	8-52
9.0	Auxiliary Systems	9-1
9.1	Fuel Storage and Handling	9-2
9.1.1	Criticality Safety of New and Spent Fuel Storage and Handling	9-2
9.1.2	New and Spent Fuel Storage	9-2
9.1.3	Spent Fuel Pool Cooling and Purification System	9-2
9.1.4	Fuel Handling System	9-2
9.1.5	Overhead Heavy Load Handling System	9-2
9.2	Water Systems	9-5
9.2.1	Essential Service Water System	9-5
9.2.2	Component Cooling Water System	9-6
9.2.3	Demineralized Water Distribution System	9-6
9.2.4	Potable and Sanitary Water Systems (PSWS)	9-6
9.2.5	Ultimate Heat Sink	9-11
9.2.6	Condensate Storage Facilities	9-22
9.2.7	Seal Water Supply System	9-23
9.2.8	Safety Chilled Water System	9-23
9.2.9	Raw Water Supply System	9-23
9.2.10	Turbine Building Closed Cooling Water System	9-26
9.3	Process Auxiliaries	9-40
9.4	Air Conditioning, Heating, Cooling and Ventilation Systems	9-41
9.4.1	Main Control Room Air Conditioning System	9-41
9.4.2	Fuel Building Ventilation System	9-41
9.4.3	Nuclear Auxiliary Building Ventilation System	9-41
9.4.4	Turbine Island Ventilation System	9-41
9.4.5	Safeguard Building Controlled-Area Ventilation System	9-45
9.4.6	Electrical Division of Safeguard Building Ventilation System (SBVSE)	9-45
9.4.7	Containment Building Ventilation System	9-45
9.4.8	Radioactive Waste Building Ventilation System	9-45
9.4.9	Emergency Power Generating Building Ventilation System	9-45
9.4.10	Station Blackout Room Ventilation System	9-45
9.4.11	Essential Service Water Pump Building Ventilation System	9-45
9.4.12	Main Steam and Feedwater Valve Room Ventilation System	9-46
9.4.13	Smoke Confinement System	9-46
9.4.14	Access Building Ventilation System	9-46
9.4.15	{ESWEMS Pumphouse HVAC System	9-46
9.4.16	FIRE PROTECTION BUILDING VENTILATION SYSTEM	9-51
9.5	Other Auxiliary Systems	9-59
9.5.1	Fire Protection	9-59
9.5.2	Communication System	9-68
9.5.3	Lighting System	9-69
9.5.4	Diesel Generator Fuel Oil Storage and Transfer System	9-69
9.5.5	Diesel Generator Cooling Water System	9-70
9.5.6	Diesel Generator Starting Air System	9-70
9.5.7	Diesel Generator Lubricating System	9-70
9.5.8	Diesel Generator Air Intake and Exhaust System	9-70

9A	Fire Protection Analysis	9A-1	
9B	Fire Protection Analysis - Plant Specific Supplement	9B-1	
9B.1	Introduction	9-2	
9B.1.1	Regulatory Bases	9-2	
9B.1.2	Defense-in-depth	9-3	
9B.1.3	Scope	9-3	
9B.2	Fire Protection Analysis Methodology	9-5	
9B.2.1	General Design Criteria	9-5	
9B.2.2	Specific Elements	9-5	
9B.2.3	Assumptions	9-9	
9B.3	Fire Area-by-Fire Area Evaluation	9-13	
9B.3.1	Turbine Building	9-13	
9B.3.2	Switchgear Building	9-15	
9B.3.3	Auxiliary Power Transformer Area	9-17	
9B.3.4	Generator Transformer Area	9-19	
9B.3.5	{Warehouse Building	9-20	
9B.3.6	Security Access Facility	9-20	
9B.3.7	Central Gas Supply Building	9-20	
9B.3.8	{Grid Systems Control Building	9-21	
9B.3.9	Fire Protection Building	9-21	
9B.3.10	{Circulating Water System Cooling Tower Structures	9-22	
9B.3.11	Circulating Water System Pumphouse	9-22	
9B.3.12	Essential Service Water Emergency Makeup System Pumphouse	9-23	
9B.3.13	BBNPP Intake Structure	9-24	
9B.4	References	9-25	
10.0	Steam and Power Conversion System	10-1	
10.1	Summary Description	10-2	
10.2	Turbine-Generator	10-3	
10.2.1	Design Bases	10-3	
10.2.2	General Description	10-3	
10.2.3	Turbine Rotor Integrity	10-3	
10.2.4	Safety Evaluation	10-5	
10.2.5	References	10-5	
10.3	Main Steam Supply System	10-6	
10.3.1	Design Bases	10-6	
10.3.2	System Description	10-6	
10.3.3	Safety Evaluation	10-6	
10.3.4	Inspection and Testing Requirements	10-6	
10.3.5	Secondary Side Water Chemistry Program	10-6	
10.3.6	Steam and Feedwater System Materials	10-6	
10.3.7	References	10-8	
10.4	Other Features Of Steam And Power Conversion System	10-9	
10.4.1	Main Condensers	10-9	
10.4.2	Main Condenser Evacuation System	10-9	
10.4.3	Turbine Gland Sealing System	10-9	
10.4.4	Turbine Bypass System	10-9	
10.4.5	Circulating Water System	10-10	
10.4.6	Condensate Polishing System	10-18	
10.4.7	Condensate and Feedwater System	10-18	

10.4.8 Steam Generator Blowdown System (PWR)	10-19
10.4.9 Emergency Feedwater System	10-19
11.0 Radioactive Waste Management	11-1
11.1 Source Terms	11-2
11.1.1 Reference	11-2
11.2 Liquid Waste Management System	11-3
11.2.1 Design Basis	11-3
11.2.2 System Description	11-3
11.2.3 Radioactive Effluent Releases	11-3
11.2.4 Liquid Waste Management System Cost-Benefit Analysis	11-8
11.2.5 References	11-9
11.3 Gaseous Waste Management Systems	11-26
11.3.1 Design Basis	11-26
11.3.2 System Description	11-26
11.3.3 Radioactive Effluent Releases	11-26
11.3.4 Gaseous Waste Management System Cost-Benefit Analysis	11-28
11.3.5 References	11-29
11.4 Solid Waste Management Systems	11-32
11.4.1 Design Basis	11-32
11.4.2 System Description	11-33
11.4.3 Radioactive Effluent Releases	11-33
11.4.4 Solid Waste Management System Cost-Benefit Analysis	11-34
11.4.5 Failure Tolerance	11-34
11.4.6 Quality Assurance	11-34
11.4.7 References	11-34
11.5 Process and Effluent Radiological Monitoring and Sampling Systems	11-35
11.5.1 Design Basis	11-35
11.5.2 System Description	11-35
11.5.3 Effluent Monitoring and Sampling	11-36
11.5.4 Process Monitoring and Sampling	11-36
11.5.5 References	11-37
12.0 Radiation Protection	12-1
12.1 Ensuring that Occupational Radiation Exposures are As Low As is Reasonably Achievable	12-2
12.1.1 Policy Considerations	12-2
12.1.2 Design Considerations	12-2
12.1.3 Operational Considerations	12-2
12.1.4 References	12-2
12.2 Radiation Sources	12-3
12.2.1 Contained Sources	12-3
12.2.2 Airborne Radioactive Material Sources	12-4
12.2.3 References	12-4
12.3 Radiation Protection Design Features	12-5
12.3.1 Facility Design Features	12-5
12.3.2 Shielding	12-7
12.3.3 Ventilation	12-7
12.3.4 Area Radiation and Airborne Radioactivity Monitoring Instrumentation	12-7
12.3.5 Dose Assessment	12-11
12.3.6 Minimization of Contamination	12-18

12.3.7	References	12-18
12.4	Dose Assessment	12-49
12.5	Operational Radiation Protection Program	12-50
12.5.1	References	12-50
13.0	Conduct of Operations	13-1
13.1	Organizational Structure of Applicant	13-2
13.1.1	Management and Technical Support Organization	13-2
13.1.2	Operating Organization	13-10
13.1.3	Qualifications of Nuclear Plant Personnel	13-18
13.1.4	References	13-19
13.2	Training	13-28
13.2.1	References	13-28
13.3	Emergency Planning	13-29
13.4	Operational Program Implementation	13-30
13.4.1	References	13-30
13.5	Plant Procedures	13-36
13.5.1	Administrative Procedures	13-36
13.5.2	Operating and Maintenance Procedures	13-39
13.5.3	References	13-43
13.6	Security	13-44
13.6.1	References	13-45
13.7	Fitness For Duty	13-46
13.7.1	References	13-47
13.8	References	13-48
14.0	Verification Programs	14-1
14.1	Specific Information to be Addressed for the Initial Plant Test Program	14-2
14.2	Initial Plant Test Program	14-3
14.2.1	Summary of Test Program and Objectives	14-3
14.2.2	Organization and Staffing	14-3
14.2.3	Test Procedures	14-8
14.2.4	Conduct of Test Program	14-10
14.2.5	Review, Evaluation, and Approval of Test Results	14-10
14.2.6	Test Records	14-13
14.2.7	Conformance of Test Programs with Regulatory Guides	14-13
14.2.8	Utilization of Reactor Operating and Testing Experience in Development of Initial Test Program	14-13
14.2.9	Trial Use of Plant Operating and Emergency Procedures	14-13
14.2.10	Initial Fuel Loading and Initial Criticality	14-13
14.2.11	Test Program Schedule	14-13
14.2.12	Individual Test Descriptions	14-14
14.2.13	References	14-15
14.2.14	COL Applicant Site-Specific Tests	14-15
14.3	Inspections, Tests, Analyses, and Acceptance Criteria	14-34
14.3.1	Tier 1, Chapter 1, Introduction	14-34
14.3.2	Tier 1, Chapter 2, Structural and Systems Engineering - Inspections, Tests, Analyses, and Acceptance Criteria	14-34

14.3.3	Tier 1, Chapter 3, Non-System Based Design Descriptions and ITAAC	14-35
14.3.4	Tier 1, Chapter 4, Interface Requirements	14-35
14.3.5	Tier 1, Chapter 5, Site Parameters	14-35
14.3.6	Design Acceptance Criteria	14-35
14.3.7	References	14-36
15.0	Transient and Accident Analysis	15-1
15.0	15-1
15.0.1	Radiological Consequence Analysis	15-1
15.0.2	Computer Codes Used in Analysis	15-1
15.0.3	Radiological Consequences of Design Basis Accidents	15-1
15.0.4	PLANT COOLDOWN	15-5
15.0.5	Compliance with Section C.I.15, "Transient and Accident Analyses," of Regulatory Guide 1.206	15-6
15.0.6	References	15-6
15.1	Increase in Heat Removal by the Secondary System	15-15
15.2	Decrease in Heat Removal by the Secondary System	15-16
15.3	Decrease in Reactor Coolant System Flow Rate	15-17
15.3.1	Partial Loss of Forced Reactor Coolant Flow	15-17
15.3.2	Complete Loss of Forced Reactor Coolant Flow	15-17
15.3.3	Reactor Coolant Pump Rotor Seizure	15-17
15.3.4	Reactor Coolant Pump Shaft Break	15-17
15.3.5	References	15-17
15.4	Reactivity and Power Distribution Anomalies	15-18
15.4.1	Uncontrolled Control Rod Assembly Withdrawal from a Subcritical or Low-Power Startup Condition	15-18
15.4.2	Uncontrolled Control Rod Assembly Withdrawal at Power	15-18
15.4.3	Control Rod Misoperation (System Malfunction or Operator Error)	15-18
15.4.4	Startup of an Inactive Reactor Coolant Pump at an Incorrect Temperature	15-18
15.4.5	Flow Controller Malfunction Causing an Increase in BWR Core Flow Rate	15-18
15.4.6	Chemical and Volume Control System Malfunction that Results in a Decrease in the Boron Concentration in the Reactor Coolant	15-18
15.4.7	Inadvertent Loading and Operation of a Fuel Assembly in an Improper Position	15-18
15.4.8	Spectrum of Rod Ejection Accidents in a PWR	15-19
15.4.9	Spectrum of Rod Drop Accidents (BWR)	15-19
15.4.10	References	15-19
15.5	Increase in Reactor Coolant Inventory	15-20
15.6	Decrease in Reactor Coolant Inventory Events	15-21
15.7	Radioactive Release from a Subsystem or Component	15-22
15.8	Anticipated Transients Without Scram	15-23
15.9	Boiling Water Reactor Stability	15-24
15.10	Spent Fuel Pool Criticality and Boron Dilution Analysis	15-25
16.0	TECHNICAL SPECIFICATIONS	16-1
17.0	Quality Assurance and Reliability Assurance	17-1
17.1	Quality Assurance During Design	17-2
17.2	Quality Assurance During the Operations Phase	17-3

17.3	Quality Assurance Program Description	17-4
17.4	Reliability Assurance Program	17-5
17.4.1	Reliability Assurance Program Scope, Stages, and Goals	17-5
17.4.2	Reliability Assurance Program Implementation	17-5
17.4.3	Organization, Design Control, Procedures and Instructions, Corrective Actions, and Audit Plans	17-6
17.4.4	Reliability Assurance Program Information Needed in a COL Application	17-6
17.4.5	References	17-16
17.5	Quality Assurance Program Description	17-18
17.5.1	QA Program Responsibilities	17-18
17.5.2	SRP Section 17.5 and the QA Program Description	17-20
17.5.3	Evaluation of the QAPD Against the SRP and QAPD Submittal Guidance	17-20
17.5.4	References	17-20
17.6	Description of Applicant's Program for Implementation of 10 CFR 50.65, the Maintenance Rule	17-22
17.6.1	Scoping Per 10 CFR 50.65(b)	17-22
17.6.2	Monitoring Per 10 CFR 50.65(a)	17-22
17.6.3	Periodic Evaluation Per 10 CFR 50.65(a)(3)	17-23
17.6.4	Risk Assessment and Management Per 10 CFR 50.65(a)(4)	17-23
17.6.5	Maintenance Rule Training and Qualification	17-23
17.6.6	Maintenance Rule Program Role in Implementation of Reliability Assurance Program (RAP) in the Operations Phase	17-23
17.6.7	MAINTENANCE RULE PROGRAM RELATIONSHIP WITH INDUSTRY OPERATING EXPERIENCE ACTIVITIES	17-24
17.6.8	Maintenance Rule Program Implementation	17-24
17.6.9	References	17-24
17.7	Maintenance Rule Program	17-25
18.0	Human Factors Engineering	18-1
18.1	Human Factors Engineering Program Management	18-2
18.1.1	Human Factors Engineering Program Goals, Assumptions and Constraints, and Scope	18-2
18.1.2	Human Factors Engineering and Control Room Design Team Organization	18-3
18.1.3	Human Factors Engineering Processes and Procedures	18-3
18.1.4	Human Factors Engineering Issues Tracking	18-3
18.1.5	Technical Program	18-3
18.1.6	References	18-3
18.2	Operating Experience Review	18-4
18.3	Functional Requirements Analysis and Functional Allocation	18-5
18.4	Task Analysis	18-6
18.5	Staffing and Qualifications	18-7
18.6	Human Reliability Analysis	18-8
18.7	Human System Interface Design	18-9
18.8	Procedure Development	18-10
18.9	Training Program Development	18-11
18.10	Verification and Validation	18-12
18.11	Design Implementation	18-13

18.12 Human Performance Monitoring	18-14
19.0 Probabilistic Risk Assessment and Severe Accident Evaluation	19-1
19.1 Probabilistic Risk Assessment	19-2
19.1.1 Uses and Application of the PRA	19-2
19.1.2 Quality of PRA	19-3
19.1.3 Special Design/Operational Features	19-5
19.1.4 Safety Insights from the Internal Events PRA for Operations at Power	19-5
19.1.5 Safety Insights from the External Events PRA for Operations at Power	19-8
19.1.6 Safety Insights from the PRA for Other Modes of Operation	19-20
19.1.7 PRA-Related Input to Other Programs and Processes	19-21
19.1.8 Conclusions and Findings	19-21
19.1.9 References	19-21
19.2 Severe Accident Evaluations	19-25
19.2.1 Introduction	19-25
19.2.2 Severe Accident Prevention	19-25
19.2.3 Severe Accident Mitigation	19-25
19.2.4 Containment Performance Capability	19-25
19.2.5 Accident Management	19-25
19.2.6 Consideration of Potential Design Improvements under 10 CFR 50.34(f)	19-25
19.2.7 Beyond Design Basis Large Commercial Aircraft Impact Assessment	19-25
19.2.8 References	19-25
19.3 Open, Confirmatory, and COL Action Items Identified as Unresolved	19-26

List of Tables

Table 1.1-1— {Acronyms Used in this Document}	1-7
Table 1.6-1— {Reports Referenced}	1-27
Table 1.7-1— {I&C Functional and Electrical One Line Diagrams}	1-29
Table 1.7-2— {Piping and Instrumentation Diagrams}	1-30
Table 1.8-1— FSAR Sections that Demonstrate Conformance to U.S. EPR FSAR Interface Requirements	1-33
Table 1.8-2— FSAR Sections that Address COL Items	1-35
Table 1.9-1— {Conformance with Regulatory Guides}	1-60
Table 2.0-2— {U.S. EPR Site Design Envelope Comparison}	2-2
Table 2.0-3— {Comparison of Inventory of Radionuclides Which Could Potentially Seep Into the Groundwater}	2-8
Table 2.1-1— {BBNPP Specific Location of the Center of the Containment Structure}	2-21
Table 2.1-2— {Total Population Within 10 mi (16 km) Radius of BBNPP (2000 - 2080)}	2-22
Table 2.1-3— {Resident Population for Counties Within 10mi (16 km) Radius of BBNPP (2000 - 2080)}	2-23
Table 2.1-4— {Total Population Within 50 mi (80 km) Radius of BBNPP (2000 - 2080)}	2-24
Table 2.1-5— {Resident Population Census and Projections (2010-2080) for Counties Within 50 mile (80 km) Radius of BBNPP}	2-25
Table 2.1-6— {Summary of Transient Populations within 10 mi (16 km) of the BBNPP Site, by Sector and Distance}	2-26
Table 2.1-7— {Transient Population Facilities - Major Employers and Colleges/Universities Within 10 mi (16 km) Radius of BBNPP}	2-27
Table 2.1-8— {Transient Population Facilities - Recreational Areas and Campgrounds/RV Parks Within 10 mi (16 km) Radius of BBNPP}	2-28
Table 2.1-9— {Transient Population Facilities - Hotel, Motel, and Bed & Breakfast Establishments within 10 mi (16 km) of the BBNPP Site}	2-29
Table 2.1-10— {Summary of Transient Populations within 10-50 mi (16-80 km) of the BBNPP Site, by 10 mi (16 km) radii}	2-30
Table 2.1-11— {Current Population and Population Projections (Resident and Transient) For the BBNPP Low Population Zone}	2-31
Table 2.1-12— {Commuting Patterns To and From Columbia and Luzerne Counties (2000)}	2-32
Table 2.1-13— {Special Facilities — Hospitals and Nursing Homes Within the 10 mi (16 km) Zone of BBNPP}	2-33
Table 2.1-14— {Special Facilities — Schools Within the 10 mi (16 km) Zone of BBNPP}	2-34
Table 2.1-15— {Actual (2000) and Projected (2018-2058) Population Within the 1 mi (1.6 km) to 30 mi (48 km) Zones of BBNPP}	2-35
Table 2.1-16— {Actual (2000) and Projected (2018-2058) Population Density (persons/mi ²) Within the 1 mi (1.6 km) to 30 mi (48 km) Zones of BBNPP}	2-36
Table 2.2-1— {Description of Facilities, Products, and Materials}	2-95
Table 2.2-2— {SSES and BBNPP Chemical Storage}	2-96
Table 2.2-3— {Hazardous Chemical Railway, Road, or Waterway Freight}	2-98
Table 2.2-4— {Aircraft Operations - Significance Factors}	2-99
Table 2.2-5— {SSES Site and BBNPP Site Chemical Disposition}	2-100
Table 2.2-6— {Hazardous Material, Nearby Facilities, Disposition}	2-102
Table 2.2-7— {Hazardous Material, Transported Chemicals, Disposition}	2-104
Table 2.2-8— {Explosion Event Analysis}	2-105
Table 2.2-9— {Flammable Vapor Cloud Events (Delayed Ignition) Analysis}	2-106
Table 2.2-10— {Toxic Vapor Cloud Analysis}	2-108
Table 2.2-11— {Description of Pipelines}	2-109

Table 2.2-12— {Description of Highways}	2-110
Table 2.3-1— {National Ambient Air Quality Standards}	2-150
Table 2.3-2— {Tornadoes Reported in Luzerne County, Pennsylvania}	2-151
Table 2.3-3— {Tornadoes Reported in Columbia County, Pennsylvania}	2-152
Table 2.3-4— {Tropical Storms and Hurricanes Passing Within 100 Statute Miles (161 km) of BBNPP, Pennsylvania}	2-153
Table 2.3-5— {Total and Average Numbers of Tropical Storms and Hurricanes (1851-2004)}	2-155
Table 2.3-6— {Monthly Mean Number of Days with Thunderstorms}	2-156
Table 2.3-7— {Drought Events Reported in Luzerne County, Pennsylvania}	2-157
Table 2.3-8— {Drought Events Reported in Columbia County, Pennsylvania}	2-159
Table 2.3-9— {Fifty Knots or Greater High Wind Events in Luzerne County, Pennsylvania}	2-161
Table 2.3-10— {Winds Greater than 75 mph and Less than 124 mph in Luzerne County, Pennsylvania}	2-163
Table 2.3-11— {Fifty Knots or Greater High Wind Events in Columbia County, Pennsylvania}	2-164
Table 2.3-12— {Winds Greater than 75 mph and Less than 124 mph in Columbia County, Pennsylvania}	2-166
Table 2.3-13— {Hail Events in Luzerne County, Pennsylvania}	2-167
Table 2.3-14— {Hail Events in Columbia County, Pennsylvania}	2-169
Table 2.3-15— {Ice Storm Events in Luzerne County, Pennsylvania}	2-171
Table 2.3-16— {IceStorm Events in Columbia County, Pennsylvania}	2-172
Table 2.3-17— {Snow Storm Events in Luzerne County, Pennsylvania}	2-174
Table 2.3-18— {Snow Storm Events in Columbia County, Pennsylvania}	2-176
Table 2.3-19— {Probable Maximum Winter Precipitation (PMWP) Values}	2-178
Table 2.3-20— {Design-Basis Tornado Characteristics for BBNPP}	2-179
Table 2.3-21— {Zero Percent Exceedance Temperature Values for Wilkes-Barre/ Scranton, Pennsylvania}	2-180
Table 2.3-22— {One Percent Exceedance Seasonal Basis Temperature Values for Wilkes- Barre/ Scranton, Pennsylvania}	2-181
Table 2.3-23— {SSES 33' (10-m) 2001-2007 Annual JFD}	2-182
Table 2.3-24— {SSES 197' (60-m) 2001-2007 Annual JFD}	2-198
Table 2.3-25— {SSES 33' (10-m) 2001-2006 Annual JFD}	2-214
Table 2.3-26— {SSES 197' (60-m) 2001-2006 Annual JFD}	2-230
Table 2.3-27— {SSES 33' (10-m) 2001-2006 Winter JFD}	2-246
Table 2.3-28— {SSES 33' (10-m) 2001-2006 Spring JFD}	2-262
Table 2.3-29— {SSES 33' (10-m) 2001-2006 Summer JFD}	2-278
Table 2.3-30— {SSES 33' (10-m) 2001-2006 Autumn JFD}	2-294
Table 2.3-31— {SSES 197' (60-m) 2001-2006 Winter JFD}	2-310
Table 2.3-32— {SSES 197' (60-m) 2001-2006 Spring JFD}	2-326
Table 2.3-33— {SSES 197' (60-m) 2001-2006 Summer JFD}	2-342
Table 2.3-34— {SSES 197' (60-m) 2001-2006 Autumn JFD}	2-358
Table 2.3-35— {SSES 33' (10-m) 2001-2006 January JFD}	2-374
Table 2.3-36— {SSES 33' (10-m) 2001-2006 February JFD}	2-390
Table 2.3-37— {SSES 33' (10-m) 2001-2006 March JFD}	2-406
Table 2.3-38— {SSES 33' (10-m) 2001-2006 April JFD}	2-422
Table 2.3-39— {SSES 33' (10-m) 2001-2006 May JFD}	2-438
Table 2.3-40— {SSES 33' (10-m) 2001-2006 June JFD}	2-454
Table 2.3-41— {SSES 33' (10-m) 2001-2006 July JFD}	2-470
Table 2.3-42— {SSES 33' (10-m) 2001-2006 August JFD}	2-486
Table 2.3-43— {SSES 33' (10-m) 2001-2006 September JFD}	2-502
Table 2.3-44— {SSES 33' (10-m) 2001-2006 October JFD}	2-518
Table 2.3-45— {SSES 33' (10-m) 2001-2006 November JFD}	2-534

Table 2.3-46— {SSES 33' (10-m) 2001-2006 December JFD}	2-550
Table 2.3-47— {SSES 197' (60-m) 2001-2006 January JFD}	2-566
Table 2.3-48— {SSES 197' (60-m) 2001-2006 February JFD}	2-582
Table 2.3-49— {SSES 197' (60-m) 2001-2006 March JFD}	2-598
Table 2.3-50— {SSES 197' (60-m) 2001-2006 April JFD}	2-614
Table 2.3-51— {SSES 197' (60-m) 2001-2006 May JFD}	2-630
Table 2.3-52— {SSES 197' (60-m) 2001-2006 June JFD}	2-646
Table 2.3-53— {SSES 197' (60-m) 2001-2006 July JFD}	2-662
Table 2.3-54— {SSES 197' (60-m) 2001-2006 August JFD}	2-678
Table 2.3-55— {SSES 197' (60-m) 2001-2006 September JFD}	2-694
Table 2.3-56— {SSES 197' (60-m) 2001-2006 October JFD}	2-710
Table 2.3-57— {SSES 197' (60-m) 2001-2006 November JFD}	2-726
Table 2.3-58— {SSES 197' (60-m) 2001-2006 December JFD}	2-742
Table 2.3-59— {Input Used to Determine JFD's}	2-758
Table 2.3-60— {Monthly Mean Wind Speed and Prevailing Wind Direction (tens of degrees) for Sites Around Bell Bend Nuclear Power Plant}	2-759
Table 2.3-61— {Monthly Maximum Two-Minute Wind Speed and Direction (tens of degrees) for Sites Around Bell Bend Nuclear Power Plant}	2-760
Table 2.3-62— {Monthly Maximum Five-Second Wind Speed and Direction (tens of degrees) for Sites Around Bell Bend Nuclear Power Plant}	2-761
Table 2.3-63— {SSES 33' (10-m) Wind Direction Persistence Summary for 2001}	2-762
Table 2.3-64— {SSES 33' (10-m) Wind Direction Persistence Summary for 2002}	2-764
Table 2.3-65— {SSES 33' (10-m) Wind Direction Persistence Summary for 2003}	2-766
Table 2.3-66— {SSES 33' (10-m) Wind Direction Persistence Summary for 2004}	2-768
Table 2.3-67— {SSES 33' (10-m) Wind Direction Persistence Summary for 2005}	2-770
Table 2.3-68— {SSES 33' (10-m) Wind Direction Persistence Summary for 2006}	2-772
Table 2.3-69— {SSES 33' (10-m) Average Wind Direction Persistence Summary for Years 2001-2006}	2-774
Table 2.3-70— {SSES 60m Wind Direction Persistence Summary for 2001}	2-776
Table 2.3-71— {SSES 60m Wind Direction Persistence Summary for 2002}	2-778
Table 2.3-72— {SSES 60m Wind Direction Persistence Summary for 2003}	2-780
Table 2.3-73— {SSES 60m Wind Direction Persistence Summary for 2004}	2-782
Table 2.3-74— {SSES 60m Wind Direction Persistence Summary for 2005}	2-784
Table 2.3-75— {SSES 60m Wind Direction Persistence Summary for 2006}	2-786
Table 2.3-76— {SSES 197' (60-m) Average Wind Direction Persistence Summary for Years 2001-2006}	2-789
Table 2.3-77— {SSES Daily Average and Extreme Temperatures (2001-2006)}	2-791
Table 2.3-78— {SSES Daily Average and Extreme Dew Point Temperatures (2001-2006)}	2-839
Table 2.3-79— {Williamsport, PA, Daily Average and Extreme Temperature and Dew Point Temperature Values (2000-2005)}	2-886
Table 2.3-80— {SSES Monthly Mean Temperatures (2001-2006)}	2-935
Table 2.3-81— {SSES Monthly Mean Extreme Maximum Temperatures (2001-2006)}	2-936
Table 2.3-82— {SSES Monthly Mean Extreme Minimum Temperatures (2001-2006)}	2-937
Table 2.3-83— {SSES Monthly Mean Daily Maximum Temperatures (2001-2006)}	2-938
Table 2.3-84— {SSES Monthly Mean Daily Minimum Temperatures (2001-2006)}	2-939
Table 2.3-85— {SSES Maximum Hourly Temperatures (2001-2006)}	2-940
Table 2.3-86— {SSES Minimum Hourly Temperatures (2001-2006)}	2-941
Table 2.3-87— {Number of SSES Hourly Temperature Values Greater Than or Less Than Indicated Value and Percent Frequency of Occurrence (2001-2006)}	2-942
Table 2.3-88— {SSES Monthly Mean Relative Humidity (2001-2006)}	2-943

Table 2.3-89— {Monthly Mean Temperatures (1971-2000) for Sites Around Bell Bend Nuclear Power Plant}	2-944
Table 2.3-90— {Monthly Mean Daily Maximum Temperatures (1971-2000) for Sites Around Bell Bend Nuclear Power Plant}	2-945
Table 2.3-91— {Monthly Mean Daily Minimum Temperatures (1971-2000) for Sites Around Bell Bend Nuclear Power Plant}	2-946
Table 2.3-92— {Monthly Mean Wet Bulb Temperatures (1978-2000) for Sites Around Bell Bend Nuclear Power Plant}	2-947
Table 2.3-93— {Monthly Mean Dew Point Temperatures (1978-2000) for Sites Around Bell Bend Nuclear Power Plant}	2-948
Table 2.3-94— {Mean Number of Days with Maximum Hourly Temperature Value Greater Than or Equal to 90°F (1971-2000) for Sites Around Bell Bend Nuclear Power Plant}	2-949
Table 2.3-95— {Mean Number of Days with Minimum Hourly Temperature Value Less Than or Equal to 32°F (1971-2000) for Sites Around BBNPP}	2-950
Table 2.3-96— {Mean Number of Days with Minimum Hourly Temperature Value Less Than or Equal to 0°F (1971-2000) for Sites Around BBNPP}	2-951
Table 2.3-97— {Monthly Mean Relative Humidity (1971-2000) for Sites Around BBNPP}	2-952
Table 2.3-98— {Daily Variation of Monthly Mean Relative Humidity (%) (1971-2000) for Sites Around BBNPP}	2-953
Table 2.3-99— {Annual Heating and Humidification Design Conditions for Wilkes-Barre/Scranton, PA}	2-954
Table 2.3-100— {Annual Cooling, Dehumidification, and Enthalpy Design Conditions for Wilkes-Barre/Scranton, PA}	2-955
Table 2.3-101— {Extreme Annual Design Conditions for Wilkes-Barre/Scranton, PA}	2-956
Table 2.3-102— {Monthly Design Dry Bulb and Mean Coincident Wet Bulb Temperature Values for Wilkes-Barre/Scranton, PA (1972-2001)}	2-957
Table 2.3-103— {Monthly Design Wet Bulb and Mean Coincident Dry Bulb Temperature Values for Wilkes-Barre/Scranton, PA (1972-2001)}	2-958
Table 2.3-104— {Monthly Design Dry Bulb and Mean Coincident Wet Bulb Temperature Values for Allentown, PA (1972-2001)}	2-959
Table 2.3-105— {Monthly Design Wet Bulb and Mean Coincident Dry Bulb Temperature Values for Allentown, PA (1972-2001)}	2-960
Table 2.3-106— {Monthly Mean Daily Temperature Range in Fahrenheit Degrees for Wilkes-Barre/Scranton, PA}	2-961
Table 2.3-107— {SSES Monthly and Annual Precipitation (2001-2006)}	2-962
Table 2.3-108— {SSES Monthly and Annual Percent Frequency (%) of Precipitation Occurrence (2001-2006)}	2-963
Table 2.3-109— {SSES Hourly Rainfall Rate Distribution (2001-2006)}	2-964
Table 2.3-110— {SSES Measured Extreme Precipitation Hourly Values (2001-2006)}	2-965
Table 2.3-111— {Mean Monthly and Annual Precipitation for Sites Around Bell Nuclear Power Plant (1971-2000)}	2-966
Table 2.3-112— {Mean Monthly and Annual Snowfall for Sites Around Bell Bend Nuclear Power Plant (1971-2000)}	2-967
Table 2.3-113— {Monthly Mean Number of Days with Precipitation for Sites Around Bell Bend Nuclear Power Plant (1971-2000)}	2-968
Table 2.3-114— {Monthly Mean Number of Days with Heavy Fog for Sites Around Bell Bend Nuclear Power Plant (1964-2006)}	2-969
Table 2.3-115— {SSES 33' (10-m) Annual Stability Persistence Summary for Year 2001}	2-970
Table 2.3-116— {SSES 33' (10-m) Annual Stability Persistence Summary for Year 2002}	2-972
Table 2.3-117— {SSES 33' (10-m) Annual Stability Persistence Summary for Year 2003}	2-974

Table 2.3-118— {SSES 33' (10-m) Annual Stability Persistence Summary for Year 2004}	2-976
Table 2.3-119— {SSES 33' (10-m) Annual Stability Persistence Summary for Year 2005}	2-978
Table 2.3-120— {SSES 33' (10-m) Annual Stability Persistence Summary for Year 2006}	2-981
Table 2.3-121— {SSES 33' (10-m) Annual Stability Persistence Summary for Years 2001-2006}	2-983
Table 2.3-122— {SSES 197' (60-m) Annual Stability Persistence Summary for Year 2001}	2-984
Table 2.3-123— {SSES 197' (60-m) Annual Stability Persistence Summary for Year 2002}	2-986
Table 2.3-124— {SSES 197' (60-m) Annual Stability Persistence Summary for Year 2003}	2-988
Table 2.3-125— {SSES 197' (60-m) Annual Stability Persistence Summary for Year 2004}	2-990
Table 2.3-126— {SSES 197' (60-m) Annual Stability Persistence Summary for Year 2005}	2-992
Table 2.3-127— {SSES 197' (60-m) Annual Stability Persistence Summary for Year 2006}	2-995
Table 2.3-128— {SSES 197' (60-m) Annual Stability Persistence Summary for Years 2001-2006}	2-998
Table 2.3-129— {SSES Monthly Atmospheric Stability Summary (2001-2006)}	2-999
Table 2.3-130— {Monthly and Annual Average Mixing Height Values (m)}	2-1000
Table 2.3-131— {Monthly and Annual Average Mixing Height Values (ft)}	2-1001
Table 2.3-132— {Temperature Inversion Frequency and Persistence at SSES, Year 2001}	2-1002
Table 2.3-133— {Temperature Inversion Frequency and Persistence at SSES, Year 2002}	2-1003
Table 2.3-134— {Temperature Inversion Frequency and Persistence at SSES, Year 2003}	2-1004
Table 2.3-135— {Temperature Inversion Frequency and Persistence at SSES, Year 2004}	2-1005
Table 2.3-136— {Temperature Inversion Frequency and Persistence at SSES, Year 2005}	2-1006
Table 2.3-137— {Temperature Inversion Frequency and Persistence at SSES, Year 2006}	2-1007
Table 2.3-138— {National Ambient Air Quality Standards}	2-1008
Table 2.3-139— {Primary Meteorological Tower Instrument Types, Specifications and Accuracies for Pre-Application and Pre-Operational Programs}	2-1009
Table 2.3-140— {Distances from BBNPP Met Tower to Nearby Obstructions to Air Flow}	2-1010
Table 2.3-141— {AEOLUS3 and ARCON96 Input }	2-1011
Table 2.3-142— {EAB/LPZ Accident χ/Q Values for Ground Level Release Using SSES 2001-2007 Meteorological Data}	2-1013
Table 2.3-143— {Control Room/TSC χ/Q Values for Stack Release Using SSES 2001-2007 Meteorological Data}	2-1014
Table 2.3-144— {Control Room/TSC χ/Q Values for Silencer Release Using SSES 2001-2007 Meteorological Data}	2-1015
Table 2.3-145— {Control Room/TSC χ/Q Values for Canopy Release Using SSES 2001-2007 Meteorological Data}	2-1016
Table 2.3-146— {Control Room/TSC χ/Q Values for Equipment Hatch Release Using SSES 2001-2007 Meteorological Data}	2-1017
Table 2.3-147— {Control Room/TSC χ/Q Values for Depressurization Shaft Release Using SSES 2001-2007 Meteorological Data}	2-1018
Table 2.3-148— {AEOLUS3 Input}	2-1019
Table 2.3-149— {Normal Effluent Annual Average, Undecayed, Undepleted χ/Q Values for Mixed Mode Release Using 242,458 cfm Flow Rate for Grid Receptors}	2-1027
Table 2.3-150— {Normal Effluent Annual Average, Undecayed, Undepleted χ/Q Values for Mixed Mode Release Using 242,458 cfm Flow Rate for Grid Receptors}	2-1028
Table 2.3-151— {Normal Effluent Annual Average, Undecayed, Undepleted χ/Q Values for Mixed Mode Release Using 242,458 cfm Flow Rate for Site Boundary Receptors}	2-1029
Table 2.3-152— {Normal Effluent Annual Average, Undecayed, Undepleted χ/Q Values (sec/m^3) for Mixed Mode Release With Building Wake for Nearest Residents}	2-1030
Table 2.3-153— {Normal Effluent Annual Average, Undecayed, Undepleted χ/Q Values (sec/m^3) for Mixed Mode Release With Building Wake for Nearest Gardens}	2-1031
Table 2.3-154— {Normal Effluent Annual Average, Undecayed, Undepleted χ/Q Values (sec/m^3) for Mixed Mode Release With Building Wake for Nearest Milk Animals}	2-1032

Table 2.3-155— {Normal Effluent Annual Average, Undecayed, Undepleted χ/Q Values (sec/m^3) for Mixed Mode Release With Building Wake for Nearest Meat Animals}	2-1033
Table 2.3-156— {Normal Effluent Annual Average, Decayed, Depleted χ/Q Values (sec/m^3) for Mixed Mode Release With Building Wake for Grid Receptors}	2-1034
Table 2.3-157— {Normal Effluent Annual Average, Decayed, Depleted χ/Q Values for Mixed Mode Release Using 242,458 cfm Flow Rate for Site Boundary Receptors}	2-1037
Table 2.3-158— {Normal Effluent Annual Average, Decayed, Depleted χ/Q Values (sec/m^3) for Mixed Mode Release With Building Wake for Nearest Residents}	2-1038
Table 2.3-159— {Normal Effluent Annual Average, Decayed, Depleted χ/Q Values (sec/m^3) for Mixed Mode Release With Building Wake for Nearest Gardens}	2-1039
Table 2.3-160— {Normal Effluent Annual Average, Decayed, Depleted χ/Q Values (sec/m^3) for Mixed Mode Release With Building Wake for Nearest Milk Animals}	2-1040
Table 2.3-161— {Normal Effluent Annual Average, Decayed, Depleted χ/Q Values (sec/m^3) for Mixed Mode Release With Building Wake for Nearest Meat Animals}	2-1041
Table 2.3-162— {Normal Effluent Annual Average, Undecayed, Undepleted Gamma χ/Q Values for Mixed Mode Release Using 242,458 cfm Flow Rate for Grid Receptors} ...	2-1042
Table 2.3-163— {Normal Effluent Annual Average, Undecayed, Undepleted Gamma χ/Q Values for Mixed Mode Release Using 242,458 cfm Flow Rate for Site Boundary Receptors}	2-1044
Table 2.3-164— {Normal Effluent Annual Average, Undecayed, Undepleted Gamma χ/Q Values (sec/m^3) for Mixed Mode Release With Building Wake for Nearest Residents}	2-1045
Table 2.3-165— {Normal Effluent Annual Average, Undecayed, Undepleted Gamma χ/Q Values (sec/m^3) for Mixed Mode Release With Building Wake for Nearest Gardens}	2-1046
Table 2.3-166— {Normal Effluent Annual Average, Undecayed, Undepleted Gamma χ/Q Values (sec/m^3) for Mixed Mode Release With Building Wake for Nearest Milk Animals}	2-1047
Table 2.3-167— {Normal Effluent Annual Average, Undecayed, Undepleted Gamma χ/Q Values (sec/m^3) for Mixed Mode Release With Building Wake for Nearest Meat Animals}	2-1048
Table 2.3-168— {Normal Effluent Annual Average D/Q Values for Mixed Mode Release Using 242,458 cfm Flow Rate for Grid Receptors}	2-1049
Table 2.3-169— {Normal Effluent Annual Average D/Q Values ($1/\text{m}^2$) for Mixed Mode Release Using 242,458 cfm Flow Rate for Site Boundary Receptors}	2-1051
Table 2.3-170— {Normal Effluent Annual Average D/Q Values ($1/\text{m}^2$) for Mixed Mode Release With Building Wake for Nearest Residents}	2-1052
Table 2.3-171— {Normal Effluent Annual Average D/Q Values ($1/\text{m}^2$) for Mixed Mode Release With Building Wake for Nearest Gardens}	2-1053
Table 2.3-172— {Normal Effluent Annual Average D/Q Values ($1/\text{m}^2$) for Mixed Mode Release With Building Wake for Nearest Milk Animals}	2-1054
Table 2.3-173— {Normal Effluent Annual Average, D/Q Values ($1/\text{m}^2$) for Mixed Mode Release With Building Wake for Nearest Meat Animals}	2-1055
Table 2.3-174— 100-Year Return Period and Historical Maximum Snowfall Events	2-1056
Table 2.3-175— Highest Daily Snow Depth	2-1057
Table 2.3-176— {BBNPP Meteorological Tower Instrument Types, Specifications and Accuracies for Operational Program}	2-1058
Table 2.3-177— {Existing Man-Made Potential Obstructions to Air Flow for the SSES Meteorological Tower}	2-1059
Table 2.3-178— {Potential Man-Made Obstructions to Air Flow for the BBNPP Meteorological Tower}	2-1060
Table 2.4-1— {Approximate Length and Average Gradient of Creeks Located near BBNPP}	2-1229
Table 2.4-2— {Annual Peak Streamflow for Wilkes-Barre, PA USGS Station No. 01536500, (1787 through 2006)}	2-1230

Table 2.4-3— {Monthly Streamflow for Wilkes-Barre, PA USGS Station No. 01536500, (1899 through 2006)}	2-1233
Table 2.4-4— {Mean Daily Streamflow for Wilkes-Barre, PA USGS Station No. 01536500, (1899 through 2006)}	2-1237
Table 2.4-5— {Maximum Daily Streamflow for Wilkes-Barre, PA USGS Station No. 01536500, (1899 through 2006)}	2-1238
Table 2.4-6— {Minimum Daily Streamflow for Wilkes-Barre, PA USGS Station No. 01536500, (1899 through 2006)}	2-1239
Table 2.4-7— {Annual Peak Streamflow for Danville, PA USGS Station No. 01540500, (1865 through 2006)}	2-1240
Table 2.4-8— {Monthly Streamflow for the Danville, PA USGS Station No. 01540500, (1905 through 2006)}	2-1243
Table 2.4-9— {Mean Daily Streamflow for Danville, PA USGS Station No. 01540500, (1905 through 2006)}	2-1247
Table 2.4-10— {Maximum Daily Streamflow for Danville, PA USGS Station No. 01540500, (1905 through 2006)}	2-1248
Table 2.4-11— {Minimum Daily Streamflow for Danville, PA USGS Station No. 01540500, (1905 through 2006)}	2-1249
Table 2.4-12— {Susquehanna River Basin Upstream Dam Information}	2-1250
Table 2.4-13— {Surface Water Users in Luzerne County}	2-1258
Table 2.4-14— {SSES Units 1 and 2 Monthly Consumptive Water Use (Million Gallons per Month)} ...	2-1260
Table 2.4-15— {Major Public Water Suppliers within Luzerne and Columbia Counties}	2-1261
Table 2.4-16— {SSES Units 1 and 2 Cooling Tower Blowdown Discharge Rate Permit Nol PA0047325}	2-1262
Table 2.4-17— {Water Pollution Control Facilities in Luzerne County}	2-1263
Table 2.4-18— {1-Hour 1 mi ² Probable Maximum Precipitation (PMP) Depths}	2-1265
Table 2.4-19— {72-Hour 10 mi ² Probable Maximum Precipitation (PMP) Depths}	2-1266
Table 2.4-20— {Sub-Basin Drainage Areas for BBNPP (Site Drainage)}	2-1267
Table 2.4-21— {HEC-HMS Sub-Basin Site PMP Peak Discharges for BBNPP (Site Drainage)}	2-1268
Table 2.4-22— {Safety-Related Facility Entrance Elevation Summary}	2-1269
Table 2.4-23— {Walker Run Probable Maximum Precipitation Depths}	2-1270
Table 2.4-24— {Walker Run PMP Peak Flow Rates}	2-1271
Table 2.4-25— {Walker Run PMF Water Surface Elevations}	2-1272
Table 2.4-26— {Historical Tsunamis and Maximum Generated Wave Heights}	2-1274
Table 2.4-27— {Estimated Average Monthly Ice Thickness, Susquehanna River 2001-2007}	2-1275
Table 2.4-28— {Estimated Average Monthly Ice Thickness, ESW Emergency Makeup Retention Pond 2001-2007}	2-1276
Table 2.4-29— {10 mi ² (25.9 km ²)Probable Maximum Precipitation Depths at the ESWEMS}	2-1277
Table 2.4-30— {Data Input and Results for Wind Setup Calculations}	2-1278
Table 2.4-31— {Wave Runup Results}	2-1279
Table 2.4-32— {Highest Wind Speeds Using Fisher-Tippet Type I (Frechet) Distribution}	2-1280
Table 2.4-33— {Summary of Information of the Stations and Range of Data Used}	2-1281
Table 2.4-34— {Annual Minimum Water Levels at Danville, PA Station}	2-1282
Table 2.4-35— {Annual Minimum Water Levels at Wilkes-Barre PA Station}	2-1285
Table 2.4-36— {Annual Low Flow Statistics for Danville and Wilkes-Barre Stations}	2-1288
Table 2.4-37— {Estimated Recurrence Interval for the Lowest Recorded Flow, Wilkes-Barre and Danville Stations}	2-1289
Table 2.4-38— {Physical Characteristics of Groundwater Wells in the North Branch Susquehanna River Basin, Pennsylvania}	2-1290
Table 2.4-39— {Yields and Specific Capacities of Wells in the North Branch Susquehanna River Basin, Pennsylvania}	2-1291

Table 2.4-40— {Specific Capacities of Wells in the Berwick-Bloomsburg-Danville Area, Pennsylvania}	2-1292
Table 2.4-41— {Effect of Lithology on Well Yields, Berwick-Bloomsburg - Danville Area, Pennsylvania}	2-1293
Table 2.4-42— {Computed Water Budget Components for Selected Drainage Basins in the North Branch Susquehanna River Basin, Pennsylvania}	2-1294
Table 2.4-43— {BBNPP Monitoring Wells and Construction Details}	2-1295
Table 2.4-44— {Monthly Groundwater Elevation Measurements, BBNPP}	2-1297
Table 2.4-45— {Monthly Surface Water Elevation Measurements, BBNPP}	2-1302
Table 2.4-46— {Water Use in the Upper Susquehanna River Basin, Pennsylvania, in 1970}	2-1304
Table 2.4-47— {Groundwater Wells Located Within a 5-Mile (8 km) Radius of BBNPP}	2-1305
Table 2.4-48— {Groundwater Withdrawals Located Within a 25-Mile (40-km) Radius of BBNPP}	2-1325
Table 2.4-49— {Groundwater Withdrawals Located Within a 5-Mile (8-km) Radius of BBNPP}	2-1334
Table 2.4-50— {Drinking Water Wells Used for Public Water Supplies, Luzerne and Columbia Counties}	2-1335
Table 2.4-51— {Horizontal Hydraulic Gradients}	2-1353
Table 2.4-52— {Vertical Hydraulic Gradients and Flow Directions}	2-1354
Table 2.4-53— {Hydraulic Conductivity Values Based on Slug Tests}	2-1356
Table 2.4-54— {Hydraulic Properties Based on Pumping Tests}	2-1357
Table 2.4-55— {Hydraulic Conductivity Values of Bedrock (Mahantango Shale) Based on Packer Tests}	2-1358
Table 2.4-56— {Summary of Hydraulic Property Testing at the SSES}	2-1360
Table 2.4-57— {Reactor Coolant Storage Tank Radionuclide Inventory}	2-1362
Table 2.4-58— {Transport Analysis Considering Advection and Radioactive Decay - Equation Inputs}	2-1363
Table 2.4-59— {Transport Analysis Considering Advection and Radioactive Decay - Results}	2-1366
Table 2.4-60— {BBNPP Site-Specific Radionuclide Adsorption (K_d) Values}	2-1368
Table 2.4-61— {Distribution Coefficients and Retardation Factors Used in Advection-Decay-Retardation Analysis}	2-1369
Table 2.4-62— {Transport Analysis Considering Advection, Radioactive Decay, and Retardation}	2-1370
Table 2.4-63— {Transport Analysis Considering Advection, Radioactive Decay, Retardation, and Dilution}	2-1371
Table 2.4-64— {Transport Analysis Considering Advection, Radioactive Decay, Retardation, and Dilution - continued}	2-1372
Table 2.4-65— {Transport Analysis Considering Advection, Radioactive Decay, Retardation, and Dilution - continued}	2-1373
Table 2.4-66— {Compliance with 10 CFR Part 20, Appendix B, Table 2}	2-1374
Table 2.5-1— {Updated Earthquake catalog (1534-April 2010) Including events with $m_b \geq 3.0$ }	2-1725
Table 2.5-2— {Conversion Between Body-Wave (m_b) and Moment (M) Magnitude}	2-1800
Table 2.5-3— {Summary of Bechtel Group Seismic Sources}	2-1801
Table 2.5-4— {Summary of Dames & Moore Seismic Sources}	2-1803
Table 2.5-5— {Summary of Law Engineering Seismic Sources}	2-1804
Table 2.5-6— {Summary of Rondout Associates Seismic Sources}	2-1805
Table 2.5-7— {Summary of Weston Geophysical Seismic Sources}	2-1806
Table 2.5-8— {Summary of Woodward-Clyde Consultants Seismic Sources}	2-1807
Table 2.5-9— {Alternative New Madrid Fault Locations}	2-1809
Table 2.5-10— {Earthquake Frequencies for Repeating New Madrid Earthquake Sequences}	2-1811
Table 2.5-11— {Controlling Earthquakes for BBNPP}	2-1812
Table 2.5-12— {Recommended Horizontal and Vertical SSE Amplitudes and common V/H Ratio}	2-1813
Table 2.5-13— {Amplification Factors for 10^{-4} and 10^{-5} Input Motions and HF and LF Rock Spectra} ...	2-1814
Table 2.5-14— {Uniform Hazard Response Spectra (Hard Rock Conditions)}	2-1816

Table 2.5-15— {Earthquake Frequencies for Repeating New Madrid Earthquake Sequences}	2-1817
Table 2.5-16— {USGS 2008 Seismicity Smoothing Models}	2-1818
Table 2.5-17— {Seed Time Histories Selected for Controlling Deaggregation Earthquakes}	2-1819
Table 2.5-18— Comparison of Post-EPRI NP-6395-D 1989 Magnitude Estimates for the 1886 Charleston Earthquake	2-1823
Table 2.5-19— {Mean and Fractile Rock Hazard Curves for PGA}	2-1824
Table 2.5-20— {Mean and Fractile Rock Hazard Curves for 25 Hz}	2-1825
Table 2.5-21— {Mean and Fractile Rock Hazard Curves for 10 Hz}	2-1826
Table 2.5-22— {Mean and Fractile Rock Hazard Curves for 5 Hz}	2-1827
Table 2.5-23— {Mean and Fractile Rock Hazard Curves for 2.5 Hz}	2-1828
Table 2.5-24— {Mean and Fractile Rock Hazard Curves for 1 Hz}	2-1829
Table 2.5-25— {Mean and Fractile Rock Hazard Curves for 0.5 Hz}	2-1830
Table 2.5-26— {Summary Of Thicknesses And Termination Elevations For Various Strata}	2-1831
Table 2.5-27— {Summary Of Geotechnical Field Tests}	2-1833
Table 2.5-28— {Summary of Site Borings}	2-1834
Table 2.5-29— {Summary of Hammer-Rod Energy Measurements}	2-1836
Table 2.5-30— {Summary Of Field-Measured Standard Penetration Test (Spt) N-Values}	2-1837
Table 2.5-31— {Summary Of Adjusted Spt N-Values Based On Energy Measurements}	2-1838
Table 2.5-32— {Summary Of Borehole Pressuremeter Test Results}	2-1839
Table 2.5-33— {Summary Of Laboratory Tests}	2-1841
Table 2.5-34— {Summary Of Moisture Content}	2-1842
Table 2.5-35— {Summary Of Unit Weight Tests Special Care Rock Samples And Undisturbed Samples}	2-1844
Table 2.5-36— {Summary Of Specific Gravity Tests Special Care Rock Samples And Undisturbed Samples}	2-1846
Table 2.5-37— {Chemical Test Results Of Soil And Rock Samples}	2-1847
Table 2.5-38— {Summary Of Unconfined Compressive Strength Tests Special Care Rock Samples}	2-1849
Table 2.5-39— {Hydraulic Conductivity Test Results}	2-1851
Table 2.5-40— {Dynamic Testing Program Samples}	2-1853
Table 2.5-41— {Resonant Column Low Strain Properties}	2-1854
Table 2.5-42— {"Free-Free" Test Results}	2-1856
Table 2.5-43— {Category 1 Structural Fill and Backfill Properties}	2-1858
Table 2.5-44— {Category 1 Structural Fill and Backfill Properties}	2-1859
Table 2.5-45— {Recommended Values Of Index Properties}	2-1860
Table 2.5-46— {Rock Mass Rating For Mahantango Formation}	2-1862
Table 2.5-47— {Recommended Values For Strength Properties}	2-1864
Table 2.5-48— {Recommended Values For Hydraulic Conductivity}	2-1866
Table 2.5-49— {Recommended Values For Elastic Modulus}	2-1868
Table 2.5-50— {Recommended Values For Static Elastic Properties}	2-1870
Table 2.5-51— {Recommended Values For Low Strain Dynamic Elastic Properties At Center Of Nuclear Island Footprint}	2-1872
Table 2.5-52— {Peak Ground Acceleration from FIRS Study}	2-1874
Table 2.5-53— {Soil Conditions For The U.S. EPR Standard Plant}	2-1876
Table 2.5-54— {Soil Conditions For The U.S. EPR Standard Plant}	2-1878
Table 2.5-55— {Foundation Elevations}	2-1880
Table 2.5-56— {Earth Pressure Coefficients}	2-1882
Table 2.5-57— {Bearing Capacity (Failure Controlled)}	2-1883
Table 2.5-58— {Elastic Settlement Analysis By Simplified Approximations}	2-1885
Table 2.5-59— {Detailed Elastic Settlement Analysis}	2-1887
Table 2.5-60— {Factor Of Safety Against Sliding}	2-1889
Table 2.5-61— {Smooth Uniform Hazard Response Spectra}	2-1890

Table 2.5-62— {Relation of the Tectonic History of the Site Region to the Associated Tectonic Features}	2-1891
Table 2.5-63— {2002-2007 Events In 500 Mile (805 km) Radius}	2-1895
Table 2.5-64— {Uniform Hazard Response Spectra Comparison of 500-mi Sensitivity Analysis}	2-1897
Table 2.5-65— {Uniform Hazard Response Spectra Comparison for the 625 mile (1006 km) Charlevoix Sensitivity Analysis Case 1}	2-1898
Table 2.5-66— {Maximum Magnitude Distribution used for the for the 625 mile (1006 km) Charlevoix Sensitivity Analyses}	2-1899
Table 2.5-67— {Uniform Hazard Response Spectra Comparison for the 625 mile (1006 km) Charlevoix Sensitivity Analysis Case 2}	2-1900
Table 2.5-68— {Maximum Magnitude Distribution for the RSZ EST Zones}	2-1901
Table 3.2-1— {Classification Summary for Site-Specific SSCs}	3-6
Table 3.7-1— {Best Estimate Soil Modeling}	3-61
Table 3.7-2— {Lower Bound Soil Modeling}	3-62
Table 3.7-3— {Upper Bound Soil Modeling}	3-63
Table 3.7-4— {Comparison of Worst Case Maximum Accelerations in EPGB}	3-64
Table 3.7-5— {Comparison of Worst Case Maximum Accelerations in ESWB}	3-65
Table 3.7-6— {BBNPP Worst Case Maximum Accelerations - EPGB}	3-66
Table 3.7-7— {Comparison of Nodal Accelerations for Selected Critical Locations in the ESWEMS Pumphouse}	3-67
Table 3.7-8— {Seismic Structural Interaction Criteria for BBNPP Site-Specific Building Structures}	3-68
Table 3.8-1— {ESWEMS Pumphouse Basemat & Pump Well Foundation Summary Table On the Building Stability}	3-244
Table 3.8-2— {ESWEMS Retention Pond - Summary of the Slope Stability}	3-245
Table 3.9-1— {Site-Specific Inservice Pump Testing Program Requirements}	3-260
Table 3.9-2— {Site-Specific Inservice Valve Testing Program Requirements}	3-261
Table 3.10-1— {Site-Specific Seismic and Dynamic Qualifications of Mechanical and Electrical Equipment}	3-267
Table 3.11-1— {Site-Specific Environmentally Qualified Electrical/I&C Equipment}	3-283
Table 3E-1— {Response Spectrum Analysis - Design Load Combinations for ESWEMS Pumphouse Structure}	3-10
Table 3E-2— {Required Factor Of Safety for ESWEMS Pumphouse Stability}	3-11
Table 3E-3— {ESWEMS Pumphouse Base Mat Resultant Membrane Forces and Moments}	3-12
Table 3E-4— {ESWEMS Pump Well Foundation Group Resultant Membrane Forces and Moments}	3-13
Table 3E-5— {ESWEMS Shear Keys Reaction Forces and Moments}	3-14
Table 3E-6— {ESWEMS Pumphouse Walls Resultant Membrane Forces & Moments}	3-15
Table 3E-7— {Required Factor of Safety for the ESWEMS Retention Pond Slope Stability}	3-16
Table 6.6-1— {Inservice Inspection Requirements for Class 3 Site-Specific ESWEMS}	6-15
Table 8.1-1— {Division 1 Emergency Diesel Generator Nominal Loads}	8-4
Table 8.1-2— {Division 2 Emergency Diesel Generator Nominal Loads}	8-5
Table 8.1-3— {Division 3 Emergency Diesel Generator Nominal Loads}	8-6
Table 8.1-4— {Division 4 Emergency Diesel Generator Nominal Loads}	8-7
Table 8.2-1— {PPL EU Transmission System Circuits Connected to the BBNPP Site}	8-29
Table 8.3-1— {BBNPP Onsite AC Power System Component Data Nominal Values}	8-39
Table 8.3-2— {BBNPP EPSS Switchgear, Load Center, and Motor Control Center Numbering and Nominal Voltage}	8-40
Table 8.3-3— {BBNPP Normal Power Supply System Switchgear Numbering and Nominal Voltage }	8-41
Table 9.2-1— {ESWEMS Alarms}	9-27
Table 9.2-2— Table 9.2-2 RWSS Flowrates	9-28
Table 9.5-1— {Fire Protection Program Compliance with Regulatory Guide 1.189}	9-71

Table 9B-1— Predefined Severities for Common Plant Ignition Source Fires	9-26
Table 9B-2— Table 9B-2 {Fire Area Parameters}	9-27
Table 10.4-1— {Circulating Water System Cooling Tower Design Specifications}	10-20
Table 11.2-1— {Input Parameters for PWR GALE Computer Code}	11-11
Table 11.2-2— {GALE Liquid Release Rates (Ci/yr)}	11-15
Table 11.2-3— {GALE Gaseous Release Rates (Ci/yr)}	11-17
Table 11.2-4— {Carbon - 14 Release Data from PWRs from GALE}	11-18
Table 11.2-5— {Carbon-14 Gaseous Release Chemical Form Reported at Two U.S. PWRs}	11-19
Table 11.2-6— {GALE Liquid Release for U.S. EPR at Bell Bend (Ci/yr)}	11-20
Table 11.2-7— {GALE Gaseous Release for U.S. EPR at Bell Bend (Ci/yr)}	11-22
Table 11.2-8— {Obtainable Dose Benefits for Liquid Waste System Augment}	11-23
Table 11.2-9— {Liquid Waste System Augment Total-Body Dose Cost-Benefit Analysis}	11-24
Table 11.2-10— {Liquid Waste System Augment Thyroid Dose Cost-Benefit Analysis}	11-25
Table 11.3-1— {Obtainable Dose Benefits for Gaseous Waste System Augment}	11-30
Table 11.3-2— {Gaseous Waste System Augment Total Body / Thyroid Dose Cost-Benefit Analysis}	11-31
Table 12.3-1— {Radiation Sources at SSES Units 1 and 2}	12-20
Table 12.3-2— {Historical All-Source Compliance for Offsite General Public}	12-22
Table 12.3-3— {FTE for BBNPP Construction Workers}	12-23
Table 12.3-4— {Gaseous Dose Rate Type and Coefficients}	12-24
Table 12.3-5— {Historic Gaseous Releases For 2001 Through 2006}	12-25
Table 12.3-6— {Historical Liquid Releases for Input to LADTAPII}	12-26
Table 12.3-7— {Historical Dilutions for Input to LADTAPII}	12-27
Table 12.3-8— {Historical Shoreline Dose}	12-28
Table 12.3-9— {Historic and Projected Loading of SSES ISFSI}	12-29
Table 12.3-10— {Condensate Storage Tank Source Terms}	12-30
Table 12.3-11— {LLRWHF Source Term}	12-32
Table 12.3-12— {SEALAND Container Source Term}	12-33
Table 12.3-13— {Occupancy by Construction Zone}	12-34
Table 12.3-14— {Collective Dose to BBNPP Construction Workers}	12-35
Table 13.1-1— {BBNPP Position/Site Specific Position Cross Reference}	13-21
Table 13.1-2— {Minimum Shift Crew Composition}	13-24
Table 13.4-1— {Operational Programs Required by NRC Regulations and Program Implementation}	13-31
Table 14.3-1— {Site Specific Analyses (Safety Significant Features)}	14-37
Table 14.3-2— {Site Specific SSC ITAAC Screening Summary}	14-38
Table 14.3-3— {Interface Requirements Screening Summary}	14-40
Table 15.0-1— {BBNPP Atmospheric Dispersion Factors}	15-7
Table 15.0-2— {BBNPP Radiological Consequences of Design Basis Accidents (rem TEDE)}	15-8
Table 15.0-3— {BBNPP Offsite Receptor Variables}	15-9
Table 15.0-4— {Design Basis Core Radionuclide Inventory Used in BBNPP Fuel Handling and Rod Ejection Accidents}	15-10
Table 15.0-5— {BBNPP Design Input for NSS and CVCS Break Locations and Flows}	15-11
Table 15.0-6— {BBNPP Design Input for Locked Rotor Accident}	15-12
Table 15.0-7— {BBNPP Fuel Handling Accident Timeline}	15-13
Table 15.0-8— {BBNPP Design Input for Fuel Handling Accident}	15-14
Table 17.4-1— {Site Specific Systems Included Within RAP}	17-17
Table 19.1-1— {Summary of External Events Evaluated for BBNPP}	19-23

List of Figures

Figure 1.1-1— {Site Area Map and Exclusion Area Boundary}	1-13
Figure 1.1-2— {Combined Exclusion Area Boundaries}	1-14
Figure 1.1-3— {10 mi (16 km) Surrounding Area}	1-15
Figure 1.1-4— {50 mi (80 km) Surrounding Area}	1-16
Figure 1.2-1— {BBNPP Nuclear and Turbine Building Island Layout}	1-20
Figure 2.1-1— {BBNPP Site Area Map}	2-37
Figure 2.1-2— {BBNPP Site 50 Mile (80 km) Radius}	2-38
Figure 2.1-3— {BBNPP Site 10 Mile (16 km) Radius}	2-39
Figure 2.1-4— {BBNPP Exclusion Area Boundary}	2-40
Figure 2.1-5— {BBNPP Principle Plant Structures}	2-41
Figure 2.1-6— {BBNPP 10 Mile (16 km) Radius Map}	2-42
Figure 2.1-7— {BBNPP 10 Mile (16 km) 2000 Population Distribution}	2-43
Figure 2.1-8— {BBNPP 10 Mile (16 km) 2010 Population Distribution}	2-44
Figure 2.1-9— {BBNPP 10 Mile (16 km) 2020 Population Distribution}	2-45
Figure 2.1-10— {BBNPP 10 Mile (16 km) 2030 Population Distribution}	2-46
Figure 2.1-11— {BBNPP 10 Mile (16 km) 2040 Population Distribution}	2-47
Figure 2.1-12— {BBNPP 10 Mile (16 km) 2050 Population Distribution}	2-48
Figure 2.1-13— {BBNPP 10 Mile (16 km) 2060 Population Distribution}	2-49
Figure 2.1-14— {BBNPP 10 mi (16 km) 2070 Population Distribution}	2-50
Figure 2.1-15— {BBNPP 10 mi (16 km) 2080 Population Distribution}	2-51
Figure 2.1-16— {BBNPP 10 Mile (16 km) 2018 Population Distribution}	2-52
Figure 2.1-17— {BBNPP 10 Mile (16 km) 2058 Population Distribution}	2-53
Figure 2.1-18— {BBNPP 50 Mile (80 km) Radius Map}	2-54
Figure 2.1-19— {BBNPP 50 Mile (80 km) 2000 Population Distribution}	2-55
Figure 2.1-20— {BBNPP 50 Mile (80 km) 2010 Population Distribution}	2-56
Figure 2.1-21— {BBNPP 50 Mile (80 km) 2020 Population Distribution}	2-57
Figure 2.1-22— {BBNPP 50 Mile (80 km) 2030 Population Distribution}	2-58
Figure 2.1-23— {BBNPP 50 Mile (80 km) 2040 Population Distribution}	2-59
Figure 2.1-24— {BBNPP 50 Mile (80 km) 2050 Population Distribution}	2-60
Figure 2.1-25— {BBNPP 50 Mile (80 km) 2060 Population Distribution}	2-61
Figure 2.1-26— {BBNPP 50 mi (80 km) 2070 Population Distribution}	2-62
Figure 2.1-27— {BBNPP 50 mi (80 km) 2080 Population Distribution}	2-63
Figure 2.1-28— {BBNPP Low Population Zone}	2-64
Figure 2.1-29— {BBNPP 50 Mile (80 km) 2018 Population Distribution}	2-65
Figure 2.1-30— {BBNPP 50 Mile (80 km) 2058 Population Distribution}	2-66
Figure 2.1-31— {BBNPP Vicinity Population Compared to NRC Siting Criteria}	2-67
Figure 2.2-1— {Site Vicinity Map}	2-111
Figure 2.2-2— {Airports and Airway Routes within 10 mi (16 km) and Significant Facilities Between 5 mi and 10 mi (8 to 16 km) of the BBNPP Site}	2-112
Figure 2.3-1— {Annual Average Number of Tornadoes, 1950-1995}	2-1062
Figure 2.3-2— {Annual Average Number of Strong-Violent (F2-F5) Tornadoes, 1950-1995}	2-1063
Figure 2.3-3— {Annual Thunderstorm Frequency}	2-1064
Figure 2.3-4— {Five-Year Lightning Flash Density Map}	2-1065
Figure 2.3-5— {Plotted PMWP Values for BBNPP}	2-1066
Figure 2.3-6— {BBNPP 33' (10-m) Annual Wind Rose}	2-1067
Figure 2.3-7— {BBNPP 197' (60-m) Annual Wind Rose}	2-1068
Figure 2.3-8— {BBNPP 33' (10-m) Seasonal Wind Roses}	2-1069
Figure 2.3-9— {BBNPP 197' (60-m) Seasonal Wind Roses}	2-1070
Figure 2.3-10— {BBNPP 33' (10-m) January Wind Rose}	2-1071

Figure 2.3-11— {BBNPP 33' (10-m) February Wind Rose}	2-1072
Figure 2.3-12— {BBNPP 33' (10-m) March Wind Rose}	2-1073
Figure 2.3-13— {BBNPP 33' (10-m) April Wind Rose}	2-1074
Figure 2.3-14— {BBNPP 33' (10-m) May Wind Rose}	2-1075
Figure 2.3-15— {BBNPP 33' (10-m) June Wind Rose}	2-1076
Figure 2.3-16— {BBNPP 33' (10-m) July Wind Rose}	2-1077
Figure 2.3-17— {BBNPP 33' (10-m) August Wind Rose}	2-1078
Figure 2.3-18— {BBNPP 33' (10-m) September Wind Rose}	2-1079
Figure 2.3-19— {BBNPP 33' (10-m) October Wind Rose}	2-1080
Figure 2.3-20— {BBNPP 33' (10-m) November Wind Rose}	2-1081
Figure 2.3-21— {BBNPP 33' (10-m) December Wind Rose}	2-1082
Figure 2.3-22— {BBNPP 197' (60-m) January Wind Rose}	2-1083
Figure 2.3-23— {BBNPP 197' (60-m) February Wind Rose}	2-1084
Figure 2.3-24— {BBNPP 197' (60-m) March Wind Rose}	2-1085
Figure 2.3-25— {BBNPP 197' (60-m) April Wind Rose}	2-1086
Figure 2.3-26— {BBNPP 197' (60-m) May Wind Rose}	2-1087
Figure 2.3-27— {BBNPP 197' (60-m) June Wind Rose}	2-1088
Figure 2.3-28— {BBNPP 197' (60-m) July Wind Rose}	2-1089
Figure 2.3-29— {BBNPP 197' (60-m) August Wind Rose}	2-1090
Figure 2.3-30— {BBNPP 197' (60-m) September Wind Rose}	2-1091
Figure 2.3-31— {BBNPP 197' (60-m) October Wind Rose}	2-1092
Figure 2.3-32— {BBNPP 197' (60-m) November Wind Rose}	2-1093
Figure 2.3-33— {BBNPP 197' (60-m) December Wind Rose}	2-1094
Figure 2.3-34— {Wilkes-Barre/Scranton, Pennsylvania, Wind Rose}	2-1095
Figure 2.3-35— {Allentown, Pennsylvania, Wind Rose}	2-1096
Figure 2.3-36— {Williamsport, Pennsylvania, Wind Rose}	2-1097
Figure 2.3-37— {BBNPP 33' (10-m) Annual Precipitation Wind Rose}	2-1098
Figure 2.3-38— {BBNPP 197' (60-m) Annual Precipitation Wind Rose}	2-1099
Figure 2.3-39— {BBNPP 33' (10-m) January Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1100
Figure 2.3-40— {BBNPP 33' (10-m) February Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1101
Figure 2.3-41— {BBNPP 33' (10-m) March Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1102
Figure 2.3-42— {BBNPP 33' (10-m) April Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1103
Figure 2.3-43— {BBNPP 33' (10-m) May Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1104
Figure 2.3-44— {BBNPP 33' (10-m) June Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1105
Figure 2.3-45— {BBNPP 33' (10-m) July Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1106
Figure 2.3-46— {BBNPP 33' (10-m) August Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1107
Figure 2.3-47— {BBNPP 33' (10-m) September Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1108
Figure 2.3-48— {BBNPP 33' (10-m) October Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1109
Figure 2.3-49— {BBNPP 33' (10-m) November Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1110
Figure 2.3-50— {BBNPP 33' (10-m) December Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1111
Figure 2.3-51— {BBNPP 197' (60-m) January Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1112
Figure 2.3-52— {BBNPP 197' (60-m) February Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1113
Figure 2.3-53— {BBNPP 197' (60-m) March Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1114
Figure 2.3-54— {BBNPP 197' (60-m) April Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1115
Figure 2.3-55— {BBNPP 197' (60-m) May Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1116
Figure 2.3-56— {BBNPP 197' (60-m) June Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1117
Figure 2.3-57— {BBNPP 197' (60-m) July Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1118
Figure 2.3-58— {BBNPP 197' (60-m) August Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1119
Figure 2.3-59— {BBNPP 197' (60-m) September Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1120

Figure 2.3-60— {BBNPP 197' (60-m) October Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr} ...	2-1121
Figure 2.3-61— {BBNPP 197' (60-m) November Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1122
Figure 2.3-62— {BBNPP 197' (60-m) December Precipitation Wind Rose for Rate Class 0.1-0.2 in/hr}	2-1123
Figure 2.3-63— {Monthly Average Mixing Heights}	2-1124
Figure 2.3-64— {Topography Within 1-Mile of the BBNPP Site}	2-1125
Figure 2.3-65— {Topography Within 5-Miles of the BBNPP Site}	2-1126
Figure 2.3-66— {Topography Within 50-Miles of the BBNPP Site}	2-1127
Figure 2.3-67— {Maximum Elevation versus Distance Within 50 Miles of the BBNPP Site}	2-1128
Figure 2.4-1— {Susquehanna River Basin and Sub-basins}	2-1376
Figure 2.4-2— {Site Area Topographic Map 5 Mile (8 km) Radius}	2-1377
Figure 2.4-3— {Walker Run Watershed}	2-1378
Figure 2.4-4— {Site Drainage Flow Pattern}	2-1379
Figure 2.4-5— {Site Utilization Plant Layout}	2-1380
Figure 2.4-6— {Susquehanna River Profile}	2-1381
Figure 2.4-7— {USGS Stream Gauges within a 50 Mile (80 Km) Radius}	2-1382
Figure 2.4-8— {Mean, Maximum & Minimum Monthly Streamflows for Wilkes-Barre, PA USGS 01536500, (1900 through 2007)}	2-1383
Figure 2.4-9— {Mean, Maximum & Minimum Monthly Streamflows for Danville, PA USGS 01540500 (1905 through 2007)}	2-1384
Figure 2.4-10— {Susquehanna River Bathymetry near Intake & Blowdown Structures}	2-1385
Figure 2.4-11— {Flood Insurance Map Panel 1 of 4}	2-1386
Figure 2.4-12— {Flood Insurance Map Panel 2 of 4}	2-1387
Figure 2.4-13— {Flood Insurance Map Panel 3 of 4}	2-1388
Figure 2.4-14— {Flood Insurance Map Panel 4 of 4}	2-1389
Figure 2.4-15— {Dams within the Susquehanna River Basin}	2-1390
Figure 2.4-16— {Surface Water Withdrawal in Luzerne County}	2-1391
Figure 2.4-17— {Surface Water Withdrawal within 5-mile (8 km) Radius}	2-1392
Figure 2.4-18— {Water Pollution Control Facilities Locations within a 5-mile (8-km) Radius}	2-1393
Figure 2.4-19— {Water Pollution Control Facilities Locations within Luzerne County}	2-1394
Figure 2.4-20— {Peak Streamflow at Wilkes-Barre and Danville Gauging Stations}	2-1395
Figure 2.4-21— {Sub-basin Site Drainage Delineation}	2-1396
Figure 2.4-22— {HEC-HMS Hydrologic Diagram}	2-1397
Figure 2.4-23— {BBNPP Site Location}	2-1398
Figure 2.4-24— {HEC-HMS Model Setup of Walker Run Watershed}	2-1399
Figure 2.4-25— {Junction 1 Hydrograph}	2-1400
Figure 2.4-26— {Junction 2 Hydrograph}	2-1401
Figure 2.4-27— {Sub-Basin A1 Hydrograph}	2-1402
Figure 2.4-28— {Sub-Basin A2 Hydrograph}	2-1403
Figure 2.4-29— {Sub-Basin A3 Hydrograph}	2-1404
Figure 2.4-30— {HEC-RAS Cross Section Locations Near Power Block}	2-1405
Figure 2.4-31— {HEC-RAS Cross Section Locations}	2-1406
Figure 2.4-32— {Complete HEC-RAS Cross Section Locations}	2-1407
Figure 2.4-33— {Walker Run PMF Water Surface Profile}	2-1408
Figure 2.4-34— {Susquehanna River Basin and Sub-Basins}	2-1409
Figure 2.4-35— {Major and Minor Dams Upstream from BBNPP}	2-1410
Figure 2.4-36— {Digital Tectonic Activity Map of the Earth}	2-1411
Figure 2.4-37— {Pennsylvania Landslide Susceptibility}	2-1412
Figure 2.4-38— {Ice Jams within 50 Mile (80 km) Radius}	2-1413
Figure 2.4-39— {ESWEMS Schematic Layout}	2-1414

Figure 2.4-40— {Glacial Deposits of Pennsylvania, 25-mile (40 km) and 5-mile (8 km) Radii}	2-1415
Figure 2.4-41— {Mean Monthly Minimum Streamflows, 1905 to 2006}	2-1416
Figure 2.4-42— {Low Flow Frequency Distribution for Danville Station}	2-1417
Figure 2.4-43— {Low Flow Frequency Distribution for Wilkes-Barre Station}	2-1418
Figure 2.4-44— {Flow Discharge Curve for Danville Station}	2-1419
Figure 2.4-45— {Flow Discharge Curve for Wilkes-Barre Station}	2-1420
Figure 2.4-46— {SRBC Water Consumptive Use}	2-1421
Figure 2.4-47— {30-Day Moving Average for Danville Station}	2-1422
Figure 2.4-48— {30-Day Moving Average for Wilkes-Barre Station}	2-1423
Figure 2.4-49— {Geologic Map of the BBNPP Site and Vicinity}	2-1424
Figure 2.4-50— {Stratigraphy and Geologic Cross Section of Berwick Anticlinorium}	2-1425
Figure 2.4-51— {Surficial Deposits at BBNPP Site and Vicinity}	2-1426
Figure 2.4-52— {Legend for Figure 2.4-51}	2-1427
Figure 2.4-53— {Frequency Distribution of Nondomestic Well Yields Grouped According to Dominant Rock Type}	2-1428
Figure 2.4-54— {Frequency Distribution of Nondomestic Well Yields Grouped According to Topographic Setting}	2-1429
Figure 2.4-55— {Distribution of Water-Bearing Zones with Depth}	2-1430
Figure 2.4-56— {Average Annual Precipitation in the North Branch Susquehanna River Basin (1941-1970)}	2-1431
Figure 2.4-57— {Percent Frequency Distribution of Annual Precipitation in the Southern Part of the North Branch Susquehanna River Basin (1931-1980)}	2-1432
Figure 2.4-58— {Locations of Drainage Basins Where Long-Term Water Budget Analyses Have Been Performed}	2-1433
Figure 2.4-59— {Percent Frequency Distribution of Annual Runoff from Wapwallopen Creek, Pennsylvania (1920-1980)}	2-1434
Figure 2.4-60— {Hydrographs of Two USGS Monitoring Wells in Luzerne County Screened in Glacial Overburden}	2-1435
Figure 2.4-61— {Hydrographs of Two USGS Monitoring Wells in Luzerne County Screened in the Catskill Formation}	2-1436
Figure 2.4-62— {Locations of Groundwater Monitoring Wells}	2-1437
Figure 2.4-63— {Locations of BBNPP Surface Water Monitoring Stations}	2-1438
Figure 2.4-64— {Location of Hydrogeological Cross Sections}	2-1439
Figure 2.4-65— {Hydrogeological Cross Section A-A'}	2-1440
Figure 2.4-66— {Hydrogeological Cross Section B-B'}	2-1441
Figure 2.4-67— {Saturated Thickness Map of the Glacial Overburden Aquifer}	2-1442
Figure 2.4-68— {Topography of the Bedrock Surface}	2-1443
Figure 2.4-69— {Topography of the Bedrock Surface in the Power Block Area}	2-1444
Figure 2.4-70— {Sole Source Aquifers Located in USEPA Region 3}	2-1445
Figure 2.4-71— {Groundwater Use in the Susquehanna River Basin 1995}	2-1446
Figure 2.4-72— {Groundwater Well Locations within a 25-Mile (40 km) Radius (PaGWIS Data)}	2-1447
Figure 2.4-73— {Groundwater Well Locations within a 5 Mile (80 km) Radius (PaGWIS Data)}	2-1448
Figure 2.4-74— {Groundwater Withdrawal within a 25-Mile (40-km) Radius (PaGWIS Data)}	2-1449
Figure 2.4-75— {Groundwater Withdrawal within a 5-Mile (8-km) Radius (PaDEP Data)}	2-1450
Figure 2.4-76— {Groundwater Production Wells at SSES}	2-1451
Figure 2.4-77— {Potentially Stressed Areas and Water Challenged Areas in the Susquehanna River Basin}	2-1452
Figure 2.4-78— {Groundwater Elevations versus Time, Well Clusters MW301 and MW302}	2-1453
Figure 2.4-79— {Groundwater Elevations versus Time, Well Clusters MW303 and MW304}	2-1454
Figure 2.4-80— {Groundwater Elevations versus Time, Well Clusters MW305 and MW306}	2-1455
Figure 2.4-81— {Groundwater Elevations versus Time, Well Clusters MW307 and MW308}	2-1456

Figure 2.4-82— {Groundwater Elevations versus Time, Well Clusters MW309 and MW310}	2-1457
Figure 2.4-83— {Water Level Fluctuations in MW301 Cluster Area Based on Pressure Transducer Data}	2-1458
Figure 2.4-84— {Water Level Fluctuations in MW302 Cluster Area Based on Pressure Transducer Data}	2-1459
Figure 2.4-85— {Potentiometric Surface Map of Glacial Overburden Aquifer, October 2007}	2-1460
Figure 2.4-86— {Potentiometric Surface Map of Glacial Overburden Aquifer, January 2008}	2-1461
Figure 2.4-87— {Potentiometric Surface Map of Glacial Overburden Aquifer, March 2008}	2-1462
Figure 2.4-88— {Potentiometric Surface Map of Glacial Overburden Aquifer, July 2008}	2-1463
Figure 2.4-89— {Potentiometric Surface Map of Shallow Bedrock Aquifer, October 2007}	2-1464
Figure 2.4-90— {Potentiometric Surface Map of Shallow Bedrock Aquifer, January 2008}	2-1465
Figure 2.4-91— {Potentiometric Surface Map of Shallow Bedrock Aquifer, March 2008}	2-1466
Figure 2.4-92— {Potentiometric Surface Map of Shallow Bedrock Aquifer, July 2008}	2-1467
Figure 2.4-93— {Potentiometric Map of Deep Bedrock Aquifer, October 2007}	2-1468
Figure 2.4-94— {Potentiometric Map of Deep Bedrock Aquifer, January 2008}	2-1469
Figure 2.4-95— {Potentiometric Map of Deep Bedrock Aquifer, March 2008}	2-1470
Figure 2.4-96— {Potentiometric Map of Deep Bedrock Aquifer, July 2008}	2-1471
Figure 2.4-97— {Areas Known or Suspected of Having Upward-Flowing Groundwater from Bedrock}	2-1472
Figure 2.4-98— {Vertical Distribution of Fractures in MW301C Between 45 and 345 Feet Below Ground Surface}	2-1473
Figure 2.4-99— {Distribution of Fracture Dip Directions in Monitoring Well MW301C}	2-1474
Figure 2.4-100— {Distribution of Fracture Dip Angles in Monitoring Well MW301C}	2-1475
Figure 2.4-101— {Vertical Distribution of Fractures in MW301C Between 45 and 345 Feet Below Ground Surface}	2-1476
Figure 2.4-102— {Hypothetical Point of Release and Subsurface Migration Path of Accidental Spill}	2-1477
Figure 2.4-103— {Distribution of Fracture Dip Directions in Monitoring Well MW310C}	2-1478
Figure 2.4-104— {Distribution of Fracture Dip Angles in Monitoring Well MW310C}	2-1479
Figure 2.5-1— {Site Region Relief Map 200 Mile (322 km) Radius}	2-1902
Figure 2.5-2— {Site Vicinity Shaded Relief Map 25 Mile (40 km) Radius}	2-1903
Figure 2.5-3— {Site Area Topographic Map 5 Mile (8 km) Radius}	2-1904
Figure 2.5-4— {Site Topographic Map 0.6 Mile (1 km) Radius}	2-1905
Figure 2.5-5— {Physiographic Provinces Within the Site Region 200 Mile (322 km) Radius}	2-1906
Figure 2.5-6— {Evolution of the Appalachian Orogenic Belt}	2-1907
Figure 2.5-7— {Location Map and Cross Section of the Middle U.S. Atlantic Passive Margin}	2-1908
Figure 2.5-8— {Maximum Horizontal Stress Directions in Eastern North America}	2-1909
Figure 2.5-9— {New Madrid Seismic Zone with Earthquake Activity (1979-2006)}	2-1910
Figure 2.5-10— {Charleston Seismic Zone (UCSS) Map with East Coast Fault System}	2-1911
Figure 2.5-11— {Tectonic Interpretations by Bechtel Group}	2-1912
Figure 2.5-12— {Tectonic Interpretations by Dames and Moore}	2-1913
Figure 2.5-13— {Tectonic Interpretations by Law Engineering}	2-1914
Figure 2.5-14— {Tectonic Interpretations by Rondout Associates}	2-1915
Figure 2.5-15— {Tectonic Interpretation by Weston Geophysical}	2-1916
Figure 2.5-16— {Tectonic Interpretations by Woodward-Clyde Consultants}	2-1917
Figure 2.5-17— {Bechtel Group EPRI Source Zones}	2-1918
Figure 2.5-18— {Dames & Moore EPRI Source Zones}	2-1919
Figure 2.5-19— {Law Engineering EPRI Source Zones}	2-1920
Figure 2.5-20— {Rondout Associates EPRI Source Zones}	2-1921
Figure 2.5-21— {Weston Geophysical EPRI Source Zones}	2-1922
Figure 2.5-22— {Woodward-Clyde Consultants EPRI Source Zones}	2-1923

Figure 2.5-23— {Regional Bouguer Gravity Anomaly Map}	2-1924
Figure 2.5-24— {Site Vicinity Bouguer Gravity Anomaly Map}	2-1925
Figure 2.5-25— {Regional Magnetic Anomaly Map}	2-1926
Figure 2.5-26— {Site Vicinity Magnetic Anomaly Map}	2-1927
Figure 2.5-27— {Site Specific Stratigraphic Column}	2-1928
Figure 2.5-28— {Ten-Foot Solid Core of Mahantango Shale with No Open Fractures}	2-1929
Figure 2.5-29— {Bechtel Group EPRI Source Zones 50-mile Radius}	2-1930
Figure 2.5-30— {Dames & Moore EPRI Source Zones 50-mile Radius}	2-1931
Figure 2.5-31— {Law Engineering EPRI Source Zones 50-mile Radius}	2-1932
Figure 2.5-32— {Rondout Associates EPRI Source Zones 50-mile Radius}	2-1933
Figure 2.5-33— {Weston Geophysical EPRI Source Zones 50-mile Radius}	2-1934
Figure 2.5-34— {Woodward-Clyde Consultants EPRI Source Zones 50-mile Radius}	2-1935
Figure 2.5-35— {Logic Tree of New Madrid Fault System}	2-1936
Figure 2.5-36— {Uniform Hazard Spectra for Hard Rock at 7 Structural Frequencies}	2-1937
Figure 2.5-37— {Mean 1E-4 Rock Deaggregation for 1 and 2.5 Hz}	2-1938
Figure 2.5-38— {Mean 1E-4 Rock Deaggregation for 5 and 10 Hz}	2-1939
Figure 2.5-39— {Mean 1E-5 Rock Deaggregation for 1 and 2.5 Hz}	2-1940
Figure 2.5-40— {Mean 1E-5 Rock Deaggregation for 5 and 10 Hz}	2-1941
Figure 2.5-41— {Smooth Hard Rock UHRS Spectra}	2-1942
Figure 2.5-42— {Shear-Wave Velocity and its Coefficient of Variation for Depth up to 500 ft (152.4 m)}	2-1943
Figure 2.5-43— {Best Estimate Shear-Wave Velocity Vs and its Coefficient of Variation for Depth up to 500 ft (152.4 m)}	2-1944
Figure 2.5-44— {60 Randomized Shear-Wave Velocity Profiles for Depth up to 500 ft (152.4 m)}	2-1945
Figure 2.5-45— {Mean and Standard Deviation of 60 Randomized Shear-Wave Velocity Profiles Compared with Best Estimate}	2-1946
Figure 2.5-46— {G/Gmax Curves Representing Uncertainty in Shear Modulus for Engineered Fill within Depth 0-30 ft}	2-1947
Figure 2.5-47— {Damping Curves Representing Uncertainty in Damping for Engineered Fill within Depth 0-30 ft}	2-1948
Figure 2.5-48— {Mean Site Amplification Factor at the Ground Surface for 1E-4 HF DEM Input Motion}	2-1949
Figure 2.5-49— {Maximum Strains Vs. Depth for 1E-4 HF DEM Input Motion}	2-1950
Figure 2.5-50— {Mean Site Amplification Factor at the Ground Surface for 1E-4 LF DEM Input Motion}	2-1951
Figure 2.5-51— {Maximum Strains Vs. Depth for 1E-4 LF DEM Input Motion}	2-1952
Figure 2.5-52— {Mean Site Amplification Factor at the Ground Surface for 1E-5 HF DEM Input Motion}	2-1953
Figure 2.5-53— {Maximum Strains Vs. Depth for 1E-5 HF DEM Input Motion}	2-1954
Figure 2.5-54— {Mean Site Amplification Factor at the Ground Service for 1E-5 LF DEM Input Motion}	2-1955
Figure 2.5-55— {Maximum Strains Vs. Depth for 1E-5 LF DEM Input Motion}	2-1956
Figure 2.5-56— {Site Spectra for 1E-4 and 1E-5}	2-1957
Figure 2.5-57— {Recommended Horizontal and Vertical Spectra}	2-1958
Figure 2.5-58— {VH Ratios from Several Publications and Recommended VH Ratios}	2-1959
Figure 2.5-59— {Mean and Fractile Rock Hazard Curves for PGA}	2-1960
Figure 2.5-60— {Mean and Fractile Rock Hazard Curves for 25Hz}	2-1961
Figure 2.5-61— {Mean and Fractile Rock Hazard Curves for 10 Hz}	2-1962
Figure 2.5-62— {Mean and Fractile Rock Hazard Curves for 5.0 Hz}	2-1963
Figure 2.5-63— {Mean and Fractile Rock Hazard Curves for 2.5 Hz}	2-1964
Figure 2.5-64— {Mean and Fractile Rock Hazard Curves for 1.0 Hz}	2-1965

Figure 2.5-65— {Mean and Fractile Rock Hazard Curves for 0.5 Hz}	2-1966
Figure 2.5-66— {Location of the Arms of the New Madrid Fault System}	2-1967
Figure 2.5-67— {Logic Tree of Ground Motion Models for Non-General Sources}	2-1968
Figure 2.5-68— {Logic Tree of Ground Motion Models for General Area Sources}	2-1969
Figure 2.5-69— {1E-4 Response Spectra of Controlling Events at BBNPP}	2-1970
Figure 2.5-70— {1E-5 Response Spectra of Controlling Events at BBNPP}	2-1971
Figure 2.5-71— {Response Spectra of Selected Time Histories for 1E-4 Controlling Events LF, DEL and DEH after Spectral Matching}	2-1972
Figure 2.5-72— {1E-4 Smooth Hard Rock Spectra Controlling Earthquakes}	2-1973
Figure 2.5-73— {1E-5 Smooth Hard Rock Spectra Controlling Earthquakes}	2-1974
Figure 2.5-74— {UCSS Map}	2-1975
Figure 2.5-75— {Updated Charleston Seismic Sources (UCSS) Logic Tree}	2-1976
Figure 2.5-76— {Mean 1E-6 Rock Deaggregation for 1 and 2.5 Hz}	2-1977
Figure 2.5-77— {Mean 1E-6 Rock Deaggregation for 5 and 10 Hz}	2-1978
Figure 2.5-78— {Bechtel EPRI Source Zones and 2002-2007 Events in 500-Mile Radius}	2-1979
Figure 2.5-79— {Dames and Moore EPRI Source Zones and 2002-2007 Events in 500-mile Radius} ...	2-1980
Figure 2.5-80— {Law Engineering EPRI Source Zones and 2002-2007 Events in 500-Mile Radius}	2-1981
Figure 2.5-81— {Rondout Associates EPRI Source Zones and 2002-2007 Events in 500-Mile Radius}	2-1982
Figure 2.5-82— {Weston Geophysical EPRI Source Zones and 2002-2007 Events in 500-Mile Radius}	2-1983
Figure 2.5-83— {Woodward-Clyde EPRI Source Zones and 2002-2007 Events in 500-Mile Radius} ...	2-1984
Figure 2.5-84— {Comparison of Seismicity Rates}	2-1985
Figure 2.5-85— {Comparison of PGA-Mean Hazard Curves}	2-1986
Figure 2.5-86— {Seismicity of New York-Philadelphia Area}	2-1987
Figure 2.5-87— {Bechtel EPRI Source Zones for Charlevoix Sensitivity Analysis Case 1}	2-1988
Figure 2.5-88— {Dames and Moore EPRI Source Zones for Charlevoix Sensitivity Analysis Case 1} ...	2-1989
Figure 2.5-89— {Law Engineering EPRI Source Zones for Charlevoix Sensitivity Analysis Case 1}	2-1990
Figure 2.5-90— {Rondout Associates EPRI Source Zones for Charlevoix Sensitivity Analysis Case 1} ...	2-1991
Figure 2.5-91— {Weston Geophysical EPRI Source Zones for Charlevoix Sensitivity Analysis Case 1}	2-1992
Figure 2.5-92— {Woodward-Clyde EPRI Source Zones for Charlevoix Sensitivity Analysis Case 1}	2-1993
Figure 2.5-93— {Bechtel EPRI Source Zones for Charlevoix Sensitivity Analysis Case 2}	2-1994
Figure 2.5-94— {Dames and Moore EPRI Source Zones for Charlevoix Sensitivity Analysis Case 2} ...	2-1995
Figure 2.5-95— {Law Engineering EPRI Source Zones for Charlevoix Sensitivity Analysis Case 2}	2-1996
Figure 2.5-96— {Rondout Associates EPRI Source Zones for Charlevoix Sensitivity Analysis Case 2} ...	2-1997
Figure 2.5-97— {Weston Geophysical EPRI Source Zones for Charlevoix Sensitivity Analysis Case 2}	2-1998
Figure 2.5-98— {Woodward-Clyde EPRI Source Zones for Charlevoix Sensitivity Analysis Case 2}	2-1999
Figure 2.5-99— {Comparison of PGA Mean Hazard Curves for Charlevoix Sensitivity Analysis}	2-2000
Figure 2.5-100— {Seismicity Rates Charlevoix Sensitivity Analysis}	2-2001
Figure 2.5-101— {Hazard Curves Sensitivity Study of the Ramapo Fault System}	2-2002
Figure 2.5-102— {Seismicity Rates of the Ramapo Fault System}	2-2003
Figure 2.5-103— {Earthquake Epicenters Map 25-mile (40 km) radius}	2-2004
Figure 2.5-104— {Stratigraphic Correlation Chart of Appalachian Basin}	2-2005
Figure 2.5-105— {Site Geotechnical Investigation Plan}	2-2006
Figure 2.5-106— {Contour Map of Interpreted Top of Competent Shale Based on Geophysical Data}	2-2007
Figure 2.5-107— {Contour Map of Interpreted Top of Decomposed Shale Based on Geophysical Data}	2-2008

Figure 2.5-108— {Contour Map of Interpreted Top of Weathered Shale Based on Geophysical Data}	2-2009
Figure 2.5-109— {Seismic Tomography Profile Line A1}	2-2010
Figure 2.5-110— {Seismic Tomography Profile Line A2}	2-2011
Figure 2.5-111— {Seismic Tomography Profile Line A3}	2-2012
Figure 2.5-112— {Seismic Tomography Profile Line A4}	2-2013
Figure 2.5-113— {Seismic Tomography Profile Line A5}	2-2014
Figure 2.5-114— {Seismic Tomography Profile Line B1}	2-2015
Figure 2.5-115— {Seismic Tomography Profile Line B2}	2-2016
Figure 2.5-116— {Seismic Tomography Profile Line B3}	2-2017
Figure 2.5-117— {Seismic Tomography Profile Line B4}	2-2018
Figure 2.5-118— {Elevation of Sound Rock}	2-2019
Figure 2.5-119— {Northwestward View of Syber Creek, with no Evidence of the Light Street Fault}	2-2020
Figure 2.5-120— {View South Along Stone Church Road at Syber Creek, with no Expression of the Light Street Fault}	2-2021
Figure 2.5-121— {Rocky Bed of the Susquehanna River at the Berwick Bridge}	2-2022
Figure 2.5-122— {Gravelly Deposits along Hunlock Creek, a Tributary to the Susquehanna}	2-2023
Figure 2.5-123— {Exposure of Soft Sediments on the East Bank of the Susquehanna River}	2-2024
Figure 2.5-124— {Exposure of Man-made Fill on the Susquehanna River}	2-2025
Figure 2.5-125— {Shale Outcrop at the Site with Steeply Steep SSE Dipping Cleavage (85 Degrees to the SSE)Cleavage}	2-2026
Figure 2.5-126— {Shale in Borrow Areas Overlain by Glacial Till Showing No Offset of Contact}	2-2027
Figure 2.5-127— {Continuous Contact Between Glacial Till and Top of Shale Bedrock}	2-2028
Figure 2.5-128— {Aerial Photo of Site with Waypoints from Field Reconnaissance}	2-2029
Figure 2.5-129— {Boring Location Plan}	2-2030
Figure 2.5-130— {Geotechnical Cross Sections}	2-2031
Figure 2.5-131— {Geotechnical Subsurface Section A-A'}	2-2032
Figure 2.5-132— {Geotechnical Subsurface Section B-B'}	2-2033
Figure 2.5-133— {Geotechnical Subsurface Section C-C'}	2-2034
Figure 2.5-134— {Geotechnical Subsurface Section D-D'}	2-2035
Figure 2.5-135— {Surface Elevation Contours}	2-2036
Figure 2.5-136— {Thickness of Overburden}	2-2037
Figure 2.5-137— {Thickness of Weathered Rock}	2-2038
Figure 2.5-138— {Elevation of Competent Rock}	2-2039
Figure 2.5-139— {Overburden Thickness and Elevation of Rock (Area near Essential Service Water Emergency Makeup System - ESWEMS)}	2-2040
Figure 2.5-140— {Location of Shelby Tubes}	2-2041
Figure 2.5-141— {Location of Special Care Samples}	2-2042
Figure 2.5-142— {Standard Penetration Test (SPT) Variability}	2-2043
Figure 2.5-143— {Geophysical Tests B-301}	2-2044
Figure 2.5-144— {Geophysical Tests G-301}	2-2045
Figure 2.5-145— {{Geophysical Tests G-302}}	2-2046
Figure 2.5-146— {Geophysical Tests G-303}	2-2047
Figure 2.5-147— {Refraction Survey Page 1 of 7}	2-2048
Figure 2.5-148— {Refraction Survey Page 2 of 7}	2-2049
Figure 2.5-149— {Refraction Survey Page 3 of 7}	2-2050
Figure 2.5-150— {Refraction Survey Page 4 of 7}	2-2051
Figure 2.5-151— {Refraction Survey Page 5 of 7}	2-2052
Figure 2.5-152— {Refraction Survey Page 6 of 7}	2-2053
Figure 2.5-153— {Refraction Survey Page 7 of 7}	2-2054

Figure 2.5-154— {Resonant Column Test A B331-ST-2}	2-2055
Figure 2.5-155— {Resonant Column Test A B310-U3}	2-2056
Figure 2.5-156— {Resonant Column Test Pit Face}	2-2057
Figure 2.5-157— {NI Soil Velocity Profile}	2-2058
Figure 2.5-158— {Recommended Strain Dependent Properties}	2-2059
Figure 2.5-159— {Excavation Plan}	2-2060
Figure 2.5-160— {Excavation West Profile}	2-2061
Figure 2.5-161— {Excavation East Profile}	2-2062
Figure 2.5-162— {Excavation Cross Section}	2-2063
Figure 2.5-163— {Liquefaction Analysis Vs Method}	2-2064
Figure 2.5-164— {Liquefaction Analysis, SPT Method}	2-2065
Figure 2.5-165— {NI Settlement Analysis Service Loads}	2-2066
Figure 2.5-166— {NI Settlement Analysis Results}	2-2067
Figure 2.5-167— {Examples of Earth Pressure Diagrams}	2-2068
Figure 2.5-168— {ESWEMS and Cross Sections}	2-2069
Figure 2.5-169— {North Side Natural Slope}	2-2070
Figure 2.5-170— {Permanent Slope Cross Sections}	2-2071
Figure 2.5-171— {Temporary Slopes Cross Sections}	2-2072
Figure 2.5-172— {Generic Soil Profile}	2-2073
Figure 2.5-173— {Regional Geology Map 200 Mile (322 km) Radius}	2-2074
Figure 2.5-174— {Geologic Map of Pennsylvania with Physiographic Provinces 25 Mile (40 km) and 5 Mile (8 km) Radii}	2-2075
Figure 2.5-175— {Physiographic Provinces and Sections of Pennsylvania 25 Mile (40 km) and 5 Mile (8 km) Radii}	2-2076
Figure 2.5-176— {Glacial Deposits of Pennsylvania 25 Mile (40 km) and 5 Mile (8 km) Radii}	2-2077
Figure 2.5-177— {Cross Section Showing the Cambrian and Ordovician Rocks of the Appalachian Basin}	2-2078
Figure 2.5-178— {Regional Generalized Composite Stratigraphic Column}	2-2079
Figure 2.5-179— {Map of Depth to Precambrian Basement Below the Appalachian Basin Deposits 25 mile (40 km) and 5 mile (8 km) Radii}	2-2080
Figure 2.5-180— {Regional Tectonic Features}	2-2081
Figure 2.5-181— {Geological Map of the St. Lawrence Rift System Between Quebec City and the St. Lawrence Estuary}	2-2082
Figure 2.5-182— {Regional Cross Section}	2-2083
Figure 2.5-183— {Stratigraphic Description for Regional Cross Section}	2-2084
Figure 2.5-184— {Bedrock Geologic Map Berwick Quadrangle}	2-2085
Figure 2.5-185— {Cross Section of Berwick Anticlinorium - Bedrock Geology of The Berwick Quadrangle}	2-2086
Figure 2.5-186— {Surficial Geologic Site Map 0.6 Mile (1 km)}	2-2087
Figure 2.5-187— {Surficial Geology Map of the Berwick Quadrangle}	2-2088
Figure 2.5-188— {Site Location Geologic Map 0.6-mile (1 km) Radius}	2-2089
Figure 2.5-189— {Site Area Geologic Map 5-mile (8km) Radius}	2-2090
Figure 2.5-190— {Site Vicinity Geologic Map 25-mile (40km) Radius}	2-2091
Figure 2.5-191— {Geotechnical Site Cross Section A-A}	2-2092
Figure 2.5-192— {Geotechnical Site Cross Section B-B}	2-2093
Figure 2.5-193— {Geotechnical Site Cross Section C-C}	2-2094
Figure 2.5-194— {Geotechnical Site Cross Section D-D}	2-2095
Figure 2.5-195— {Geotechnical Site Cross Section E-E}	2-2096
Figure 2.5-196— {Geotechnical Site Cross Section F-F}	2-2097
Figure 2.5-197— {LIDAR Image with Topographic Sections Across the Site Vicinity}	2-2098

Figure 2.5-198— {Topographical Map of Site Vicinity 25-mile (40 km) Radius with Waypoints from Field Reconnaissance}	2-2099
Figure 2.5-199— {Mesozoic Basins and Associated Known Faults}	2-2100
Figure 2.5-200— {Site Geology in Available LIDAR Data Base map}	2-2101
Figure 2.5-201— {Topographic Section Across the Site Location}	2-2102
Figure 2.5-202— {Location Map for West Chester and Avondale Massifs}	2-2103
Figure 2.5-203— {Generic Distribution of Structures and Features of Mesozoic Rift Basins}	2-2104
Figure 2.5-204— {Idealized Cross Section of the Reading Prong, West Chester and Avondale Massifs, and the Philadelphia Terrane}	2-2105
Figure 2.5-205— {Development of the Reading Prong Nappe Megasystem}	2-2106
Figure 2.5-206— {Regional Tectonic Features with Bouguer Gravity Anomaly}	2-2107
Figure 2.5-207— {Regional Tectonic Basins with Bouguer Gravity Anomaly}	2-2108
Figure 2.5-208— {Regional Tectonic Features with Magnetic Anomaly}	2-2109
Figure 2.5-209— {Regional Tectonic Basins with Magnetic Anomaly}	2-2110
Figure 2.5-210— {Surficial Geology Map Overlaid on LiDAR Base Map}	2-2111
Figure 2.5-211— {LiDAR Image of the Site}	2-2112
Figure 2.5-212— {Site Area Geology Overlaid on LiDAR Base Map}	2-2113
Figure 2.5-213— {Site Area Geology Overlaid on LiDAR Base Map without Geologic Coloration}	2-2114
Figure 2.5-214— {Site Area Geology overlaid on Stretched LiDAR Base Map without Geologic Coloration}	2-2115
Figure 2.5-215— {Site Vicinity Geology Overlaid on LiDAR Base Map}	2-2116
Figure 2.5-216— {LiDAR Data {Site Vicinity Geology Overlaid on LiDAR Base Map Without Overlaid Site Vicinity Geology}Geologic Coloration}	2-2117
Figure 2.5-217— {Generalized Geologic Map and Cross Section in the Potomac River Region}	2-2118
Figure 2.5-218— {Generalized Geologic Map and Cross Section of the Eastern Maryland Piedmont}	2-2119
Figure 2.5-219— {Techtonostratigraphic Provinces within the Site Region (200 mile, 320 km Radius)}	2-2120
Figure 2.5-220— {Devonian Gas Shale Recoverability Map}	2-2121
Figure 2.5-221— {Marcellus Shale Contour Map}	2-2122
Figure 2.5-222— {Eastern Pennsylvania Marcellus Shale Gas Wells}	2-2123
Figure 3.7-1— {Comparison of BBNPP GMRS and EUR CSDRS, 5% Damping (Horizontal)}	3-69
Figure 3.7-2— {Comparison of BBNPP GMRS and EUR CSDRS, 5% Damping (Vertical)}	3-70
Figure 3.7-3— {BBNPP Horizontal SSE Ground Motion and EUR CSDRS Anchored at 0.1g PGA Horizontal Direction, 5% Damping}	3-71
Figure 3.7-4— {Comparison of BBNPP FIRS (EPGB 1 and 2) and EUR CSDRS, Horizontal Direction, 5% Damping}	3-72
Figure 3.7-5— {Comparison of BBNPP FIRS (EPGB 1 and 2) and EUR CSDRS, Vertical Direction, 5% Damping}	3-73
Figure 3.7-6— {Comparison of BBNPP FIRS (EPGB 3 and 4) and EUR CSDRS, Horizontal Direction, 5% Damping}	3-74
Figure 3.7-7— {Comparison of BBNPP FIRS (EPGB 3 and 4) and EUR CSDRS, Vertical Direction, 5% Damping}	3-75
Figure 3.7-8— {Comparison of BBNPP FIRS (ESWB 1 & 2) and EUR CSDRS, Horizontal Direction, 5% Damping}	3-76
Figure 3.7-9— {Comparison of BBNPP FIRS (ESWB 1 &2) and EUR CSDRS, Vertical Direction, 5% Damping}	3-77
Figure 3.7-10— {Comparison of BBNPP FIRS (ESWB 3) and EUR CSDRS, Horizontal Direction, 5% Damping}	3-78
Figure 3.7-11— {Comparison of BBNPP FIRS (ESWB 3) and EUR CSDRS, Vertical Direction, 5% Damping}	3-79

Figure 3.7-12— {Comparison of BBNPP FIRS (ESWB 4) and EUR CSDRS, Horizontal Direction, 5% Damping}	3-80
Figure 3.7-13— {Comparison of BBNPP FIRS (ESWB 4) and EUR CSDRS, Vertical Direction, 5% Damping}	3-81
Figure 3.7-14— {Shear Wave Velocity Profiles Below NI Base Mat for BBNPP}	3-82
Figure 3.7-15— {EPR DC Soil Cases (Uniform) vs BBNPP Soil Cases for SSI Analysis of NI}	3-83
Figure 3.7-16— {EPR DC Soil Cases (Layered) vs BBNPP Soil Cases for SSI Analysis of NI}	3-84
Figure 3.7-17— {NI Base Mat (Node 417) X- Direction Response Spectra at 5% Damping}	3-85
Figure 3.7-18— {NI Base Mat (Node 417) Y- Direction Response Spectra at 5%Damping}	3-86
Figure 3.7-19— {NI Base Mat (Node 417) Z- Direction Response Spectra at 5%Damping}	3-87
Figure 3.7-20— {EPGB 1 & 2 Base Mat X- Direction Response Spectra at 5% Damping}	3-88
Figure 3.7-21— {EPGB 1 & 2 Base Mat Y- Direction Response Spectra at 5% Damping}	3-89
Figure 3.7-22— {EPGB 1 & 2 Base Mat Z- Direction Response Spectra at 5% Damping}	3-90
Figure 3.7-23— {EPGB 3 & 4 Base Mat X- Direction Response Spectra at 5% Damping}	3-91
Figure 3.7-24— {EPGB 3 & 4 Base Mat Y- Direction Response Spectra at 5% Damping}	3-92
Figure 3.7-25— {EPGB 3 & 4 Base Mat Z- Direction Response Spectra at 5% Damping}	3-93
Figure 3.7-26— {ESWB 1 Base Mat X- Direction Response Spectra at 5% Damping}	3-94
Figure 3.7-27— {ESWB 1 Base Mat Y- Direction Response Spectra at 5% Damping}	3-95
Figure 3.7-28— {ESWB 1 Base Mat Z- Direction Response Spectra at 5% Damping}	3-96
Figure 3.7-29— {ESWB 2 Base Mat X- Direction Response Spectra at 5% Damping}	3-97
Figure 3.7-30— {ESWB 2 Base Mat Y- Direction Response Spectra at 5% Damping}	3-98
Figure 3.7-31— {ESWB 2 Base Mat Z- Direction Response Spectra at 5% Damping}	3-99
Figure 3.7-32— {ESWB 3 Base Mat X- Direction Response Spectra at 5% Damping}	3-100
Figure 3.7-33— {ESWB 3 Base Mat Y- Direction Response Spectra at 5% Damping}	3-101
Figure 3.7-34— {ESWB 3 Base Mat Z- Direction Response Spectra at 5% Damping}	3-102
Figure 3.7-35— {ESWB 4 Base Mat X- Direction Response Spectra at 5% Damping}	3-103
Figure 3.7-36— {ESWB 4 Base Mat Y- Direction Response Spectra at 5% Damping}	3-104
Figure 3.7-37— {ESWB 4 Base Mat Z- Direction Response Spectra at 5% Damping}	3-105
Figure 3.7-38— {Reactor Bldg Internal Structure, Elev. 5.15m, X (E-W) Direction, 5% Damping}	3-106
Figure 3.7-39— {Reactor Bldg Internal Structure, Elev. 5.15m, Y (N-S) Direction, 5%Damping}	3-107
Figure 3.7-40— {Reactor Bldg Internal Structure, Elev. 5.15m, Z (Vert) Direction, 5%Damping}	3-108
Figure 3.7-41— {Reactor Bldg Internal Structure, Elev. 19.5m, X (E-W) Direction, 5%Damping}	3-109
Figure 3.7-42— {Reactor Bldg Internal Structure, Elev. 19.5m, Y (N-S) Direction, 5%Damping}	3-110
Figure 3.7-43— {Reactor Bldg Internal Structure, Elev. 19.5m, Z (Vert) Direction, 5% Damping}	3-111
Figure 3.7-44— {Safeguard Building 1, Elev. 8.1m, X (E-W) Direction, 5% Damping}	3-112
Figure 3.7-45— {Safeguard Building 1, Elev. 8.1m, Y (N-S) Direction, 5% Damping}	3-113
Figure 3.7-46— {Safeguard Building 1, Elev. 8.1m, Z (Vert) Direction, 5% Damping}	3-114
Figure 3.7-47— {Safeguard Building 1, Elev. 21.0m, X (E-W) Direction, 5% Damping}	3-115
Figure 3.7-48— {Safeguard Building 1, Elev. 21.0m, Y (N-S) Direction, 5% Damping}	3-116
Figure 3.7-49— {Safeguard Building 1, Elev. 21.0m, Z (Vert) Direction, 5% Damping}	3-117
Figure 3.7-50— {Safeguard Building 2/3, Elev. 8.1m, X (E-W) Direction, 5% Damping}	3-118
Figure 3.7-51— {Safeguard Building 2/3, Elev. 8.1m, Y (N-S) Direction, 5% Damping}	3-119
Figure 3.7-52— {Safeguard Building 2/3, Elev. 8.1m, Z (Vert) Direction, 5% Damping}	3-120
Figure 3.7-53— {Safeguard Building 2/3, Elev. 15.4m, X (E-W) Direction, 5% Damping}	3-121
Figure 3.7-54— {Safeguard Building 2/3, Elev. 15.4m, Y (N-S) Direction, 5% Damping}	3-122
Figure 3.7-55— {Safeguard Building 2/3, Elev. 15.4m, Z (Vert) Direction, 5% Damping}	3-123
Figure 3.7-56— {Safeguard Building 4, Elev. 21.0m, X (E-W) Direction, 5% Damping}	3-124
Figure 3.7-57— {Safeguard Building 4, Elev. 21.0m, Y (N-S) Direction, 5% Damping}	3-125
Figure 3.7-58— {Safeguard Building 4, Elev. 21.0m, Z (Vert) Direction, 5% Damping}	3-126
Figure 3.7-59— {Containment Building, Elev. 37.6m, X (E-W) Direction, 5% Damping}	3-127
Figure 3.7-60— {Containment Building, Elev. 37.6m, Y (N-S) Direction, 5% Damping}	3-128

Figure 3.7-61— {Containment Building, Elev. 37.6m, Z (Vert) Direction, 5% Damping}	3-129
Figure 3.7-62— {Containment Building, Elev. 58.0m, X (E-W) Direction, 5% Damping}	3-130
Figure 3.7-63— {Containment Building, Elev. 58.0m, Y (N-S) Direction, 5% Damping}	3-131
Figure 3.7-64— {Containment Building, Elev. 58.0m, Z (Vert) Direction, 5% Damping}	3-132
Figure 3.7-65— {EPBG, Elev. 0.0m X (E-W) Direction, 5% Damping}	3-133
Figure 3.7-66— {EPGB, Elev. 0.0m, Y (N-S) Direction, 5% Damping}	3-134
Figure 3.7-67— {EPGB, Elev. 0.0m, Z (Vert) Direction, 5% Damping}	3-135
Figure 3.7-68— {ESWB, Elev. 19.20m, X (E-W) Direction, 5% Damping}	3-136
Figure 3.7-69— {ESWB, Elev. 19.20m, Y (N-S) Direction, 5% Damping}	3-137
Figure 3.7-70— {ESWB, Elev. 19.20m, Z (Vert) Direction, 5% Damping}	3-138
Figure 3.7-71— {ESWB, Elev. 4.27m, X (E-W) Direction, 5% Damping}	3-139
Figure 3.7-72— {ESWB, Elev. 4.27m, Y (N-S) Direction, 5% Damping}	3-140
Figure 3.7-73— {ESWB, Elev. 4.27m, Z (Vert) Direction, 5% Damping}	3-141
Figure 3.7-74— {Stick vs. FEM Spectrum Comparison at Elev. 58.00m – Containment Dome Apex (Without Polar Crane), 5% Damping X-Direction}	3-142
Figure 3.7-75— {Stick vs. FEM Spectrum Comparison at Elev. 58.00m – Containment Dome Apex (Without Polar Crane), 5% Damping Y-Direction}	3-143
Figure 3.7-76— {Stick vs. FEM Spectrum Comparison at Elev. 58.00m – Containment Dome Apex (Without Polar Crane), 5% Damping Z-Direction}	3-144
Figure 3.7-77— {Stick vs. FEM Spectrum Comparison at Elev. 37.60m – Containment Building (Without Polar Crane), 5% Damping Y-Direction}	3-145
Figure 3.7-78— {Stick vs. FEM Spectrum Comparison at Elev. 37.60m – Containment Building (Without Polar Crane), 5% Damping X-Direction}	3-146
Figure 3.7-79— {Stick vs. FEM Spectrum Comparison at Elev. 37.60m – Containment Building (Without Polar Crane), 5% Damping Z-Direction}	3-147
Figure 3.7-80— {Spectrum Comparison at Elev. 19.50m – Reactor Building Internal Structure, 4% Damping X-Direction}	3-148
Figure 3.7-81— {Spectrum Comparison at Elev. 19.50m – Reactor Building Internal Structure, 4% Damping Y-Direction}	3-149
Figure 3.7-82— {Spectrum Comparison at Elev. 19.50m – Reactor Building Internal Structure, 4% Damping Z-Direction}	3-150
Figure 3.7-83— {Spectrum Comparison at Elev. 5.15m – Reactor Building Internal Structure, 4% Damping X-Direction}	3-151
Figure 3.7-84— {Spectrum Comparison at Elev. 5.15m – Reactor Building Internal Structure, 4% Damping Y-Direction}	3-152
Figure 3.7-85— {Spectrum Comparison at Elev. 5.15m – Reactor Building Internal Structure, 4% Damping Z-Direction}	3-153
Figure 3.7-86— {3D Finite Element Model of Balance of NI Common Base Mat Structures Perspective View}	3-154
Figure 3.7-87— {Section Cutoff of Dynamic FE Model}	3-155
Figure 3.7-88— {Balance of NI Individual Component of Dynamic FE Model}	3-156
Figure 3.7-89— {Reactor Building Internal Structure of Dynamic FE Model}	3-157
Figure 3.7-90— {Reactor Containment Building of Dynamic FE Model}	3-158
Figure 3.7-91— {Reactor Coolant System of Dynamic FE Model}	3-159
Figure 3.7-92— {Isometric View of FEM for EPGB}	3-160
Figure 3.7-93— {BBNPP Response Spectra at NI Common Base Mat Structure (Node 417) – 5% Damping, X - Direction}	3-161
Figure 3.7-94— {BBNPP Response Spectra at NI Common Base Mat Structure (Node 417) – 5% Damping, Y - Direction}	3-162
Figure 3.7-95— {BBNPP Response Spectra at NI Common Base Mat Structure (Node 417) – 5% Damping, Z – Direction}	3-163

Figure 3.7-96— {BBNPP Response Spectra at Centers of Footprints of EPGB and ESWB – 5% Damping, X - Direction}	3-164
Figure 3.7-97— {BBNPP Response Spectra at Centers of Footprints of EPGB and ESWB – 5% Damping, Y - Direction}	3-165
Figure 3.7-98— {BBNPP Response Spectra at Centers of Footprints of EPGB and ESWB – 5% Damping, Z - Direction}	3-166
Figure 3.7-99— {Comparison of Response Spectra – Dynamic Versus Static Model, Reactor Shield Building, X-Direction}	3-167
Figure 3.7-100— {Comparison of Response Spectra – Dynamic Versus Static Model, Reactor Shield Building, Y-Direction}	3-168
Figure 3.7-101— {Comparison of Response Spectra – Dynamic Versus Static Model, Reactor Shield Building, Z-Direction}	3-169
Figure 3.7-102— {Comparison of Response Spectra – Dynamic Versus Static Model, Reactor Building Internal Structure, X-Direction}	3-170
Figure 3.7-103— {Comparison of Response Spectra – Dynamic Versus Static Model, Reactor Building Internal Structure, Y-Direction}	3-171
Figure 3.7-104— {Comparison of Response Spectra – Dynamic Versus Static Model, Reactor Building Internal Structure, Z-Direction}	3-172
Figure 3.7-105— {Comparison of Response Spectra – Dynamic Versus Static Model, Containment Building, X-Direction}	3-173
Figure 3.7-106— {Comparison of Response Spectra – Dynamic Versus Static Model, Containment Building, Y-Direction}	3-174
Figure 3.7-107— {Comparison of Response Spectra – Dynamic Versus Static Model, Containment Building, Z-Direction}	3-175
Figure 3.7-108— {Comparison of Response Spectra – Dynamic Versus Static Model, Safeguard Building 1, X-Direction}	3-176
Figure 3.7-109— {Comparison of Response Spectra – Dynamic Versus Static Model, Safeguard Building 1, Y-Direction}	3-177
Figure 3.7-110— {Comparison of Response Spectra – Dynamic Versus Static Model, Safeguard Building 1, Z-Direction}	3-178
Figure 3.7-111— {Comparison of Response Spectra – Dynamic Versus Static Model, Safeguard Buildings 2 and 3, X-Direction}	3-179
Figure 3.7-112— {Comparison of Response Spectra – Dynamic Versus Static Model, Safeguard Buildings 2 and 3, Y-Direction}	3-180
Figure 3.7-113— {Comparison of Response Spectra – Dynamic Versus Static Model, Safeguard Buildings 2 and 3, Z-Direction}	3-181
Figure 3.7-114— {Comparison of Response Spectra – Dynamic Versus Static Model, Safeguard Building 4, X-Direction}	3-182
Figure 3.7-115— {Comparison of Response Spectra – Dynamic Versus Static Model, Safeguard Building 4, Y-Direction}	3-183
Figure 3.7-116— {Comparison of Response Spectra – Dynamic Versus Static Model, Safeguard Building 4, Z-Direction}	3-184
Figure 3.7-117— {Spectrum Envelope of Reactor Bldg Internal Structure, Elev. 5.15m, X (EW) Direction, 2%, 3%, 4%, 5%, 7%, and 10% Damping}	3-185
Figure 3.7-118— {Spectrum Envelope of Reactor Bldg Internal Structure, Elev. 5.15m, Y (N-S) Direction, 2%, 3%, 4%, 5%, 7%, and 10% Damping}	3-186
Figure 3.7-119— {Spectrum Envelope of Safeguard Building 1, Elev. 8.1m, X (E-W) Direction, 2%, 3%, 4%, 5%, 7%, and 10% Damping}	3-187
Figure 3.7-120— {Spectrum Envelope of Safeguard Building 1, Elev. 8.1m, Y (N-S) Direction, 2%, 3%, 4%, 5%, 7%, and 10% Damping}	3-188

Figure 3.7-121— {Spectrum Envelope of Safeguard Building 2/3, Elev. 8.1m, X (E-W) Direction, 2%, 3%, 4%, 5%, 7%, and 10% Damping}	3-189
Figure 3.7-122— {Spectrum Envelope of EPGB, Elev. 0.0m, X (E-W) Direction, 2%, 3%, 4%, 5%, 7%, and 10% Damping}	3-190
Figure 3.7-123— {Spectrum Envelope of EPGB, Elev. 0.0m, Y (N-S) Direction, 2%, 3%, 4%, 5%, 7%, and 10% Damping}	3-191
Figure 3.7-124— {Spectrum Envelope of EPGB, Elev. 0.0m, Z (Vert) Direction, 2%, 3%, 4%, 5%, 7%, and 10% Damping}	3-192
Figure 3.7-125— {Spectrum Envelope of ESWB, Elev. 19.20m, X (E-W) Direction, 2%, 3%, 4%, 5%, 7%, and 10% Damping}	3-193
Figure 3.7-126— {Spectrum Envelope of ESWB, Elev. 19.20m, Y (N-S) Direction, 2%, 3%, 4%, 5%, 7%, and 10% Damping}	3-194
Figure 3.7-127— {Spectrum Envelope of ESWB, Elev. 19.20m, Z (Vert) Direction, 2%, 3%, 4%, 5%, 7%, and 10% Damping}	3-195
Figure 3.7-128— {Spectrum Envelope of ESWB, Elev. 4.27m, X (E-W) Direction, 2%, 3%, 4%, 5%, 7%, and 10% Damping}	3-196
Figure 3.7-129— {Spectrum Envelope of ESWB, Elev. 4.27m, Y (N-S) Direction, 2%, 3%, 4%, 5%, 7%, and 10% Damping}	3-197
Figure 3.7-130— {Spectrum Envelope of ESWB, Elev. 4.27m, Z (Vert) Direction, 2%, 3%, 4%, 5%, 7%, and 10% Damping}	3-198
Figure 3.7-131— {Horizontal and Vertical FIRS at Elevation 669 ft msl (203.9 m)}	3-199
Figure 3.7-132— {N-S Direction Time Histories Matching ESWEMS Foundation Level FIRS}	3-200
Figure 3.7-133— {E-W Direction Time Histories Matching ESWEMS Foundation Level FIRS}	3-201
Figure 3.7-134— {Vertical Direction Time Histories Matching ESWEMS Foundation Level FIRS}	3-202
Figure 3.7-135— {Response Spectra Computed from the Time History and Target FIRS in N-S Direction}	3-203
Figure 3.7-136— {Response Spectra Computed from the Time History and Target FIRS in E-W Direction}	3-204
Figure 3.7-137— {Response Spectra Computed from the Time History and Target FIRS in Vertical Direction}	3-205
Figure 3.7-138— {Low-Strain Body Wave Velocity Profile Below the Pumphouse}	3-206
Figure 3.7-139— {Strain-Compatible Soil Properties for the Lower Bound, Best Estimate and Upper Bound Profiles}	3-207
Figure 3.7-140— {In-Structure Floor Response Spectra in E-W Direction at First Floor Level of the ESWEMS Pumphouse}	3-208
Figure 3.7-141— {In-Structure Floor Response Spectra in N-S Direction at First Floor Level of the ESWEMS Pumphouse}	3-209
Figure 3.7-142— {In-Structure Floor Response Spectra in Vertical Direction at First Floor Level of the ESWEMS Pumphouse}	3-210
Figure 3.7-143— {In-Structure Floor Response Spectra in E-W Direction at Mezzanine Level of the ESWEMS Pumphouse}	3-211
Figure 3.7-144— {In-Structure Floor Response Spectra in N-S Direction at Mezzanine Level of the ESWEMS Pumphouse}	3-212
Figure 3.7-145— {In-Structure Floor Response Spectra in Vertical Direction at Mezzanine Level of the ESWEMS Pumphouse}	3-213
Figure 3.7-146— {In-Structure Floor Response Spectra in E-W Direction at Roof Level of the ESWEMS Pumphouse}	3-214
Figure 3.7-147— {In-Structure Floor Response Spectra in N-S Direction at Roof Level of the ESWEMS Pumphouse}	3-215
Figure 3.7-148— {In-Structure Floor Response Spectra in Vertical Direction at Roof Level of the ESWEMS Pumphouse}	3-216

Figure 3.7-149— {Isometric View of the ESWEMS Pumphouse GT-Strudl Finite Element Model - Exterior Wall, Roof and Apron}	3-217
Figure 3.7-150— {Isometric View of the ESWEMS Pumphouse GT-Strudl Finite Element Model - Exterior Wall, Roof and Apron}	3-218
Figure 3.7-151— {BBNPP Buried Pipe Horizontal FIRS}	3-219
Figure 3.7-152— {BBNPP Buried Pipe Vertical FIRS}	3-220
Figure 3.7-153— {Dynamic Soil Structure Interaction Model}	3-221
Figure 3.7-154— {Boundary Conditions of the GT-Strudl Model}	3-222
Figure 3.8-1— {Schematic Site Plan of Seismic Category I Buried Utilities at the NI (Electrical Duct Banks)}	3-246
Figure 3.8-2— {Schematic Site Plan of Seismic Category I Buried Utilities at the NI (Underground Piping)}	3-247
Figure 3.8-3— {Isometric View of the GT Strudl Finite Element Model for the ESWEMS Pumphouse Structure (Partial View of Basemat, Exterior Walls, and Interior Walls)}	3-248
Figure 3.8-4— {Isometric View of the GT Strudl Finite Element Model for the ESWEMS Pumphouse Structure (Partial View of Pump Wells, Wing Walls and Apron)}	3-249
Figure 3E-1— {Isometric View of ESWEMS Pumphouse Main Base Mat & Pump Well Base - Finite Element Mesh}	3-17
Figure 3E-2— {Isometric View of ESWEMS Pumphouse GT Strudl Finite Element Model - Exterior Wall, Roof and Apron}	3-18
Figure 3E-3— {GT STRUDL Finite Element Planar Reference System}	3-19
Figure 3E-4— {Plant Arrangement - ESWEMS Pumphouse Excavation Cut & Backfill}	3-20
Figure 3E-5— {Plant Arrangement - ESWEMS Retention Pond & Pumphouse Location Plan}	3-21
Figure 3E-6— {Plant Arrangement - ESWEMS Retention Pond Typical Riprap Detail}	3-22
Figure 3E-7— {Plant Arrangement - ESWEMS Retention Pond Spillway Plan}	3-23
Figure 3E-8— {Plant Arrangement - ESWEMS Retention Pond Spillway Section}	3-24
Figure 3E-9— {Plant Arrangement - ESWEMS Retention Pond Section at Embankment}	3-25
Figure 3E-10— {Plant Arrangement - ESWEMS Retention Pond Section at Embankment}	3-26
Figure 3E-11— {Plant Arrangement - ESWEMS Retention Pond Section at Embankment}	3-27
Figure 3E-12— {Plant Arrangement - ESWEMS Pumphouse Rebar}	3-28
Figure 8.1-1— {BBNPP Site 500 kV Circuit Corridors}	8-8
Figure 8.2-1— {BBNPP 500kV Switchyard and Transmission Line Layout}	8-30
Figure 8.2-2— {BBNPP 500kV Switchyard Single Line Diagram}	8-31
Figure 8.2-3— {Susquehanna 500kV, Yard 2}	8-32
Figure 8.2-4— {Susquehanna 500kV Yard}	8-33
Figure 8.3-1— {BBNPP Emergency Power Supply System Single Line Drawing}	8-42
Figure 8.3-2— {BBNPP Normal Power Supply System Single Line Drawing}	8-45
Figure 9.2-1— {Potable Water}	9-29
Figure 9.2-2— {Sanitary Waste Water System}	9-30
Figure 9.2-3— {ESWEMS Schematic}	9-31
Figure 9.2-4— {Plant Arrangement - ESWEMS Pumphouse Floor Plan}	9-32
Figure 9.2-5— {Plant Arrangement - ESWEMS Pumphouse Section A-A}	9-33
Figure 9.2-6— {Plant Arrangement - ESWEMS Pumphouse Section B-B}	9-34
Figure 9.2-7— {Plant Arrangement - ESWEMS Pumphouse Section C-C}	9-35
Figure 9.2-8— {Plant Arrangement - ESWEMS Pumphouse Pumpwell Plan}	9-36
Figure 9.2-9— {Plant Arrangement - ESWEMS Pumphouse Mezzanine Plan}	9-37
Figure 9.2-10— {Plant Arrangement - ESWEMS Pumphouse Roof Plan}	9-38
Figure 9.2-11— {Raw Water Supply System}	9-39
Figure 9.4-1— {ESWEMS Pumphouse HVAC}	9-56
Figure 9.4-2— {ESWEMS Pumphouse HVAC Duct and Instrumentation Diagram}	9-57
Figure 9.4-3— {Turbine Building Ventilation System}	9-58

Figure 9.5-1— {Fire Protection Organization}	9-79
Figure 9.5-2— {Fire Water Distribution System - Site Specific Facilities}	9-80
Figure 9B-1— {Fire Barrier Location, Turbine Building Plan at Elevation (-)23 ft}	9-42
Figure 9B-2— {Fire Barrier Location, Turbine Building Plan at Elevation 0 ft}	9-43
Figure 9B-3— {Fire Barrier Location, Turbine Building Plan at Elevation +38 ft}	9-44
Figure 9B-4— {Fire Barrier Location, Turbine Building Plan at Elevation +65 ft}	9-45
Figure 9B-5— {Fire Barrier Location, Turbine Building Plan at Elevation (-)43 ft}	9-46
Figure 9B-6— {Fire Barrier Location, Turbine Building Roof Plan}	9-47
Figure 9B-7— {Fire Barrier Location, Turbine Building Section A-A}	9-48
Figure 9B-8— {Fire Barrier Location, Turbine Building Section B-B}	9-49
Figure 9B-9— {Fire Barrier Location, Turbine Building Section C-C}	9-50
Figure 9B-10— {Fire Barrier Location, SWGR-SBO Buildings Plan View at Elevation (-)13 ft}	9-51
Figure 9B-11— {Fire Barrier Location, SWGR-SBO-AUX BLR Buildings Plan View at Elevation 0 ft}	9-52
Figure 9B-12— {Fire Barrier Location, SWGR-SBO-AUX BLR Buildings Plan View at Elevation 13 ft}	9-53
Figure 9B-13— {Fire Barrier Location, SWGR-SBO-AUX BLR Buildings Plan View at Elevation 24.5 ft}	9-54
Figure 9B-14— {Fire Barrier Location, SWGR-SBO-AUX BLR Buildings Plan View Section A-A}	9-55
Figure 9B-15— {Fire Barrier Location, Transformer Area Plan View at Elevation 0 ft}	9-56
Figure 9B-16— {Fire Barrier Location, Warehouse Building Plan}	9-57
Figure 9B-17— {Fire Barrier Location, Security Access Facility Plan}	9-58
Figure 9B-18— {Fire Barrier Location, Central Gas Supply Building Plan View at Elevation 85'0"}	9-59
Figure 9B-19— {Fire Barrier Location, Grid Systems Control Building}	9-60
Figure 9B-20— {Fire Barrier Location, Fire Protection Building Plan View at Elevation 85'0"}	9-61
Figure 9B-21— {Fire Barrier Location, Cooling Tower Structure, Plan View and Section A-A}	9-62
Figure 9B-22— {Fire Barrier Location, Circulating Water System Pumphouse}	9-63
Figure 9B-23— {Fire Barrier Location, ESWEMS Ground Floor and Mezzanine Plan}	9-64
Figure 9B-24— {Fire Barrier Location, BBNPP Intake Structure}	9-65
Figure 10.4-1— {Circulating Water System P&ID (at Cooling Tower)}	10-21
Figure 10.4-2— {CWS Pumphouse (Plan View)}	10-22
Figure 10.4-3— {CWS Pumphouse (Section View)}	10-23
Figure 10.4-4— {Circulating Water System Cooling Tower}	10-24
Figure 10.4-5— {BBNPP Intake Structure (Plan View)}	10-25
Figure 10.4-6— {Circulating Water System P&ID (Makeup System)}	10-26
Figure 10.4-7— {BBNPP Intake Structure (Section View)}	10-27
Figure 10.4-8— {Circulating Water System P&ID (Blowdown System)}	10-28
Figure 10.4-9— {Discharge Diffuser}	10-29
Figure 12.3-1— {Site Layout}	12-36
Figure 12.3-2— {CST and RWST Locations on Plant Grid}	12-37
Figure 12.3-3— {Source Location}	12-38
Figure 12.3-4— {Annual Dose Rate in 2017 in Units of mrem 8760 hours}	12-39
Figure 12.3-5— {ISFSI Distance Equation}	12-40
Figure 12.3-6— {ISFSI Satellite Image}	12-41
Figure 12.3-7— {SSES ISFSI (blue border) with TLDs and Grid}	12-42
Figure 12.3-8— {TLD (ID 13S2) Data Verifying Time Correlation Function}	12-43
Figure 12.3-9— {Dose vs Distance for CSTs}	12-44
Figure 12.3-10— {Dose vs Distance for LLRWHF}	12-45
Figure 12.3-11— {Dose vs Distance for SEALAND Containers}	12-46
Figure 12.3-12— {Dose vs Distance for Steam Dryer Storage Vault}	12-47
Figure 12.3-13— {Dose vs Distance for Turbine Building}	12-48
Figure 13.1-1— {BBNPP Organization Chart}	13-25
Figure 13.1-2— {Bell Bend Nuclear Power Plant Operating Shift Organization} ^{1,2}	13-26
Figure 13.1-3— {Hiring and Training Schedule for Plant Staff} ¹	13-27

Figure 14.2-1—{BBNPP Startup Organization}	14-33
--	-------