

## Part 02



---

Exelon Generation  
Victoria County Station  
ESP Application

### **ESP Table of Contents**

- Part 01 — Administrative Information
- Part 02 — Site Safety Analysis Report (SSAR)
- Part 03 — Environmental Report (ER)
- Part 04 — Emergency Plan (E-Plan)
- Part 05 — Enclosures

**Victoria County Station**

**ESP Application**

**Part 2**

**Site Safety Analysis Report**

**Revision 1**

## ESP SSAR Overall Table of Contents

<b>Chapter 1      Introduction and General Description of the Plant .....</b>	<b>1.1-1</b>
1.1      Introduction .....	1.1-1
1.2      General Plant Description .....	1.2-1
1.2.1      Site Location .....	1.2-1
1.2.2      Site Development .....	1.2-1
1.3      Comparison With Other Facilities .....	1.3-1
1.4      Identification of Agents and Contractors .....	1.4-1
1.4.1      Bechtel Power Corporation .....	1.4-1
1.4.2      Other Contractors .....	1.4-1
1.4.2.1      Tetra Tech NUS, Inc. ....	1.4-1
1.4.2.2      MACTEC Engineering and Consulting, Inc. ....	1.4-1
1.4.2.3      William Lettis and Associates, Inc. ....	1.4-2
1.4.2.4      Risk Engineering, Inc. ....	1.4-2
1.4.2.5      Murray and Trettel, Inc. ....	1.4-2
1.5      Requirements for Further Technical Information .....	1.5-1
1.6      Material Incorporated by Reference .....	1.6-1
1.7      Drawings and Other Detailed Information .....	1.7-1
1.8      Interfaces With Standard Design .....	1.8-1
1.9      Conformance With Regulatory Criteria .....	1.9-1
1.10      Overview of Reactor Types .....	1.10-1
1.10.1      Advanced Boiling Water Reactor .....	1.10-1
1.10.2      Advanced Passive Pressurized Water Reactor .....	1.10-1
1.10.3      Economic Simplified Boiling Water Reactor .....	1.10-2
1.10.4      Advanced Pressurized Water Reactor .....	1.10-2
1.10.5      mPower .....	1.10-2
<b>Chapter 2      Site Characteristics .....</b>	<b>2.0-1</b>
2.0      Plant Parameters Envelope .....	2.0-1
2.0.1      Plant Parameters Envelope Approach .....	2.0-1
2.0.2      Site Characteristics and Site-Related Design Parameters .....	2.0-2
2.0.3      Liquid and Gaseous Releases .....	2.0-2
2.0.4      References .....	2.0-3
2.1      Geography and Demography .....	2.1-1
2.1.1      Site Location and Description .....	2.1-1
2.1.1.1      Site Location .....	2.1-1
2.1.1.2      Site Description .....	2.1-2
2.1.2      Exclusion Area Authority and Control .....	2.1-3
2.1.2.1      Authority .....	2.1-3
2.1.2.2      Control of Activities Unrelated to Plant Operation .....	2.1-4
2.1.2.3      Arrangements for Traffic Control .....	2.1-4
2.1.2.4      Abandonment or Relocation of Public Roads .....	2.1-4
2.1.3      Population Distribution .....	2.1-4
2.1.3.1      Resident Population within 10 Miles .....	2.1-5
2.1.3.2      Resident Population Between 10 and 50 Miles .....	2.1-6
2.1.3.3      Transient Population .....	2.1-6
2.1.3.4      Low Population Zone .....	2.1-8

### ESP SSAR Overall Table of Contents (Cont.)

<u>Section</u>	<u>Title</u>	<u>Page</u>
2.1.3.5	Population Center .....	2.1-8
2.1.3.6	Population Density .....	2.1-9
2.1.4	References .....	2.1-9
2.2	Nearby Industrial, Transportation, and Military Facilities .....	2.2-1
2.2.1	Location and Routes .....	2.2-1
2.2.2	Descriptions .....	2.2-5
2.2.2.1	Description of Facilities .....	2.2-5
2.2.2.2	Description of Products and Materials .....	2.2-6
2.2.2.3	Description of Natural Gas/Chemical Pipelines and Gas/Oil Fields .....	2.2-10
2.2.2.4	Description of Waterways .....	2.2-15
2.2.2.5	Description of Highways .....	2.2-16
2.2.2.6	Description of Railroads .....	2.2-17
2.2.2.7	Description of Airports, Airways and Military Operations Areas .....	2.2-17
2.2.2.8	Description of Mining Activities .....	2.2-18
2.2.2.9	Military Facilities .....	2.2-18
2.2.2.10	Projections of Industrial Growth .....	2.2-18
2.2.3	Evaluation of Potential Accidents .....	2.2-19
2.2.3.1	Determination of Design Basis Events .....	2.2-19
2.2.4	References .....	2.2-34
2.3	Local Meteorology .....	2.3-1
2.3.1	Regional Climatology .....	2.3-1
2.3.1.1	Data Sources .....	2.3-1
2.3.1.2	General Climate .....	2.3-4
2.3.1.3	Severe Weather .....	2.3-5
2.3.1.4	Meteorological Data for Evaluating the Ultimate Heat Sink .....	2.3-16
2.3.1.5	Site Characteristic Dry and Wet Bulb Temperatures .....	2.3-17
2.3.1.6	Restrictive Dispersion Conditions .....	2.3-19
2.3.1.7	Climate Changes .....	2.3-21
2.3.1.8	References .....	2.3-24
2.3.2	Local Meteorology .....	2.3-35
2.3.2.1	Data Sources .....	2.3-35
2.3.2.2	Normal, Mean, and Extreme Values of Meteorological Parameters .....	2.3-36
2.3.2.3	Topographic Description .....	2.3-42
2.3.2.4	Potential Influence of the Plant and Related Facilities on Meteorology .....	2.3-43
2.3.2.5	Current and Projected Site Air Quality .....	2.3-44
2.3.2.6	References .....	2.3-45
2.3.3	Meteorological Monitoring .....	2.3-119
2.3.3.1	General Monitoring Program Description .....	2.3-120
2.3.3.2	Meteorological Tower and Instrument Siting .....	2.3-121
2.3.3.3	Pre-Application Monitoring Phase .....	2.3-125
2.3.3.4	Preoperational Monitoring Phase .....	2.3-133
2.3.3.5	Operational Monitoring Phase .....	2.3-133
2.3.3.6	Meteorological Data .....	2.3-135
2.3.3.7	References .....	2.3-142
2.3.4	Short-Term Atmospheric Dispersion Estimates for Accident Releases .....	2.3-158

### ESP SSAR Overall Table of Contents (Cont.)

<u>Section</u>	<u>Title</u>	<u>Page</u>
2.3.4.1	Basis .....	2.3-158
2.3.4.2	Offsite Dispersion Estimates (PAVAN Modeling Results) .....	2.3-160
2.3.4.3	References .....	2.3-161
2.3.5	Long-Term Atmospheric Dispersion Estimates for Routine Releases .....	2.3-167
2.3.5.1	Basis .....	2.3-167
2.3.5.2	Summary of Calculation Results .....	2.3-169
2.3.5.3	References .....	2.3-169
2.4	Hydrologic Engineering .....	2.4.1-1
2.4.1	Hydrologic Description .....	2.4.1-1
2.4.1.1	Site and Facilities .....	2.4.1-1
2.4.1.2	Hydrosphere .....	2.4.1-2
2.4.1.3	References .....	2.4.1-10
2.4.2	Floods .....	2.4.2-1
2.4.2.1	Flood History .....	2.4.2-1
2.4.2.2	Flood Design Considerations .....	2.4.2-3
2.4.2.3	Effects of Local Intense Precipitation .....	2.4.2-4
2.4.2.4	References .....	2.4.2-5
2.4.3	Probable Maximum Flood on Streams and Rivers .....	2.4.3-1
2.4.3.1	Probable Maximum Precipitation .....	2.4.3-5
2.4.3.2	Precipitation Losses .....	2.4.3-6
2.4.3.3	Runoff and Stream Course Models .....	2.4.3-6
2.4.3.4	Probable Maximum Flood Flow .....	2.4.3-11
2.4.3.5	Water Level Determinations .....	2.4.3-13
2.4.3.6	Coincident Wind Wave Activity .....	2.4.3-14
2.4.3.7	Probable Maximum Flood Water Level .....	2.4.3-14
2.4.3.8	References .....	2.4.3-15
2.4.4	Potential Dam Failures .....	2.4.4-1
2.4.4.1	Dam Failure Permutations .....	2.4.4-2
2.4.4.2	Unsteady Flow Analysis of Potential Dam Failures .....	2.4.4-4
2.4.4.3	Water Level at the VCS Site .....	2.4.4-14
2.4.4.4	References .....	2.4.4-16
2.4.5	Probable Maximum Surge and Seiche Flooding .....	2.4.5-1
2.4.5.1	Probable Maximum Winds and Associated Meteorological Parameters .....	2.4.5-1
2.4.5.2	Surge and Seiche Water Level .....	2.4.5-2
2.4.5.3	Wave Actions .....	2.4.5-11
2.4.5.4	Resonance .....	2.4.5-12
2.4.5.5	Protective Structures .....	2.4.5-12
2.4.5.6	References .....	2.4.5-13
2.4.6	Probable Maximum Tsunami Hazards .....	2.4.6-1
2.4.6.1	Probable Maximum Tsunami .....	2.4.6-1
2.4.6.2	Historical Tsunami Record .....	2.4.6-4
2.4.6.3	Source Generator Characteristics .....	2.4.6-6
2.4.6.4	Tsunami Analysis .....	2.4.6-16
2.4.6.5	Tsunami Water Levels .....	2.4.6-22
2.4.6.6	Hydrography and Harbor or Breakwater Influences on Tsunami .....	2.4.6-22

### ESP SSAR Overall Table of Contents (Cont.)

<u>Section</u>	<u>Title</u>	<u>Page</u>
2.4.6.7	Effects on Safety-Related Facilities .....	2.4.6-23
2.4.6.8	References .....	2.4.6-23
2.4.7	Ice Effects .....	2.4.7-1
2.4.7.1	Historical Ice Accumulation .....	2.4.7-1
2.4.7.2	High- and Low-Water Levels .....	2.4.7-2
2.4.7.3	Ice Sheet Formation .....	2.4.7-3
2.4.7.4	Ice-Induced Forces and Blockages .....	2.4.7-4
2.4.7.5	Consideration of Other Site-Related Evaluation Criteria .....	2.4.7-4
2.4.7.6	References .....	2.4.7-4
2.4.8	Cooling Water Canals and Reservoirs .....	2.4.8-1
2.4.8.1	Cooling Basin .....	2.4.8-1
2.4.8.2	Seiche in Cooling Basin .....	2.4.8-8
2.4.8.3	References .....	2.4.8-9
2.4.9	Channel Diversions .....	2.4.9-1
2.4.9.1	Historical Channel Diversions .....	2.4.9-1
2.4.9.2	Regional Topographic Evidence .....	2.4.9-2
2.4.9.3	Ice Causes .....	2.4.9-4
2.4.9.4	Flooding of Site Due to Channel Diversion .....	2.4.9-4
2.4.9.5	Human-Induced Causes of Channel Diversion .....	2.4.9-4
2.4.9.6	Alternate Water Sources .....	2.4.9-6
2.4.9.7	References .....	2.4.9-6
2.4.10	Flooding Protection Requirements .....	2.4.10-1
2.4.11	Low Water Considerations .....	2.4.11-1
2.4.11.1	Low Flow in Rivers and Streams .....	2.4.11-2
2.4.11.2	Low Water Resulting from Surges, Seiches, or Tsunamis .....	2.4.11-4
2.4.11.3	Historical Low Water .....	2.4.11-4
2.4.11.4	Future Controls .....	2.4.11-5
2.4.11.5	Plant Requirements .....	2.4.11-5
2.4.11.6	Heat Sink Dependability Requirements .....	2.4.11-6
2.4.11.7	References .....	2.4.11-6
2.4.12	Groundwater .....	2.4.12-1
2.4.12.1	Description and Onsite Use .....	2.4.12-1
2.4.12.2	Groundwater Sources .....	2.4.12-14
2.4.12.3	Subsurface Pathways .....	2.4.12-31
2.4.12.4	Monitoring or Safeguard Requirements .....	2.4.12-52
2.4.12.5	Site Characteristics for Subsurface Hydrostatic Loading .....	2.4.12-53
2.4.12.6	References .....	2.4.12-54
2.4.12-A	Texas Water Development Board Well Locations .....	2.4.12-A-1
2.4.12-B	Record of Wells by County .....	1
2.4.12-C	Groundwater Flow Model for the Victoria County Station Site, Texas .....	2.4.12-C-1
2.4.13	Accidental Releases of Radioactive Liquid Effluents in Ground and Surface Waters .....	2.4.13-1
2.4.13.1	Accident Scenario .....	2.4.13-1
2.4.13.2	Conceptual Model .....	2.4.13-2
2.4.13.3	Radionuclide Transport Analysis .....	2.4.13-3

### ESP SSAR Overall Table of Contents (Cont.)

<u>Section</u>	<u>Title</u>	<u>Page</u>
2.4.13.4	Compliance with 10 CFR 20 .....	2.4.13-7
2.4.13.5	Releases to Surface Water .....	2.4.13-8
2.4.13.6	References .....	2.4.13-8
2.4.14	Technical Specifications and Emergency Operation Requirements .....	2.4.14-1
2.5	Geology, Seismology, and Geotechnical Engineering .....	2.5.1-1
2.5.1	Basic Geologic and Seismic Information .....	2.5.1-3
2.5.1.1	Regional Geology .....	2.5.1-4
2.5.1.2	Site Area Geology .....	2.5.1-64
2.5.1.3	References .....	2.5.1-102
2.5.1-A	Geophysical Cross Sections .....	2.5.1-A-1
2.5.2	Vibratory Ground Motion .....	2.5.2-1
2.5.2.1	Seismicity .....	2.5.2-2
2.5.2.2	Geologic and Tectonic Characteristics of the Site and Region .....	2.5.2-9
2.5.2.3	Correlation of Earthquake Activity with Seismic Sources .....	2.5.2-26
2.5.2.4	Probabilistic Seismic Hazard Analysis and Controlling Earthquakes .....	2.5.2-27
2.5.2.5	Seismic Wave Transmission Characteristics of the Site .....	2.5.2-52
2.5.2.6	Ground Motion Response Spectra .....	2.5.2-60
2.5.2.7	References .....	2.5.2-63
2.5.2-A	Computer Program: P-SHAKE .....	2.5.2-A-2
2.5.2-A-1	Description .....	2.5.2-A-2
2.5.2-A-2	Validation .....	2.5.2-A-2
2.5.2-A-3	Extent of Application .....	2.5.2-A-2
2.5.3	Surface Faulting .....	2.5.3-1
2.5.3.1	Geological, Seismological, and Geophysical Investigations .....	2.5.3-2
2.5.3.2	Geological Evidence, or Absence of Evidence, for Surface Deformation .....	2.5.3-4
2.5.3.3	Correlation of Earthquakes with Capable Tectonic Sources .....	2.5.3-6
2.5.3.4	Ages of Most Recent Deformation .....	2.5.3-6
2.5.3.5	Relationship of Tectonic Structures in the Site Area to Regional Tectonic Sources .....	2.5.3-11
2.5.3.6	Characterization of Capable Tectonic Sources .....	2.5.3-11
2.5.3.7	Designation of Zones of Quaternary Deformation in the Site Region .....	2.5.3-14
2.5.3.8	Potential for Tectonic or Non-Tectonic Deformation at the Site .....	2.5.3-14
2.5.3.9	References .....	2.5.3-16
2.5.4	Stability of Subsurface Materials and Foundations .....	2.5.4-1
2.5.4.1	Geologic Features .....	2.5.4-1
2.5.4.2	Properties of Subsurface Materials .....	2.5.4-2
2.5.4.3	Foundation Interfaces .....	2.5.4-34
2.5.4.4	Geophysical Surveys .....	2.5.4-34
2.5.4.5	Excavation and Backfill .....	2.5.4-41
2.5.4.6	Groundwater Conditions .....	2.5.4-49
2.5.4.7	Response of Soil and Rock to Dynamic Loading .....	2.5.4-51
2.5.4.8	Liquefaction Evaluation .....	2.5.4-56
2.5.4.9	Earthquake Site Characteristics .....	2.5.4-66

### ESP SSAR Overall Table of Contents (Cont.)

<u>Section</u>	<u>Title</u>	<u>Page</u>
2.5.4.10	Static Stability .....	2.5.4-66
2.5.4.11	Design Criteria .....	2.5.4-76
2.5.4.12	Techniques to Improve Subsurface Conditions .....	2.5.4-78
2.5.4.13	References .....	2.5.4-79
2.5.4-A	Supplemental Subsurface Investigation Evaluation .....	2.5.4-A-2
2.5.4-A-1	Supplemental Investigation Work; Updated Field and Laboratory Testing Summaries .....	2.5.4-A-2
2.5.4-A-2	Soil Strata Statistics and Subsurface Stratification .....	2.5.4-A-3
2.5.4-A-3	SPT Resistance (N) Value Statistics .....	2.5.4-A-4
2.5.4-A-4	CPT Parameter Statistics .....	2.5.4-A-5
2.5.4-A-5	Shear Wave Velocity Statistics .....	2.5.4-A-6
2.5.4-A-6	Derived Engineering Properties .....	2.5.4-A-7
2.5.4-A-7	Summary .....	2.5.4-A-9
2.5.5	Stability of Slopes .....	2.5.5-1
2.5.5.1	Slope Characteristics .....	2.5.5-1
2.5.5.2	Design Criteria and Analyses .....	2.5.5-12
2.5.5.3	Logs of Borings .....	2.5.5-24
2.5.5.4	Compacted Fill .....	2.5.5-24
2.5.5.5	References .....	2.5.5-30
2.5.5-A	Computer Software SLOPE/W and SEEP/W v.7.11 (Geo-Slope International, Ltd.) .....	2.5.5-A-1
<b>Chapter 3</b>	<b>Design of Structures, Components, Equipment, and Systems .....</b>	<b>3.5-1</b>
3.5.1.6	Aircraft Hazards .....	3.5-1
<b>Chapter 11</b>	<b>Radioactive Waste Management .....</b>	<b>11.2-1</b>
11.2.3	Liquid Radioactive Releases .....	11.2-1
11.2.3.1	Exposure Pathways .....	11.2-1
11.2.3.2	Liquid Pathway Doses .....	11.2-2
11.2.3.3	References .....	11.2-3
11.3.3	Gaseous Radioactive Releases .....	11.3-1
11.3.3.1	Exposure Pathways .....	11.3-1
11.3.3.2	Gaseous Pathway Doses .....	11.3-2
11.3.3.3	References .....	11.3-3
<b>Chapter 13</b>	<b>Conduct of Operations .....</b>	<b>13.3-1</b>
13.3	Emergency Planning .....	13.3-1
13.3.1	Physical Characteristics .....	13.3-2
13.3.1.1	Site Description .....	13.3-2
13.3.1.2	Area Population .....	13.3-3
13.3.2	Emergency Plan .....	13.3-3
13.3.3	Emergency Planning Zones .....	13.3-4
13.3.3.1	Plume Exposure Pathway .....	13.3-4
13.3.3.2	Ingestion Pathway .....	13.3-4
13.3.4	Evacuation Time Estimates .....	13.3-4
13.3.5	Contacts and Agreements .....	13.3-5

### ESP SSAR Overall Table of Contents (Cont.)

<u>Section</u>	<u>Title</u>	<u>Page</u>
13.3.6 References .....		13.3-6
13.6 Industrial Security .....		13.6-1
<b>Chapter 15 Accident Analysis .....</b>		<b>15-1</b>
15.1 Selection of Accidents .....		15-1
15.2 Evaluation Methodology .....		15-2
15.3 Source Terms .....		15-3
15.4 Radiological Consequences .....		15-3
15.5 References .....		15-4
<b>Chapter 17 Quality Assurance .....</b>		<b>17.1-1</b>
17.1 ESP Quality Assurance .....		17.1-1
17.1.1 References .....		17.1-1
17A Victoria County Station, Quality Assurance Program Description .....		17A-1