

**Clinch River Nuclear Site**

**Early Site Permit Application**

**PART 3**

**Environmental Report**

**Revision 2**

**TABLE OF CONTENTS**

	<b><u>PAGE</u></b>
<b>CHAPTER 1 INTRODUCTION TO THE ENVIRONMENTAL REPORT.....</b>	<b>1-1</b>
1.1 THE PROPOSED ACTION .....	1-1
1.1.1 Purpose and Need .....	1-1
1.1.2 Proposed Project .....	1-3
1.1.2.1 The Applicant and Owner .....	1-3
1.1.2.2 Site Location .....	1-4
1.1.2.3 Reactor Information .....	1-4
1.1.2.4 Cooling System Information.....	1-4
1.1.2.5 Transmission System Information.....	1-4
1.1.2.6 Preapplication Public Involvement.....	1-5
1.1.2.7 Construction Start Date.....	1-5
1.2 STATUS OF REVIEWS, APPROVALS AND CONSULTATIONS.....	1-5
1.2.1 ESP Issuance .....	1-6
1.2.2 Preconstruction, Construction, and Operation Activities .....	1-7
1.3 METHODOLOGY .....	1-7
1.4 REFERENCES.....	1-7
<b>CHAPTER 2 ENVIRONMENTAL DESCRIPTION.....</b>	<b>2.0-1</b>
2.1 SITE LOCATION.....	2.1-1
2.1.1 References.....	2.1-2
2.2 LAND.....	2.2-1
2.2.1 The Site and Vicinity .....	2.2-1
2.2.1.1 The Site.....	2.2-1
2.2.1.2 The Site Vicinity .....	2.2-4
2.2.2 The Region .....	2.2-6
2.2.3 Transmission Corridors and Offsite Areas .....	2.2-7
2.2.4 References.....	2.2-9
2.3 WATER.....	2.3.1-1
2.3.1 Hydrology.....	2.3.1-1
2.3.1.1 Surface Water .....	2.3.1-1
2.3.1.2 Groundwater .....	2.3.1-13
2.3.1.3 References.....	2.3.1-34
2.3.2 Water Use .....	2.3.2-1
2.3.2.1 Surface Water .....	2.3.2-1
2.3.2.2 Groundwater Use.....	2.3.2-3
2.3.2.3 References.....	2.3.2-7
2.3.3 Water Quality .....	2.3.3-1
2.3.3.1 Surface Water .....	2.3.3-1

**TABLE OF CONTENTS (CONTINUED)**

	<u>PAGE</u>
2.3.3.2	Groundwater ..... 2.3.3-9
2.3.3.3	References..... 2.3.3-13
Appendix 2.3-A	Oak Ridge Reservation Selected Bedrock Hydraulic Conductivity Test Results ..... 2.3-A-1
Appendix 2.3-B	Clinch River Breeder Reactor Project Packer Test Results ..... 2.3-B-1
Appendix 2.3-C	Vertical Hydraulic Gradients ..... 2.3-C-1
Appendix 2.3-D	Detailed Analytes Table..... 2.3-D-1
2.4	ECOLOGY ..... 2.4.1-1
2.4.1	Terrestrial Ecology ..... 2.4.1-1
2.4.1.1	Upland Habitats ..... 2.4.1-1
2.4.1.2	Wetland Habitats..... 2.4.1-5
2.4.1.3	Important Terrestrial Habitats ..... 2.4.1-10
2.4.1.4	Wildlife ..... 2.4.1-13
2.4.1.5	Important Terrestrial Species..... 2.4.1-17
2.4.1.6	Transmission Corridor Habitats and Species..... 2.4.1-26
2.4.1.7	References..... 2.4.1-27
2.4.2	Aquatic Ecology ..... 2.4.2-1
2.4.2.1	Aquatic Habitats..... 2.4.2-1
2.4.2.2	Important Aquatic Habitats..... 2.4.2-21
2.4.2.3	Important Aquatic Species ..... 2.4.2-21
2.4.2.4	References..... 2.4.2-31
2.5	SOCIOECONOMICS ..... 2.5.1-1
2.5.1	Demography ..... 2.5.1-1
2.5.1.1	Population Data by Sector ..... 2.5.1-1
2.5.1.2	Population Data by Political Jurisdiction ..... 2.5.1-2
2.5.1.3	Transient Population ..... 2.5.1-3
2.5.1.4	Total Permanent and Transient Populations..... 2.5.1-5
2.5.1.5	Population Density ..... 2.5.1-6
2.5.1.6	References..... 2.5.1-6
2.5.2	Community Characteristics ..... 2.5.2-1
2.5.2.1	Economy ..... 2.5.2-1
2.5.2.2	Transportation..... 2.5.2-3
2.5.2.3	Taxes ..... 2.5.2-8
2.5.2.4	Land Use..... 2.5.2-10
2.5.2.5	Aesthetics and Recreation ..... 2.5.2-12
2.5.2.6	Housing..... 2.5.2-16
2.5.2.7	Community Infrastructure and Public Services ..... 2.5.2-19
2.5.2.8	Education ..... 2.5.2-25

**TABLE OF CONTENTS (CONTINUED)**

	<b><u>PAGE</u></b>
2.5.2.9	References.....2.5.2-27
2.5.3	Historic Properties.....2.5.3-1
2.5.3.1	Cultural Resource Surveys .....2.5.3-2
2.5.3.2	Consultations with the State Historic Preservation Office and Native American Tribes.....2.5.3-7
2.5.3.3	Prehistoric Archaeological Sites .....2.5.3-8
2.5.3.4	Multicomponent Archaeological Sites .....2.5.3-9
2.5.3.5	Historic Archeological Sites .....2.5.3-10
2.5.3.6	Caves.....2.5.3-12
2.5.3.7	Historic Sites .....2.5.3-12
2.5.3.8	National Historic Parks.....2.5.3-25
2.5.3.9	Historic Cemeteries.....2.5.3-26
2.5.3.10	Traditional Cultural Properties .....2.5.3-26
2.5.3.11	References.....2.5.3-26
2.5.4	Environmental Justice.....2.5.4-1
2.5.4.1	Methodology .....2.5.4-1
2.5.4.2	Minority Populations.....2.5.4-2
2.5.4.3	Low-Income Populations.....2.5.4-4
2.5.4.4	Communities with Unique Characteristics .....2.5.4-5
2.5.4.5	Migrant Populations .....2.5.4-8
2.5.4.6	References.....2.5.4-9
2.6	GEOLOGY .....2.6-1
2.6.1	Geological Conditions .....2.6-1
2.6.1.1	Physiography .....2.6-1
2.6.1.2	Stratigraphy.....2.6-2
2.6.1.3	Structural Geology .....2.6-2
2.6.2	References.....2.6-3
2.7	METEOROLOGY AND AIR QUALITY .....2.7.1-1
2.7.1	Regional Climatology .....2.7.1-1
2.7.1.1	Data Sources .....2.7.1-1
2.7.1.2	Tennessee Climate Description .....2.7.1-1
2.7.1.3	CRN Site Regional Climate.....2.7.1-3
2.7.1.4	References.....2.7.1-6
2.7.2	Regional Air Quality .....2.7.2-1
2.7.2.1	Background Air Quality .....2.7.2-1
2.7.2.2	Projected Air Quality .....2.7.2-2
2.7.2.3	Restrictive Dispersion Conditions .....2.7.2-2

**TABLE OF CONTENTS (CONTINUED)**

	<u>PAGE</u>
2.7.2.4	References.....2.7.2-3
2.7.3	Severe Weather .....2.7.3-1
2.7.3.1	Thunderstorms, Hail and Lightning.....2.7.3-1
2.7.3.2	Extreme Winds.....2.7.3-1
2.7.3.3	Tornadoes.....2.7.3-2
2.7.3.4	Winter Storms .....2.7.3-3
2.7.3.5	Tropical Cyclones .....2.7.3-4
2.7.3.6	Droughts .....2.7.3-4
2.7.3.7	Heavy Fog.....2.7.3-4
2.7.3.8	References.....2.7.3-4
2.7.4	Local Meteorology.....2.7.4-1
2.7.4.1	Normal, Mean, and Extreme Values .....2.7.4-1
2.7.4.2	Topographic Description and Potential Modifications .....2.7.4-7
2.7.4.3	Potential Influence of Plant and its Facilities on Local Air Meteorology .....2.7.4-8
2.7.4.4	Global Climate Change.....2.7.4-8
2.7.4.5	References.....2.7.4-10
2.7.5	Short-Term Diffusion Estimates .....2.7.5-1
2.7.5.1	Purpose and Background .....2.7.5-1
2.7.5.2	Calculation Methodology and Assumptions .....2.7.5-1
2.7.5.3	Results and Conclusions .....2.7.5-5
2.7.6	Long-Term (Routine) Diffusion Estimates.....2.7.6-1
2.7.6.1	Calculation Methodology and Assumptions .....2.7.6-1
2.7.6.2	Complex Terrain Modeling Analysis .....2.7.6-3
2.7.6.3	Summary of XOQDOQ Results and Conclusions.....2.7.6-5
2.7.6.4	References.....2.7.6-6
2.8	NOISE .....2.8-1
2.8.1	References.....2.8-3
2.9	RELATED FEDERAL PROJECT ACTIVITIES.....2.9-1
2.9.1	TN 58/Bear Creek Road Modifications .....2.9-1
2.9.2	Barge Terminal Refurbishment.....2.9-2
2.9.3	69 kV Underground Transmission Line.....2.9-2
2.9.4	Summary.....2.9-2
2.9.5	References.....2.9-3
<b>CHAPTER 3 PLANT DESCRIPTION .....3.0-1</b>	
3.1	EXTERNAL APPEARANCE AND PLANT LAYOUT .....3.1-1
3.1.1	Site Description.....3.1-1
3.1.2	Power Plant Description.....3.1-1

**TABLE OF CONTENTS (CONTINUED)**

	<u>PAGE</u>
3.1.3	References..... 3.1-3
3.2	REACTOR POWER CONVERSION SYSTEM ..... 3.2-1
3.2.1	Reactor Description ..... 3.2-1
3.2.2	Engineered Safety Features ..... 3.2-2
3.2.3	Power Conversion Systems..... 3.2-2
3.3	PLANT WATER USE ..... 3.3-1
3.3.1	Water Consumption ..... 3.3-1
3.3.2	Water Treatment..... 3.3-2
3.3.3	References..... 3.3-2
3.4	COOLING SYSTEM..... 3.4-1
3.4.1	Description and Operational Modes..... 3.4-1
3.4.1.1	System Description ..... 3.4-1
3.4.1.2	Operational Modes..... 3.4-1
3.4.1.3	Heat Generated, Dissipated to the Atmosphere, and Released in Liquid Discharges..... 3.4-1
3.4.1.4	Water Source and Quantities of Water Withdrawn, Consumed, and Discharged ..... 3.4-2
3.4.2	Component Descriptions..... 3.4-2
3.4.2.1	Intake System ..... 3.4-2
3.4.2.2	Holding Pond ..... 3.4-3
3.4.2.3	Discharge..... 3.4-4
3.4.2.4	Heat Dissipation..... 3.4-4
3.4.2.5	Bypass Flow..... 3.4-4
3.4.3	References..... 3.4-5
3.5	RADIOACTIVE WASTE MANAGEMENT SYSTEM..... 3.5-1
3.5.1	Liquid Waste Management Subsystem ..... 3.5-1
3.5.2	Gaseous Radioactive Waste Management Subsystem..... 3.5-2
3.5.3	Solid Radioactive Waste Management Subsystem ..... 3.5-2
3.6	NON-RADIOACTIVE WASTE SYSTEM ..... 3.6-1
3.6.1	Effluents Containing Chemicals or Biocides ..... 3.6-1
3.6.2	Sanitary System Effluents..... 3.6-1
3.6.3	Other Effluents ..... 3.6-2
3.6.3.1	Gaseous Effluents..... 3.6-2
3.6.3.2	Liquid Effluents ..... 3.6-2
3.6.3.3	Solid Effluents ..... 3.6-3
3.6.4	References..... 3.6-4
3.7	POWER TRANSMISSION SYSTEM ..... 3.7-1

**TABLE OF CONTENTS (CONTINUED)**

	<b><u>PAGE</u></b>
3.7.1	Transmission System.....3.7-1
3.7.2	Transmission Line Corridors .....3.7-2
3.7.3	Transmission System Design Parameters .....3.7-3
3.7.3.1	500-kV Switchyard and 161-kV Switchyard .....3.7-3
3.7.3.2	500-kV Structures and Conductors .....3.7-3
3.7.3.3	161-kV Structures and Conductors .....3.7-3
3.7.3.4	Underground 69-kV Line .....3.7-4
3.7.3.5	General Methods of Construction Switchyard.....3.7-4
3.7.3.6	Transmission Line Tie-Ins and Relocation of the 161-kV Transmission Line .....3.7-5
3.7.3.7	69-kV Underground Transmission Line .....3.7-6
3.7.3.8	Description of Various Upgrading Activities .....3.7-6
3.7.4	Predicted Noise Levels from Transmission System Operations .....3.7-9
3.7.5	References.....3.7-9
3.8	TRANSPORTATION OF RADIOACTIVE MATERIALS .....3.8-1
3.8.1	Transportation of Unirradiated Fuel .....3.8-1
3.8.2	Transportation of Irradiated Fuel.....3.8-1
3.8.3	Transportation of Radioactive Waste .....3.8-2
3.9	CONSTRUCTION ACTIVITIES.....3.9-1
3.9.1	Construction Schedule.....3.9-1
3.9.2	Preconstruction Activities .....3.9-2
3.9.2.1	Clearing, Grubbing, and Spoils Management .....3.9-2
3.9.2.2	Connection to Existing Power Transmission Corridor.....3.9-2
3.9.2.3	Access Road .....3.9-3
3.9.2.4	Rail Siding and Barge Facility Improvements .....3.9-3
3.9.2.5	Preconstruction Security .....3.9-3
3.9.2.6	Temporary Construction Utilities .....3.9-4
3.9.2.7	Temporary Construction Facilities .....3.9-4
3.9.2.8	Power Block Earthwork (Excavation).....3.9-4
3.9.2.9	Cooling Towers and Makeup Water Supply Pipelines .....3.9-5
3.9.2.10	Potable Water Pipelines.....3.9-5
3.9.2.11	Dredging .....3.9-6
3.9.3	Construction Activities.....3.9-6
3.9.3.1	Reactor Service Building.....3.9-6
3.9.3.2	Radwaste Building .....3.9-7
3.9.3.3	Turbine Building .....3.9-7
3.9.3.4	Other Facilities .....3.9-7
3.9.4	Construction Equipment.....3.9-8
3.9.5	Construction Traffic and Scheduling .....3.9-8

**TABLE OF CONTENTS (CONTINUED)**

	<b><u>PAGE</u></b>
3.9.6 Noise.....	3.9-9
3.9.7 References.....	3.9-9
3.10 WORKFORCE CHARACTERIZATION.....	3.10-1
3.10.1 Construction Workforce Characterization.....	3.10-1
3.10.1.1 Preconstruction Activities Workforce.....	3.10-1
3.10.1.2 Construction Activities Workforce.....	3.10-1
3.10.2 Construction Worker Relocation and Commuting.....	3.10-2
3.10.3 Operations Workforce.....	3.10-3
3.10.4 Peak Overlap Workforce.....	3.10-3
3.10.5 References.....	3.10-4
<b>CHAPTER 4 ENVIRONMENTAL IMPACTS OF CONSTRUCTION.....</b>	<b>4.0-1</b>
4.1 LAND USE IMPACTS.....	4.1-1
4.1.1 The Site and Vicinity.....	4.1-1
4.1.1.1 The Site.....	4.1-1
4.1.1.2 The Vicinity.....	4.1-4
4.1.2 Transmission Corridors and Offsite Areas.....	4.1-5
4.1.3 Historic Properties.....	4.1-6
4.1.3.1 Prehistoric and Historic Archaeological Sites.....	4.1-10
4.1.3.2 Historic Structures.....	4.1-11
4.1.3.3 Cemeteries.....	4.1-11
4.1.3.4 Traditional Cultural Properties.....	4.1-11
4.1.4 References.....	4.1-12
4.2 WATER-RELATED IMPACTS.....	4.2-1
4.2.1 Hydrological Alterations.....	4.2-1
4.2.1.1 Surface Water.....	4.2-2
4.2.1.2 Groundwater.....	4.2-4
4.2.2 Water-Use Impacts.....	4.2-4
4.2.2.1 Surface Water.....	4.2-4
4.2.2.2 Groundwater.....	4.2-5
4.2.3 Water Quality Impacts.....	4.2-5
4.2.3.1 Surface Water.....	4.2-5
4.2.3.2 Groundwater.....	4.2-6
4.2.4 References.....	4.2-7
4.3 ECOLOGICAL IMPACTS.....	4.3-1
4.3.1 Impacts to Terrestrial Ecosystems.....	4.3-2
4.3.1.1 Upland Habitats.....	4.3-2
4.3.1.2 Wetland Habitats.....	4.3-4
4.3.1.3 Important Terrestrial Habitats.....	4.3-6
4.3.1.4 Wildlife.....	4.3-6



**TABLE OF CONTENTS (CONTINUED)**

	<u>PAGE</u>
4.3.1.5	Important Terrestrial Species.....4.3-8
4.3.1.6	Transmission Corridors.....4.3-10
4.3.1.7	Summary of Impacts to Terrestrial Ecosystems during Preconstruction and Construction.....4.3-11
4.3.2	Impacts to Aquatic Ecosystems.....4.3-12
4.3.2.1	Streams on the CRN Site and the Barge/Traffic Area.....4.3-13
4.3.2.2	Ponds on the CRN Site and the Barge/Traffic Area.....4.3-14
4.3.2.3	The Clinch River Arm of the Watts Bar Reservoir.....4.3-15
4.3.2.4	Important Aquatic Species and Habitats.....4.3-17
4.3.2.5	Transmission Corridors.....4.3-18
4.3.2.6	Summary of Impacts to Aquatic Ecosystems during Preconstruction and Construction.....4.3-19
4.3.3	References.....4.3-20
4.4	SOCIOECONOMIC IMPACTS.....4.4-1
4.4.1	Physical Impacts.....4.4-1
4.4.1.1	Noise and Vibration.....4.4-1
4.4.1.2	Air Quality.....4.4-5
4.4.2	Social and Economic Impacts.....4.4-7
4.4.2.1	Population and Housing.....4.4-7
4.4.2.2	Employment and Income.....4.4-9
4.4.2.3	Transportation.....4.4-10
4.4.2.4	Tax Revenues to Local Jurisdictions.....4.4-14
4.4.2.5	Land Use.....4.4-15
4.4.2.6	Aesthetics and Recreation.....4.4-17
4.4.2.7	Community Infrastructure and Services.....4.4-18
4.4.2.8	Education.....4.4-21
4.4.3	Environmental Justice Impacts.....4.4-22
4.4.3.1	Potential Physical Impacts.....4.4-23
4.4.3.2	Potential Socioeconomic Impacts.....4.4-24
4.4.4	References.....4.4-25
4.5	RADIATION EXPOSURE TO CONSTRUCTION WORKERS.....4.5-1
4.5.1	Site Layout.....4.5-1
4.5.2	Radiation Sources.....4.5-1
4.5.2.1	Direct Radiation.....4.5-2
4.5.2.2	Gaseous Effluents.....4.5-2
4.5.2.3	Liquid Effluents.....4.5-3
4.5.3	Construction Worker Dose Rates.....4.5-3
4.5.3.1	Direct Radiation.....4.5-3
4.5.3.2	Gaseous Effluents.....4.5-3

**TABLE OF CONTENTS (CONTINUED)**

	<u>PAGE</u>
4.5.3.3 Liquid Effluents .....	4.5-4
4.5.4 Construction Worker Dose Estimates .....	4.5-4
4.5.4.1 Direct Radiation .....	4.5-5
4.5.4.2 Gaseous Effluents.....	4.5-5
4.5.4.3 Liquid Effluents .....	4.5-5
4.5.4.4 Workforce Dose .....	4.5-5
4.5.5 Compliance with Dose Regulations .....	4.5-6
4.5.6 Summary of Radiation Exposure to Construction Workers.....	4.5-7
4.5.7 References.....	4.5-7
4.6 MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS DURING CONSTRUCTION .....	4.6-1
4.7 CUMULATIVE IMPACTS RELATED TO CONSTRUCTION ACTIVITIES .....	4.7-1
4.7.1 Contributors to Cumulative Effects .....	4.7-1
4.7.1.1 Past, Present, and Reasonably Foreseeable Future Projects .....	4.7-1
4.7.1.2 Global Climate Change.....	4.7-2
4.7.2 Cumulative Land Use Impacts .....	4.7-2
4.7.3 Cumulative Water Impacts .....	4.7-5
4.7.3.1 Surface Water Hydrology Impacts .....	4.7-5
4.7.3.2 Water Use Impacts .....	4.7-6
4.7.3.3 Water-Quality Impacts .....	4.7-10
4.7.4 Cumulative Ecological Impacts .....	4.7-12
4.7.4.1 Terrestrial Ecology and Wetlands Impacts .....	4.7-13
4.7.4.2 Aquatic Ecology Impacts.....	4.7-17
4.7.5 Cumulative Socioeconomics and Environmental Justice Impacts .....	4.7-21
4.7.5.1 Socioeconomic Impacts .....	4.7-21
4.7.5.2 Environmental Justice Impacts .....	4.7-25
4.7.5.3 Historic Properties Impacts .....	4.7-26
4.7.6 Radiological Health Impacts .....	4.7-28
4.7.7 Nonradiological Health Impacts .....	4.7-30
4.7.8 References.....	4.7-31
<b>CHAPTER 5 ENVIRONMENTAL IMPACTS OF STATION OPERATION .....</b>	<b>5.0-1</b>
5.1 LAND USE IMPACTS .....	5.1-1
5.1.1 The Site and Vicinity .....	5.1-1
5.1.1.1 The Site.....	5.1-1
5.1.1.2 The Vicinity .....	5.1-2
5.1.2 Transmission Corridors and Offsite Areas .....	5.1-2
5.1.3 Historic Properties.....	5.1-2
5.1.3.1 Prehistoric and Historic Archaeological Sites .....	5.1-3
5.1.3.2 Historic Structures.....	5.1-4

**TABLE OF CONTENTS (CONTINUED)**

	<u>PAGE</u>
5.1.3.3 Cemeteries.....	5.1-4
5.1.3.4 Traditional Cultural Properties .....	5.1-4
5.1.4 References.....	5.1-4
5.2 WATER-RELATED IMPACTS .....	5.2-1
5.2.1 Hydrology Alterations and Plant Water Supply .....	5.2-1
5.2.1.1 Hydrologic Setting.....	5.2-1
5.2.1.2 Impacts of Facility Operations on Hydrology .....	5.2-2
5.2.1.3 Sufficiency of Water Supply for Facility Operations .....	5.2-5
5.2.2 Water Use Impacts .....	5.2-5
5.2.2.1 Water Availability .....	5.2-5
5.2.2.2 Water Quality .....	5.2-7
5.2.3 References.....	5.2-8
5.3 COOLING SYSTEM IMPACTS .....	5.3-1
5.3.1 Intake System .....	5.3-1
5.3.1.1 Hydrodynamic Description and Physical Impacts .....	5.3-1
5.3.1.2 Aquatic Ecosystems.....	5.3-2
5.3.2 Discharge System.....	5.3-5
5.3.2.1 Thermal Discharges and Other Physical Impacts.....	5.3-5
5.3.2.2 Aquatic Ecosystems.....	5.3-11
5.3.3 Heat Discharge System .....	5.3-12
5.3.3.1 Heat Dissipation to the Atmosphere .....	5.3-12
5.3.3.2 Terrestrial Ecosystems .....	5.3-19
5.3.4 Impacts to Members of the Public.....	5.3-22
5.3.4.1 Etiologic Agent (Microorganism) Impacts .....	5.3-22
5.3.4.2 Noise.....	5.3-26
5.3.5 References.....	5.3-27
5.4 RADIOLOGICAL IMPACTS OF NORMAL OPERATION.....	5.4-1
5.4.1 Exposure Pathways .....	5.4-1
5.4.1.1 Liquid Pathways.....	5.4-2
5.4.1.2 Gaseous Pathways .....	5.4-3
5.4.1.3 Direct Radiation from SMRs .....	5.4-3
5.4.2 Radiation Dose Modeling.....	5.4-3
5.4.2.1 Liquid Pathways.....	5.4-4
5.4.2.2 Gaseous Pathways.....	5.4-5
5.4.3 Impacts to Members of the Public.....	5.4-6
5.4.4 Impacts to Biota Other than Members of the Public .....	5.4-7
5.4.5 Occupational Doses.....	5.4-9
5.4.6 References.....	5.4-9

**TABLE OF CONTENTS (CONTINUED)**

	<b><u>PAGE</u></b>
5.5 ENVIRONMENTAL IMPACTS OF WASTE.....	5.5-1
5.5.1 Nonradioactive-Waste-System Impacts.....	5.5-1
5.5.1.1 Impacts of Discharges to Water.....	5.5-1
5.5.1.2 Impacts of Discharges to Land.....	5.5-2
5.5.1.3 Impacts of Discharges to Air.....	5.5-3
5.5.1.4 Sanitary Waste.....	5.5-3
5.5.2 Hazardous and Mixed Waste Impacts.....	5.5-4
5.5.2.1 Plant Systems Producing Hazardous and Mixed Waste.....	5.5-4
5.5.2.2 Hazardous and Mixed Waste Storage and Disposal.....	5.5-5
5.5.2.3 Waste Minimization Plan.....	5.5-5
5.5.2.4 Environmental Impacts of Hazardous and Mixed Waste.....	5.5-6
5.5.3 References.....	5.5-6
5.6 TRANSMISSION SYSTEM IMPACTS.....	5.6-1
5.6.1 Impacts to Terrestrial Ecosystems.....	5.6-2
5.6.2 Impacts to Aquatic Ecosystems.....	5.6-3
5.6.3 Impacts to Members of the Public.....	5.6-5
5.6.3.1 Electromagnetic Field Exposure.....	5.6-5
5.6.3.2 Electrical Shock.....	5.6-5
5.6.3.3 Noise.....	5.6-6
5.6.3.4 Radio and Television Interference.....	5.6-7
5.6.3.5 Visual Impacts.....	5.6-7
5.6.4 References.....	5.6-8
5.7 URANIUM FUEL CYCLE AND TRANSPORTATION IMPACTS.....	5.7-1
5.7.1 Uranium Fuel Cycle Impacts.....	5.7-1
5.7.1.1 Land Use.....	5.7-4
5.7.1.2 Water Use.....	5.7-5
5.7.1.3 Fossil Fuel Effects.....	5.7-6
5.7.1.4 Chemical Effluents.....	5.7-7
5.7.1.5 Radioactive Effluents.....	5.7-7
5.7.1.6 Radioactive Wastes.....	5.7-9
5.7.1.7 Occupational Dose.....	5.7-10
5.7.1.8 Transportation.....	5.7-10
5.7.1.9 Summary.....	5.7-10
5.7.2 Transportation of Radioactive Materials.....	5.7-10
5.7.2.1 Transportation Assessment.....	5.7-11
5.7.2.2 Incident-Free Transportation Impact Analysis.....	5.7-15
5.7.2.3 Summary.....	5.7-18
5.7.3 References.....	5.7-19

**TABLE OF CONTENTS (CONTINUED)**

	<b><u>PAGE</u></b>
5.8	SOCIOECONOMIC IMPACTS ..... 5.8-1
5.8.1	Physical Impacts of Station Operation ..... 5.8-1
5.8.1.1	Noise ..... 5.8-1
5.8.1.2	Air Quality ..... 5.8-3
5.8.1.3	Thermal Emissions ..... 5.8-6
5.8.1.4	Visual Intrusions ..... 5.8-8
5.8.2	Social and Economic Impacts of Station Operation ..... 5.8-12
5.8.2.1	Population and Housing ..... 5.8-12
5.8.2.2	Employment and Income ..... 5.8-15
5.8.2.3	Transportation ..... 5.8-17
5.8.2.4	Tax Revenues to Local Jurisdictions ..... 5.8-19
5.8.2.5	Land Use ..... 5.8-20
5.8.2.6	Recreation ..... 5.8-22
5.8.2.7	Community Infrastructure and Services ..... 5.8-22
5.8.2.8	Education ..... 5.8-27
5.8.3	Environmental Justice Impacts ..... 5.8-28
5.8.3.1	Potential Physical Impacts ..... 5.8-28
5.8.3.2	Potential Socioeconomic Impacts ..... 5.8-30
5.8.4	References ..... 5.8-31
5.9	DECOMMISSIONING IMPACTS ..... 5.9-1
5.9.1	NRC GEIS on Decommissioning of Nuclear Facilities ..... 5.9-1
5.9.2	Conclusions ..... 5.9-3
5.9.3	References ..... 5.9-3
5.10	MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS DURING OPERATION ..... 5.10-1
5.11	CUMULATIVE IMPACTS RELATED TO STATION OPERATION ..... 5.11-1
5.11.1	Past, Present, and Reasonably Foreseeable Future Projects ..... 5.11-1
5.11.2	Cumulative Land Use Impacts ..... 5.11-1
5.11.3	Cumulative Water Impacts ..... 5.11-3
5.11.3.1	Surface Water Hydrology Impacts ..... 5.11-3
5.11.3.2	Water Use Impacts ..... 5.11-4
5.11.3.3	Water Quality Impacts ..... 5.11-7
5.11.4	Cumulative Ecological Impacts ..... 5.11-9
5.11.4.1	Terrestrial Ecology and Wetlands Impacts ..... 5.11-10
5.11.4.2	Aquatic Ecology Impacts ..... 5.11-11
5.11.5	Cumulative Socioeconomics and Environmental Justice Impacts ..... 5.11-15
5.11.5.1	Socioeconomic Impacts ..... 5.11-15
5.11.5.2	Environmental Justice Impacts ..... 5.11-21
5.11.6	Cumulative Historic Properties Impacts ..... 5.11-23

**TABLE OF CONTENTS (CONTINUED)**

	<b><u>PAGE</u></b>
5.11.7 Cumulative Impacts of Postulated Accidents.....	5.11-24
5.11.7.1 Cumulative Fuel Cycle, Transportation and Decommissioning Impacts .....	5.11-25
5.11.8 Radiological Health Impacts .....	5.11-28
5.11.9 Nonradiological Health Impacts .....	5.11-30
5.11.10 References.....	5.11-32
 <b>CHAPTER 6 ENVIRONMENTAL MEASUREMENTS AND MONITORING PROGRAMS ....6.0-1</b>	
6.1 THERMAL MONITORING.....	6.1-1
6.1.1 Site Preparation Thermal Monitoring .....	6.1-1
6.1.2 Construction and Preoperational Thermal Monitoring .....	6.1-3
6.1.3 Operational Thermal Monitoring .....	6.1-3
6.1.4 References.....	6.1-4
6.2 RADIOLOGICAL MONITORING .....	6.2-1
6.2.1 Introduction .....	6.2-1
6.2.2 Radiological Environmental Monitoring Programs .....	6.2-1
6.2.2.1 Pathways Monitored .....	6.2-2
6.2.2.2 Land Use Census .....	6.2-3
6.2.3 Quality Assurance Program .....	6.2-3
6.2.4 References.....	6.2-4
6.3 HYDROLOGICAL MONITORING .....	6.3-1
6.3.1 Site Preparation Monitoring .....	6.3-1
6.3.1.1 Surface Water .....	6.3-1
6.3.1.2 Groundwater .....	6.3-2
6.3.2 Construction and Preoperational Monitoring.....	6.3-3
6.3.2.1 Surface Water .....	6.3-3
6.3.2.2 Groundwater .....	6.3-3
6.3.3 Operational Monitoring.....	6.3-4
6.3.4 References.....	6.3-4
6.4 METEOROLOGICAL MONITORING .....	6.4-1
6.4.1 Historical Data Collection at the CRN Site.....	6.4-1
6.4.2 Site Preparation Monitoring .....	6.4-2
6.4.2.1 General Site Description .....	6.4-2
6.4.2.2 Meteorological Tower Description, Location, and Exposure.....	6.4-2
6.4.2.3 Potential Obstructions Surrounding Meteorological Tower.....	6.4-3
6.4.2.4 Meteorological Measurements.....	6.4-5
6.4.2.5 Meteorological Sensor Orientation.....	6.4-7
6.4.2.6 Data Recording .....	6.4-7
6.4.2.7 Meteorological Data Analysis Procedure .....	6.4-9
6.4.2.8 Instrument Calibration and Maintenance .....	6.4-9

**TABLE OF CONTENTS (CONTINUED)**

	<b><u>PAGE</u></b>
6.4.2.9 System Accuracy .....	6.4-10
6.4.3 Operational Monitoring.....	6.4-11
6.4.4 References.....	6.4-11
<b>6.5 ECOLOGICAL MONITORING .....</b>	<b>6.5-1</b>
6.5.1 Terrestrial Ecology and Land Use.....	6.5-1
6.5.1.1 Site Preparation Monitoring .....	6.5-1
6.5.1.2 Construction, Preoperational, and Operational Monitoring .....	6.5-2
6.5.2 Aquatic Ecology .....	6.5-3
6.5.2.1 Site Preparation Monitoring .....	6.5-3
6.5.2.2 Construction Monitoring .....	6.5-5
6.5.2.3 Preoperational and Operational Monitoring .....	6.5-5
6.5.3 References.....	6.5-6
<b>6.6 CHEMICAL MONITORING .....</b>	<b>6.6-1</b>
6.6.1 Site Preparation Monitoring .....	6.6-1
6.6.1.1 Surface Water Monitoring .....	6.6-1
6.6.1.2 Groundwater Monitoring .....	6.6-5
6.6.2 Construction and Preoperational Monitoring.....	6.6-6
6.6.2.1 Surface Water Monitoring .....	6.6-6
6.6.2.2 Groundwater Monitoring .....	6.6-7
6.6.3 Operational Monitoring.....	6.6-7
6.6.3.1 Surface Water Monitoring .....	6.6-7
6.6.3.2 Groundwater Monitoring .....	6.6-7
6.6.4 References.....	6.6-8
<b>6.7 SUMMARY OF MONITORING PROGRAMS.....</b>	<b>6.7-1</b>
6.7.1 Site Preparation and Construction Monitoring .....	6.7-1
6.7.2 Preoperational Monitoring.....	6.7-3
6.7.3 Operational Monitoring.....	6.7-4
<b>CHAPTER 7 ENVIRONMENTAL IMPACTS OF POSTULATED ACCIDENTS INVOLVING RADIOACTIVE MATERIALS .....</b>	<b>7.0-1</b>
<b>7.1 DESIGN BASIS ACCIDENTS .....</b>	<b>7.1-1</b>
7.1.1 Accident Selection .....	7.1-1
7.1.2 Source Term .....	7.1-2
7.1.3 Evaluation Methodology and Conclusions .....	7.1-3
7.1.4 References.....	7.1-3
<b>7.2 SEVERE ACCIDENTS .....</b>	<b>7.2-1</b>
7.2.1 Methodology .....	7.2-1
7.2.2 TVA Methodology .....	7.2-3

**TABLE OF CONTENTS (CONTINUED)**

	<u>PAGE</u>
7.2.3 Consequences to Population Groups .....	7.2-4
7.2.3.1 Air Pathways .....	7.2-4
7.2.3.2 Surface Water Pathways .....	7.2-5
7.2.3.3 Groundwater Pathways.....	7.2-6
7.2.4 Health Risks .....	7.2-6
7.2.5 Conclusions .....	7.2-7
7.2.6 References.....	7.2-7
7.3 SEVERE ACCIDENT MITIGATION ALTERNATIVES .....	7.3-1
7.4 TRANSPORTATION ACCIDENTS .....	7.4-1
7.4.1 Radiological Impacts .....	7.4-2
7.4.1.1 Transportation of Unirradiated Fuel .....	7.4-3
7.4.1.2 Transportation of Irradiated Fuel.....	7.4-3
7.4.1.3 Transportation of Radioactive Waste .....	7.4-6
7.4.2 Non-Radiological Impacts .....	7.4-7
7.4.2.1 Transportation of Unirradiated Fuel .....	7.4-7
7.4.2.2 Transportation of Irradiated Fuel.....	7.4-8
7.4.2.3 Transportation of Radioactive Waste .....	7.4-8
7.4.2.4 Comparison to 10 CFR 51.52 Table S-4.....	7.4-8
7.4.3 Summary and Conclusion .....	7.4-9
7.4.4 References.....	7.4-9
<b>CHAPTER 8 NEED FOR POWER .....</b>	<b>8-1</b>
<b>CHAPTER 9 ALTERNATIVES .....</b>	<b>9.0-1</b>
9.1 NO-ACTION ALTERNATIVE .....	9.1-1
9.1.1 References.....	9.1-2
9.2 ENERGY ALTERNATIVES .....	9.2-1
9.3 ALTERNATIVE SITES .....	9.3-1
9.3.1 Identification of Candidate Areas .....	9.3-3
9.3.2 Identification of Potential Sites .....	9.3-3
9.3.3 Evaluation of Potential Sites and Identification of Candidates Sites .....	9.3-4
9.3.4 Alternative Site Review .....	9.3-5
9.3.4.1 Environmental Criteria .....	9.3-6
9.3.4.2 Cumulative Impacts .....	9.3-64
9.3.5 Conclusions .....	9.3-102



**TABLE OF CONTENTS (CONTINUED)**

	<u>PAGE</u>
9.3.6	References.....9.3-104
9.4	ALTERNATIVE PLANT SYSTEMS.....9.4-1
9.4.1	Heat Dissipation Systems.....9.4-1
9.4.1.1	Proposed Heat Dissipation System.....9.4-1
9.4.1.2	Screening of Alternatives to the Proposed Heat Dissipation System.....9.4-1
9.4.2	Circulating Water Systems.....9.4-5
9.4.2.1	Proposed Circulating Water System.....9.4-6
9.4.2.2	Alternatives to the Proposed Circulating Water System.....9.4-7
9.4.2.3	Water Treatment.....9.4-15
9.4.3	Transmission Systems.....9.4-16
9.4.4	References.....9.4-16
<b>CHAPTER 10 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION ..... 10-1</b>	
10.1	UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS..... 10-1
10.1.1	Unavoidable Adverse Environmental Impacts during Construction and Preconstruction..... 10-1
10.1.2	Unavoidable Adverse Environmental Operational Impacts..... 10-4
10.2	IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES ..... 10-6
10.2.1	Irreversible Environmental Commitments..... 10-6
10.2.1.1	Land Use..... 10-7
10.2.1.2	Aquatic and Terrestrial Biota..... 10-7
10.2.1.3	Historic Properties..... 10-7
10.2.1.4	Air and Water Resources..... 10-8
10.2.1.5	Socioeconomic Resources..... 10-8
10.2.1.6	Disposal of Non-hazardous, Hazardous, and Radioactive Waste ... 10-8
10.2.1.7	Uranium Fuel Cycle..... 10-8
10.2.2	Irretrievable Environmental Commitments..... 10-8
10.2.2.1	Construction and Irradiated Materials..... 10-9
10.2.2.2	Water Consumption..... 10-9
10.2.2.3	Consumption of Energy Used in Constructing the Reactors..... 10-9
10.2.2.4	Consumption of Uranium..... 10-10
10.3	RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY OF THE HUMAN ENVIRONMENT..... 10-10
10.4	BENEFIT-COST BALANCE..... 10-11
10.5	REFERENCES..... 10-11
APPENDIX A CONSULTATION	
APPENDIX B ENVIRONMENTAL PROTECTION PLAN	

**LIST OF TABLES**

Table 1.2-1	Consultations Required for Early Site Permit
Table 1.2-2	Authorizations Required for Preconstruction, Construction, and Operation Activities
Table 1.3-1	Environmental Report Responses to Early Site Permit Regulatory Requirements
Table 2.1-1	CRN Site Center Point in Longitude and Latitude (Decimal Degrees)
Table 2.1-2	CRN Site Center Point in Tennessee State Plane Projection (NAD27 UTM Zone 16 Meters)
Table 2.2-1	USGS Land-Use Categories for the CRN Site and Surrounding Areas
Table 2.2-2	1942 Soil Survey for Roane County, Tennessee
Table 2.2-3	2009 Soil Survey for Roane County, Tennessee
Table 2.3.1-1	Monthly Means of Estimated Pan Evaporation Computed from Meteorological Measurements Using a Form of the Penman Equation
Table 2.3.1-2	Summary of Hydrogeologic Properties on the ORR
Table 2.3.1-3	Well Construction Summary
Table 2.3.1-4	Horizontal Hydraulic Gradients
Table 2.3.1-5	Borehole Packer Test Results Summary
Table 2.3.1-6	Well Slug Test Results Summary
Table 2.3.1-7	CRN Constant Rate Aquifer Pumping Test Results
Table 2.3.1-8	Rock Effective Porosity Measurements on the Oak Ridge Reservation
Table 2.3.1-9	Representative Soil and Rock Properties Important to Radionuclide Transport
Table 2.3.1-10	Groundwater Linear Velocity and Travel Time
Table 2.3.2-1	Trends of Estimated Water Use in the Tennessee River Watershed 1995 to 2035
Table 2.3.2-2	2010 Surface Water Use in the Surface Water Review Area (mgd)
Table 2.3.2-3	Surface Water Withdrawals in Anderson, Knox, Loudon, Meigs, Morgan, Rhea, and Roane Counties
Table 2.3.2-4	Groundwater Withdrawals from Five Counties Surrounding the CRN by Use Category
Table 2.3.2-5	Summary of Nearby Water Systems Using Groundwater for Supply
Table 2.3.2-6	Nearby Public Water Systems Using Groundwater for Supply
Table 2.3.2-7	Characteristics of Individual Wells Located Within a 1.5-mile Radius of the CRN Site
Table 2.3.3-1	Surface Water Bodies near CRN Site listed in 2012 303(d)
Table 2.3.3-2	Maximum Concentrations for Quarterly Surface Water Samples at the CRN Site (July 2013; March, May, November 2014; and February, April, and June, 2015)
Table 2.3.3-3	Maximum Concentrations for Quarterly Stormwater Samples at the CRN Site (July 2013, and March, May, and November 2014)

**LIST OF TABLES (CONTINUED)**

Table 2.3.3-4	Analytical Results for Standard Water Quality Parameters and Chlorophyll a in Samples Collected Monthly March through December 2011 at CRM 15.5, 18.5, 19.7 and 22.0
Table 2.3.3-5	Concentrations of Total and Dissolved Metals in Water Samples Collected Bi-Monthly April through December 2011 at CRM 15.5, 18.5, 19.7 and 22.0
Table 2.3.3-6	Maximum Concentrations of Selected Metals in Water Samples Collected at CRM 15.5, 18.5, 19.7, and 22.0 and Respective Water Quality Criteria for the Protection of Fish and Aquatic Life
Table 2.3.3-7	Pesticide and PCB Concentrations in Sediments Collected at CRM's 15.5, 18.5, and 22.0 in 2011 and at Far-Field Locations (CRM 24.5, TRM 560.8, and TRM 532.5) in 2010 and 2011
Table 2.3.3-8	Metals Concentrations in Sediments Collected at CRM's 15.5, 18.5, and 22.0 in 2011 and at Far-Field Locations (CRM 24.5, TRM 560.8, and TRM 532.5) in 2010 and 2011
Table 2.3.3-9	Field Geochemical Results
Table 2.3.3-10	Laboratory Geochemical Results
Table 2.3.3-11	Baseline Range of Field Parameters for Groundwater
Table 2.3.3-12	Detailed Summary - Baseline Range of Field Parameters for Groundwater
Table 2.3.3-13	Baseline Groundwater Temperatures and Sample Depths
Table 2.3.3-14	Baseline Groundwater Summary
Table 2.3.3-15	Baseline Groundwater Summary Legacy Contaminants
Table 2.3.3-16	Baseline Groundwater Summary of Detected Analytes
Table 2.4.1-1	Vegetation/Land Cover Types, Percent Coverage, and Acreage on the CRN Site
Table 2.4.1-2	Plants Observed on the Clinch River Property (2011 and 2013) and Barge/Traffic Area (2015)
Table 2.4.1-3	Wetlands on the CRN Site and Barge/Traffic Area
Table 2.4.1-4	Animals Observed on the Clinch River Property (2011 to 2013) and Barge/Traffic Area (2014 to 2015)
Table 2.4.1-5	Terrestrial and Wetland Species with Federal or State Status and Recorded Occurrences in Roane County, Tennessee
Table 2.4.1-6	Habitats of Terrestrial and Wetland Species with State Status and Recorded Occurrences in Roane County, Tennessee
Table 2.4.1-7	Biological Resources in ROWs of Transmission System Line Segments to be Modified
Table 2.4.2-1	Fish Species Collected in 2011 Sampling During Four Seasons at Locations Upstream (CRM 18.5) and Downstream (CRM 15.0) of the CRN Site
Table 2.4.2-2	Summary of Reservoir Fish Assemblage Index (RFAI) Scores and Ecological Health Ratings

**LIST OF TABLES (CONTINUED)**

Table 2.4.2-3	Numbers and Percent Composition of Fish Eggs and Larvae Collected in Ichthyoplankton Samples from Upstream (CRM 18.0) and Downstream (CRM 15.5) of the CRN Site – February 2011 through January 2012
Table 2.4.2-4	Summary of Overall Reservoir Benthic Index (RBI) Scores and Ecological Health Ratings
Table 2.4.2-5	Water Bodies Documented on the CRN Site and Barge/Traffic Area
Table 2.4.2-6	Aquatic Species with Federal or State Status and Recorded Occurrences in Roane County, Tennessee
Table 2.5.1-1	Counties Wholly or Partially Within the 50-Mile Radius
Table 2.5.1-2	Projected Permanent Population for Each Sector 0 to 10 Miles (0 to 16 km)
Table 2.5.1-3	Projected Permanent Population for Each Sector 0 to 10 Miles (0 to 16 km)
Table 2.5.1-4	Projected Permanent Population for Each Sector 10 to 50 Miles (16 to 80 km)
Table 2.5.1-5	Projected Permanent Population for Each Sector 10 to 50 Miles (16 to 80 km)
Table 2.5.1-6	Historical and Projected Population
Table 2.5.1-7	Age and Gender Distribution, 2010
Table 2.5.1-8	Contributors to Transient Population within the 50-Mile (80 km) Region
Table 2.5.1-9	National and State Parks Within 50 Miles with Reported Visitor Data
Table 2.5.1-10	Peak Daily Projected Transient Population for Each Sector 0 to 50 Miles (0 to 80 km)
Table 2.5.1-11	Transient Workers Entering the 50-Mile Region, 2006-2010
Table 2.5.1-12	Description of Sparseness and Proximity Demographic Categories
Table 2.5.1-13	Generic Environmental Impact Statement Sparseness and Proximity Matrix
Table 2.5.2-1	Employment By Industry (2001 – 2011)
Table 2.5.2-2	Employment Trends (2001 – 2011)
Table 2.5.2-3	Top Employers Located in Anderson, Knox, Loudon, and Roane Counties, Tennessee
Table 2.5.2-4	Household Income Distribution in Communities Closest to Clinch River Site
Table 2.5.2-5	Per Capita Personal Income (2001 – 2011)
Table 2.5.2-6	Level of Service (LOS) Index
Table 2.5.2-7	Total Revenues for Anderson, Knox, Loudon, and Roane Counties FY 2010 through FY 2014
Table 2.5.2-8	Anderson, Knox, Loudon, and Roane County Tax Collections by Category
Table 2.5.2-9	Tennessee Property Tax Classes
Table 2.5.2-10	Appropriation of Tennessee State Funds for Fiscal Year 2012-2013

**LIST OF TABLES (CONTINUED)**

Table 2.5.2-11	TVA Tax Equivalent Payments to State of Tennessee and Counties FY 2011 through FY 2015
Table 2.5.2-12	Housing in Anderson, Knox, Loudon and Roane Counties, Tennessee
Table 2.5.2-13	Percent of Houses Built by Decade
Table 2.5.2-14	Temporary Housing at Recreational Sites
Table 2.5.2-15	Public Water Supply Systems and Capacities in Anderson, Knox, Loudon, and Roane Counties, Tennessee
Table 2.5.2-16	Public Wastewater Treatment Facilities in Anderson, Knox, Loudon, and Roane Counties, Tennessee
Table 2.5.2-17	Police Services
Table 2.5.2-18	Area Hospitals and Medical Centers
Table 2.5.2-19	Nursing Homes in Anderson, Knox, Loudon, and Roane Counties, Tennessee
Table 2.5.2-20	Public Schools in Anderson, Knox, Loudon, and Roane Counties, Tennessee
Table 2.5.2-21	Colleges and Universities within 50 Miles of the CRN Site
Table 2.5.2-22	Traffic Incident Rates in the Vicinity of the Clinch River Site (February 2008 to November 2012)
Table 2.5.3-1	Previously Recorded Aboveground Historic Properties Within a 10-Mile Radius of the CRN Site
Table 2.5.3-2	Prehistoric and Historic Archaeological Sites on and in the Vicinity of the CRN Site
Table 2.5.4-1	Minority and Low-Income Populations within 50-Mile Radius <sup>1</sup>
Table 2.5.4-2	Organizations Contacted to Identify Communities with Unique Characteristics
Table 2.5.4-3	Farms that Employ Migrant Labor in the Clinch River Nuclear Site Region, 2007
Table 2.7.1-1	Normal Temperatures (°F) Across Tennessee
Table 2.7.1-2	Normal Precipitation (inches) Across Tennessee
Table 2.7.1-3	Dry Bulb Temperatures at the Oak Ridge NWS and Knoxville NWS Stations
Table 2.7.1-4	Mean Wet Bulb Temperatures, Dew Point Temperatures and Relative Humidity at the Oak Ridge and Knoxville NWS Stations
Table 2.7.1-5	Wind Data for the Oak Ridge and Knoxville NWS Stations
Table 2.7.2-1	Tennessee County Nonattainment Areas
Table 2.7.2-2	Maintenance Areas in Tennessee
Table 2.7.3-1	Maximum Wind Speeds at Oak Ridge and Knoxville
Table 2.7.3-2	Tornadoes reported within 10 Miles of CRN Site (1950-2013)
Table 2.7.3-3	Extreme Snowfall for NWS Stations Around CRN
Table 2.7.4-1	Comparisons of Meteorological Tower Measurements

**LIST OF TABLES (CONTINUED)**

Table 2.7.4-2	CRN Site 10-Meter Joint Frequency Distribution by Wind Speed and Direction for All Stability Classes (April 21, 2011 through July 9, 2013)
Table 2.7.4-3	10-Meter Wind Direction (WD) Persistence for CRN
Table 2.7.4-4	Air Temperatures for the Knoxville NWS Station
Table 2.7.4-5	Air Temperatures for the Oak Ridge NWS Station
Table 2.7.4-6	CRN Site, Oak Ridge and Knoxville Mean Monthly Dry Bulb Temperatures
Table 2.7.4-7	Relative Humidity and Wet Bulb Temperatures for CRN Site (10-Meters), Oak Ridge NWS Station, and Knoxville NWS Station
Table 2.7.4-8	Historical Precipitation Data for the Oak Ridge NWS Station
Table 2.7.4-9	Precipitation at the Oak Ridge NWS Station During CRN Meteorological Sampling Period
Table 2.7.4-10	Oak Ridge NWS Station Precipitation by CRN Wind Direction
Table 2.7.4-11	Historical Snowfall (Inches) for the Knoxville and Oak Ridge NWS Stations
Table 2.7.4-12	Fog Occurrence for the Knoxville and Oak Ridge NWS Stations
Table 2.7.4-13	Pasquill Atmospheric Stabilities for CRN Site
Table 2.7.4-14	Frequency Distribution of Consecutive Hours of Inversion Conditions
Table 2.7.4-15	Average Mixing Height Data
Table 2.7.4-16	CRN Site Historical Meteorological Towers
Table 2.7.5-1	Classification of Atmospheric Stability
Table 2.7.5-2	Joint Frequency Distribution (Hours) of Wind Speed and Direction by Atmospheric Stability Class – Stability Class A June 1, 2011 to May 31, 2013
Table 2.7.5-3	Joint Frequency Distribution (Hours) of Wind Speed and Direction by Atmospheric Stability Class – Stability Class B June 1, 2011 to May 31, 2013
Table 2.7.5-4	Joint Frequency Distribution (Hours) of Wind Speed and Direction by Atmospheric Stability Class – Stability Class C June 1, 2011 to May 31, 2013
Table 2.7.5-5	Joint Frequency Distribution (Hours) of Wind Speed and Direction by Atmospheric Stability Class – Stability Class D June 1, 2011 to May 31, 2013
Table 2.7.5-6	Joint Frequency Distribution (Hours) of Wind Speed and Direction by Atmospheric Stability Class – Stability Class E June 1, 2011 to May 31, 2013
Table 2.7.5-7	Joint Frequency Distribution (Hours) of Wind Speed and Direction by Atmospheric Stability Class – Stability Class F June 1, 2011 to May 31, 2013

**LIST OF TABLES (CONTINUED)**

Table 2.7.5-8	Joint Frequency Distribution (Hours) of Wind Speed and Direction by Atmospheric Stability Class – Stability Class G June 1, 2011 to May 31, 2013
Table 2.7.5-9	Percent Occurrence for Each Wind Direction June 1, 2011 to May 31, 2013
Table 2.7.5-10	Percent in Each Stability Class June 1, 2011 to May 31, 2013
Table 2.7.5-11	Distances for the EAB and LPZ at the 16 Wind Direction Sectors
Table 2.7.5-12	PAVAN Modeling Inputs
Table 2.7.5-13	CRN Site SMR 50 Percent Probability Level X/Q Values
Table 2.7.6-1	List of Inputs used in the XOQDOQ Modeling
Table 2.7.6-2	CALPUFF Model Input Configuration for Complex Terrain Analysis
Table 2.7.6-3	Long-Term Average X/Q Values Estimated from XOQDOQ and CALPUFF at the EAB
Table 2.7.6-4	Long-Term Average X/Q Values Estimated from XOQDOQ and CALPUFF at the Low Population Zone (LPZ)
Table 2.7.6-5	CRN Offsite Receptor Locations
Table 2.7.6-6	Annual Average X/Q for No Decay, Undepleted for Specified Distances at Each Sector
Table 2.7.6-7	Annual Average X/Q for 2.26 Day Decay, Undepleted for Specified Distances at Each Sector
Table 2.7.6-8	Annual Average X/Q for 8 Day Decay, Depleted for Specified Distances at Each Sector
Table 2.7.6-9	Annual Average D/Q at Specified Distances for Each Sector
Table 2.7.6-10	X/Q and D/Q Values for No Decay, Decay, and Undepleted, at Each Receptor Location
Table 3.1-1	CRN Site Characteristics
Table 3.1-2	CRN Site Related Design Parameters
Table 3.5-1	CRN Site Projected Average Normal Liquid Radioactive Release
Table 3.5-2	Liquid Effluent Activities Per Reactor
Table 3.5-3	CRN Site Project Average Normal Gaseous Radioactive Release
Table 3.5-4	Gaseous Effluent Activities Per Reactor
Table 3.5-5	Projected Principal Radionuclides in Solid Radioactive Waste from the CRN Site
Table 3.6-1	Projected Blowdown Constituents and Concentrations
Table 3.6-2	Projected Maximum Annual Emissions from Auxiliary Boilers
Table 3.6-3	Projected Maximum Annual Emissions from Standby Diesel Generators
Table 3.6-4	Projected Standby Power System Gas Turbines Flue Gas Effluents
Table 3.7-1	Detailed Transmission Line Segment Information
Table 3.9-1	Anticipated Schedule for Construction and Operation of Two or More SMR Units at the CRN Site

**LIST OF TABLES (CONTINUED)**

Table 3.9-2	Peak and Attenuated Noise Levels Expected from Operation of Construction Equipment
Table 3.10-1	Estimated Percent of Onsite Construction Labor Force by Category
Table 3.10-2	Estimated Construction Workforce for a Projected Six-Year Construction Schedule (From Beginning of Site Preparation until Fuel Load of the Last Unit)
Table 3.10-3	Estimated Operations Workforce by Month for a Projected Six-Year Construction Schedule (From Beginning of Site Preparation until Fuel Load of the Last Unit)
Table 4.1-1	Land Cover Types to be Disturbed by Development on the CRN Site
Table 4.3-1	Land Cover Types to be Disturbed by Development on the CRN Site
Table 4.4-1	A-Weighted Sound Levels (dBA) of Construction Equipment and Modeled Attenuation at Various Distances
Table 4.4-2	Typical Emission Factors (grams/bhp-hr) for Construction-Related Equipment
Table 4.4-3	Emission Factors (grams/veh-mi) for Vehicles on Construction Site
Table 4.4-4	Summary of Overall LOS and Delay by Intersection
Table 4.4-5	Police Protection in the Four Counties of Interest, Adjusted for the Construction Workforce and Associated Population Increase
Table 4.4-6	Fire Protection in the Four Counties of Interest, Adjusted for the Construction Workforce and Associated Population Increase
Table 4.4-7	School Enrollments and Teacher/Student Ratios
Table 4.5-1	Total Doses to Construction Workers from All Units (mrem/yr)
Table 4.5-2	Compliance of Construction Worker Doses from All Units with 10 CFR 20.1301 Criteria
Table 4.5-3	Compliance of Construction Worker Doses from Each Unit with 10 CFR 50, Appendix I Criteria (mrem/yr)
Table 4.6-1	Summary of Measures and Controls to Limit Adverse Impacts During Construction
Table 4.6-2	Summary of Construction- and Preconstruction-Related Impacts for Safety-Related Structures, Systems, or Components
Table 4.7-1	Past, Present and Reasonably Foreseeable Future Projects and Other Actions Considered in the Cumulative Analysis of Oak Ridge Reservation
Table 5.3-1	Average annual densities of fish eggs and larvae (number/1000 m <sup>3</sup> ) collected at the upstream sample location (CRM 18.0) near the proposed intake for the CR SMR Project from February 2011 through January 2012
Table 5.3-2	Cooling Tower Design Inputs for SACTI Model
Table 5.3-3	Cooling Tower Droplet Mass Spectrum
Table 5.3-4	Water Deposition in kg/km <sup>2</sup> -mo
Table 5.3-5	Salt Deposition kg/km <sup>2</sup> -mo
Table 5.3-6	TDS Deposition kg/km <sup>2</sup> -mo



**LIST OF TABLES (CONTINUED)**

Table 5.3-7	Hours of Plume Shadowing
Table 5.3-8	Annual Plume Length Frequency
Table 5.4-1	Liquid Pathway Parameters – Aquatic Food and Activities
Table 5.4-2	Aquatic Food Consumption from Clinch River arm of Watts Bar Reservoir for 2067 Population within 50 Miles (kg/yr)
Table 5.4-3	Liquid Pathway Parameters
Table 5.4-4	Gaseous Pathway Parameters – GASPAR II Information
Table 5.4-5	Total Population Distribution Within 50 Miles of the CRN Site in 2067
Table 5.4-6	Food Production in Tennessee
Table 5.4-7	Vegetable, Milk, and Meat Production within 50 Miles in 2067
Table 5.4-8	Liquid Effluent Doses per Unit Units to MEI (mrem/yr)
Table 5.4-9	Liquid Effluent Doses from All Units to MEI (mrem/yr)
Table 5.4-10	Gaseous Effluent Doses per Unit to MEI
Table 5.4-11	Gaseous Effluent Doses from All Units to MEI
Table 5.4-12	Liquid Effluent Doses Per Unit to Population Within 50 Miles (person-rem/yr)
Table 5.4-13	Gaseous Effluent Dose Per Unit to Population Within 50 Miles (person-rem/yr)
Table 5.4-14	Gaseous Effluent Thyroid Doses Per Unit to MEI from Iodines and Particulates (mrem/yr)
Table 5.4-15	Compliance of MEI Annual Doses Per Unit with 10 CFR 50, Appendix I Criteria
Table 5.4-16	Compliance of MEI Doses from All Units with 40 CFR 190.10 Criteria (mrem/yr)
Table 5.4-17	Doses from All Units to Population Within 50 Miles (person-rem/yr)
Table 5.4-18	Liquid Effluent Doses from All Units to Biota
Table 5.4-19	Gaseous Effluent Doses from All Units to Biota
Table 5.4-20	Doses from All Units to Biota
Table 5.7-1	Scaling Factor - Reference Plant and CRN SMRs
Table 5.7-2	Uranium Fuel Cycle Environmental Data
Table 5.7-3	Whole Body 100-Year Dose Commitment Estimate
Table 5.7-4	Estimated 100-Year Environmental Dose Commitment from Mining and Milling for Each Year of Operation
Table 5.7-5	Radiation Exposure to the United States Population
Table 5.7-6	Number of Truck Shipments of Unirradiated Fuel
Table 5.7-7	Number of Radioactive Waste Shipments
Table 5.7-8	CRN Site SMR Comparisons to 10 CFR 51.52 Reference Conditions
Table 5.7-9	Total Shipment Cumulative Dose Summary
Table 5.8-1	Preliminary Annual Estimates for Criteria Pollutant Emissions from SMR-Supporting Fossil Fuel Fired Equipment

**LIST OF TABLES (CONTINUED)**

Table 5.8-2	Comparison of Life-Cycle CO <sub>2</sub> Equivalent Emissions for Different Energy Sources
Table 5.8-3	Law Enforcement Officers and Officer-to-Resident Ratios in Geographic Area of Interest
Table 5.8-4	Fire Fighters and Firefighter-to-Resident Ratios in Geographic Area of Interest
Table 5.8-5	School Enrollments and Teacher/Student Ratios in Geographic Area of Interest
Table 5.10-1	Summary of Measures and Controls to Limit Adverse Operational Impacts
Table 5.11-1	Geographic Areas of Interest Defined for the Analyzed Resource Areas
Table 5.11-2	Title V Operating Permit Sources In Roane, Anderson, Knox, Loudon, and Morgan Counties, Tennessee
Table 6.1-1	Description of Thermal Monitoring Locations and Data Collection
Table 6.2-1	Duration of Preoperational Program for Specific Media
Table 6.2-2	Potential Radiological Environmental Monitoring Program Sample Station Locations
Table 6.2-3	Site Preparation, Construction/Preoperational, and Operational Radiological Environmental Monitoring Program
Table 6.4-1	Onsite Meteorological Data Collection
Table 6.4-2	Data Recovery Rates for Combined Wind Speed and Direction
Table 6.4-3	Combined Wind Speed, Wind Direction, and Stability Class Data Recovery Rate at 10-Meters for June 1, 2011 through May 31, 2013
Table 6.4-4	Calibrations of Meteorological Sensors
Table 6.4-5	Meteorological System Accuracy Versus Specifications
Table 6.5-1	TVA Field Activities included in the Terrestrial Wildlife Site Preparation Monitoring Program
Table 6.6-1	Surface Water Analytical Parameters and Bottle Types
Table 6.6-2	Surface Water Quality Parameters, Reporting Limits, and Methods of Analysis
Table 6.6-3	Total and Dissolved Metals Analyses in Surface Water, Reporting Limits, and Methods
Table 6.6-4	Chemical Measurements in Sediments, Detection Limits, and Methods
Table 6.6-5	Groundwater Analytical Parameters
Table 6.6-6	Monitoring Wells Included in Sampling
Table 6.7-1	Summary of Monitoring Programs
Table 7.1-1	LOCA Bounding Design Basis Accident Atmospheric Radioactive Release (in Ci)
Table 7.1-2	CRN Site LOCA Doses
Table 7.2-1	Bounding CRN Site SMR Release Category Relative Frequencies
Table 7.2-2	Representative CRN Site SMR Chemical Group Assignment
Table 7.2-3	Representative CRN Site SMR Source Term Release Fractions

**LIST OF TABLES (CONTINUED)**

Table 7.2-4	Environmental Impacts with a 50-Mile Radius for Severe Accidents at CRN Site
Table 7.2-5	Comparison of Environmental Risks for the PPE with Risks for Current-Generation Reactors at Five Sites Evaluated in NUREG-1150
Table 7.2-6	Comparison of Environmental Risks from Severe Accidents for PPE with Risks for Current Nuclear Power Plants Undergoing Operating License Renewal Review
Table 7.4-1	CRN Site Model Accident, Fatality and Injury Rates
Table 7.4-2	CRN Site Model Irradiated Fuel Source Term
Table 7.4-3	CRN Site Model Severity and Release Fractions for Uncanistered Truck-Transported Fuel
Table 7.4-4	CRN Site Model Radiological Accident Analysis Results (per CRN Site operating year)
Table 7.4-5	CRN Site Model Non-Radiological Accident Analysis Results for Normalized Number of Shipments: Fatalities
Table 7.4-6	CRN Site Model Non-Radiological Accident Analysis Results for Normalized Number of Shipments: Injuries
Table 7.4-7	CRN Site Model Comparison to 10 CFR 51.52 Summary Table S-4: "Accidents in Transport" Bounding Technology Summary
Table 9.3-1	Summary of Preconstruction, Construction, and Operation Impact Evaluations for Environmental and Socioeconomic Criteria
Table 9.3-2	ORR Site 2 Land Use/Land Cover
Table 9.3-3	ORR Site 8 Land Use/Land Cover
Table 9.3-4	Redstone Arsenal 12 Land Use/Land Cover
Table 9.3-5	Minority and Low-Income Populations within Redstone Arsenal 12 50-Mile Radius
Table 9.3-6	Summary of Past, Present and Reasonably Foreseeable Future Projects Considered in the Cumulative Analysis of Redstone Arsenal
Table 9.3-7	Summary of Potential Cumulative Impacts of Construction and Operation to Environmental and Socioeconomic Criteria by Site
Table 9.4.2-1	Discharge Alternatives Evaluated to Attenuate Impact of SMR Blowdown
Table 9.4.2-2	Order-of-Magnitude Capital Costs and Notable O&M Impacts for Alternative Systems
Table 9.4.2-3	Assessment Summary of Discharge Alternatives
Table 10.1-1	Unavoidable Adverse Environmental Impacts from Construction and Preconstruction
Table 10.1-2	Operational-Related Unavoidable Adverse Environmental Impacts

## LIST OF FIGURES

Figure 1.1-1	CRN Site Location Map
Figure 2.1-1	CRN Site 50-Mile Regional Map
Figure 2.1-2	CRN Site 6-Mile Vicinity Map
Figure 2.1-3	CRN Site Layout
Figure 2.2-1	CRN Site Topographic Map
Figure 2.2-2	CRN Site Land Cover Types
Figure 2.2-3	CRN Site Prime Farmland Soils
Figure 2.2-4	CRN Site 6-Mile Vicinity Land Cover Map
Figure 2.2-5	CRN Site 50-Mile Regional Land Cover Map
Figure 2.2-6	CRN Site Vicinity Transmission Lines
Figure 2.2-7	Transmission Line Segments Requiring Upgrades
Figure 2.2-8	CRN Site Borrow Areas
Figure 2.2-9	CRN Site Flood Hazard Map
Figure 2.2-10	Transmission Segments Requiring Upgrades with Federal Lands, Parks, Wildlife Refuges, and Wilderness Areas
Figure 2.3.1-1	CRN Site Vicinity Water Resources
Figure 2.3.1-2	CRN Site Regional Water Resources
Figure 2.3.1-3	Melton Hill Dam Weekly Discharge Frequency
Figure 2.3.1-4	Operating Guide for Headwater Elevation at Watts Bar Dam
Figure 2.3.1-5	Daily Average Release from Melton Hill Dam
Figure 2.3.1-6	Percentile for Daily Average Release from Melton Hill Dam
Figure 2.3.1-7	Percentile for Hourly Average Release from Melton Hill Dam
Figure 2.3.1-8	Average Annual Frequency of No Release Events from Melton Hill Dam
Figure 2.3.1-9	WSEL Measurements at CR SMR and WBH, and Discharge Measurements at Melton Hill Dam
Figure 2.3.1-10	Headwater Elevation at Watts Bar Dam, Showing Max, Min, and Average Values of Daily Midnight Readings, 2004-2013
Figure 2.3.1-11	Hourly Water Temperature for Tailwater Below Melton Hill Dam
Figure 2.3.1-12	Daily Maximum, Minimum, and Average Hourly Water Temperature for Tailwater Below Melton Hill Dam
Figure 2.3.1-13	Percentile for Change in Hourly Water Temperature between CRM 16.1 and CRM 22.6/MHH Tailwater
Figure 2.3.1-14	CRN Site Bathymetry
Figure 2.3.1-15	Location Map - ORR and CRN Site
Figure 2.3.1-16	Geographic Regions of Tennessee
Figure 2.3.1-17	Preconstruction Topographic and Geologic Map and Cross-Section of the CRBRP Project
Figure 2.3.1-18	Current Site Topography and Observation Well Locations
Figure 2.3.1-19	CRBRP Fill and Excavation Areas
Figure 2.3.1-20	Cambrian and Ordovician Aquifers
Figure 2.3.1-21	Typical Cross-Section of the East Tennessee Aquifer System

**LIST OF FIGURES (CONTINUED)**

Figure 2.3.1-22	Site Area Hydrogeostratigraphy
Figure 2.3.1-23	ORR Vertical Flow Conceptualization
Figure 2.3.1-24	ORR Historic Bedrock Hydraulic Conductivity Test Data
Figure 2.3.1-25	ORR Aquifer Pumping Test Results
Figure 2.3.1-26	CRBRP Bedrock Packer Hydraulic Conductivity Tests
Figure 2.3.1-27	Groundwater Levels Adjacent to the Clinch River
Figure 2.3.1-28	Sole Source Aquifers in EPA Region IV
Figure 2.3.1-29	U.S. Geological Survey Regional Hydrograph
Figure 2.3.1-30	U.S. Geological Survey Hydrograph near the CRN Site
Figure 2.3.1-31	(Sheet 1 of 14) Hydrograph of OW-101 Well Cluster
Figure 2.3.1-31	(Sheet 2 of 14) Hydrograph of OW-202 Well Cluster
Figure 2.3.1-31	(Sheet 3 of 14) Hydrograph of OW-401 Well Cluster
Figure 2.3.1-31	(Sheet 4 of 14) Hydrograph of OW-409 Well Cluster
Figure 2.3.1-31	(Sheet 5 of 14) Hydrograph of OW-415 Well Cluster
Figure 2.3.1-31	(Sheet 6 of 14) Hydrograph of OW-416 Well Cluster
Figure 2.3.1-31	(Sheet 7 of 14) Hydrograph of OW-417 Well Cluster
Figure 2.3.1-31	(Sheet 8 of 14) Hydrograph of OW-418 Well Cluster
Figure 2.3.1-31	(Sheet 9 of 14) Hydrograph of OW-419 Well Cluster
Figure 2.3.1-31	(Sheet 10 of 14) Hydrograph of OW-420 Well Cluster
Figure 2.3.1-31	(Sheet 11 of 14) Hydrograph of OW-421 Well Cluster
Figure 2.3.1-31	(Sheet 12 of 14) Hydrograph of OW-423 Well Cluster
Figure 2.3.1-31	(Sheet 13 of 14) Hydrograph of OW-428 Well Cluster
Figure 2.3.1-31	(Sheet 14 of 14) Hydrograph of OW-429 Well Cluster
Figure 2.3.1-32	Bethel Valley Flow Conceptualization
Figure 2.3.1-33	Potentiometric Surface Map for September 24, 2013
Figure 2.3.1-34	Potentiometric Surface Map for December 20, 2013
Figure 2.3.1-35	Potentiometric Surface Map for January 13, 2014
Figure 2.3.1-36	Potentiometric Surface Map for March 16, 2014
Figure 2.3.1-37	Potentiometric Surface Map for May 15, 2014
Figure 2.3.1-38	Potentiometric Surface Map for August 18, 2014
Figure 2.3.1-39	Potentiometric Surface Map for November 4, 2014
Figure 2.3.1-40	Potentiometric Surface Map for February 12, 2015
Figure 2.3.1-41	Potentiometric Surface Map for May 19, 2015
Figure 2.3.1-42	Potentiometric Surface Map for August 10, 2015
Figure 2.3.1-43	Snapshot in Time Showing Equipotential Lines in the Vertical Plane Along the Strike of the Bedding Plane on June 13, 2014
Figure 2.3.1-44	Fracture Frequency Histogram
Figure 2.3.1-45	Example Acoustic Televiewer Geophysical Log
Figure 2.3.1-46	Clinch River Nuclear Borehole Packer Test Results Box and Whisker Plots

**LIST OF FIGURES (CONTINUED)**

Figure 2.3.1-47	Scatter Plot of Clinch River Nuclear Packer Test Hydraulic Conductivity Results with Depth
Figure 2.3.1-48	Slug Test Results for CRN Site
Figure 2.3.1-49	Comparison of Slug and Packer Test Results
Figure 2.3.2-1	Surface Water Intakes near the CRN Site in Anderson, Knox, Loudon, Meigs, Morgan, Rhea, and Roane Counties
Figure 2.3.2-2	Groundwater Use Study Areas
Figure 2.3.2-3	Groundwater Use by Category in the Groundwater Study Area for 2000, 2005, and 2010
Figure 2.3.2-4	Groundwater Intakes Near the CRN Site in Anderson, Knox, Loudon, and Roane Counties
Figure 2.3.2-5	Individual Well Locations Within a 1.5-mile Radius of the CRN Site
Figure 2.3.3-1	CRN Site Surface Water Monitoring Locations
Figure 2.3.3-2	Piper Trilinear Diagram
Figure 2.3.3-3	ORR Groundwater Contamination Map
Figure 2.4.1-1	Land Cover Types on the CRN Site
Figure 2.4.1-2	Streams, Ponds, and Wetlands on the CRN Site and Barge/Traffic Area
Figure 2.4.1-3	ORR Designated Areas in the Vicinity of the CRN Site
Figure 2.5.1-1	0 to 10 mile Population Sector Map
Figure 2.5.1-2	10 to 50 mile Population Sector Map
Figure 2.5.1-3	0 to 2 Mile Population Sector Map
Figure 2.5.2-1	Traffic Study Intersections Potentially Impacted by the Proposed Project
Figure 2.5.3-1	Prehistoric/Historic Archaeological Sites On and Adjacent to the Clinch River Property
Figure 2.5.3-2	NRHP-Listed Aboveground Historic Properties Within 10-Mile of the Center Point of the CRN Site
Figure 2.5.3-3	Previous Surveys On and Adjacent to the CR SMR APE
Figure 2.5.4-1	Minority Population Block Groups Within 50 Miles of the CRN Site
Figure 2.5.4-2	Low-Income Population Block Groups Within 50 Miles of the CRN Site
Figure 2.6-1	Map of Physiographic Provinces
Figure 2.6-2	Local Physiography
Figure 2.6-3	Geologic Cross Section of the CRN Site
Figure 2.6-4	CRN Site Geologic Map
Figure 2.7.1-1	Tennessee Meteorological Data Monitoring City Locations
Figure 2.7.1-2	Topographical Features Within 5 Miles of the CRN Site
Figure 2.7.1-3	Topographical Features Within 50 Miles of the CRN Site
Figure 2.7.2-1	Roane County Census Block Group PM2.5 Non-Attainment Area Relative to CRN Site
Figure 2.7.4-1	Wind Rose CRN Site 10-Meter January through December
Figure 2.7.4-2	Wind Rose CRN Site 60-Meter January through December

**LIST OF FIGURES (CONTINUED)**

Figure 2.7.4-3	Wind Rose Oak Ridge NWS 10 Years January through December
Figure 2.7.4-4	Clinch River Property Average 10-Meter Wind Direction (by Quarter)
Figure 2.7.4-5	Wind Rose CRN Site 10-Meter All Data
Figure 2.7.4-6	Wind Rose CRN Site 60-Meter All Data
Figure 2.7.4-7	Wind Rose Oak Ridge NWS 10 Years All Data
Figure 2.7.4-8	Concurrent Mean Dew Point Temperatures (Fahrenheit)
Figure 2.7.4-9	Concurrent Mean Wet Bulb Temperatures (Fahrenheit)
Figure 2.7.4-10	Topography in the Vicinity of the CRN Site
Figure 2.7.4-11	Effects of Topography on Wind Flow in the CRN Site Vicinity
Figure 2.7.4-12	Elevation Profiles 0 to 50 Miles from CRN Site
Figure 2.7.5-1	Effluent Release Boundary with Analytical EAB
Figure 2.7.5-2	Effluent Release Boundaries (ERBs), Analytical EAB, and Site EAB
Figure 2.7.5-3	Site Center Point and Distance to the LPZ
Figure 2.7.6-1	Location of Sensitive Receptors (Land Use Survey)
Figure 2.7.6-2	LPZ and Analytical EAB Distances Used for the Complex Terrain Analysis
Figure 2.8-1	Ambient Noise Measurement Locations
Figure 3.1-1	CRN Site Utilization Plan
Figure 3.1-2	CRN Site Cleared Areas
Figure 3.1-3	Architectural Rendering of the Clinch River SMR Surrogate Plant (Two Units) Superimposed on a Site Aerial (View to the Southeast)
Figure 3.3-1	CRN Site Water Use Diagram
Figure 3.4-1	Location Plan of Intake Structure
Figure 3.4-2	Conceptual Intake Structure Arrangement
Figure 3.4-3	Conceptual Plan View of Intake Structure
Figure 3.4-4	Conceptual Section View of Intake Structure
Figure 3.4-5	Conceptual Layout of Proposed Discharge Structure
Figure 3.7-1	CRN Site Transmission System
Figure 3.7-2	Transmission Systems in the Vicinity of the CRN Site
Figure 3.7-3	Typical TVA 500 kV Switchyard
Figure 3.7-4	Typical TVA 161 kV Switchyard
Figure 3.7-5	Typical TVA 500 kV Structure
Figure 3.7-6	Typical TVA 161 kV Transmission Structures
Figure 3.7-7	Transmission Line Segments Requiring Upgrades
Figure 3.10-1	Estimated Construction Workforce by Month
Figure 3.10-2	Estimated Operational Workforce by Month
Figure 3.10-3	Estimated Overlap Workforce by Month
Figure 4.1-1	Areas to be Cleared and Land Cover Disturbed on the CRN Site Vicinity
Figure 4.3-1	Areas to be Cleared and Land Cover Disturbed on the CRN Site and Barge/Traffic Area
Figure 4.4-1	Proposed Geometry

**LIST OF FIGURES (CONTINUED)**

Figure 4.7-1	Oak Ridge Reservation Past, Present and Reasonably Foreseeable Future Projects
Figure 5.3-1	River Flows for PPE Extreme Winter Conditions, Full Power
Figure 5.3-2	River Flows for PPE Extreme Summer Conditions, Full Power
Figure 5.3-3	Temperatures at 5-Foot Depth for PPE Extreme Winter Conditions, Full Power
Figure 5.3-4	Temperatures at 5-Foot Depth for PPE Extreme Summer Conditions, Full Power
Figure 5.3-5	Approximate Zone of Influence of SMR Thermal Effluent at Water Surface for PPE Extreme Winter Conditions, Full Power
Figure 5.3-6	Approximate Zone of Influence of SMR Thermal Effluent at Water Surface for PPE Extreme Summer Conditions, Full Power
Figure 5.8-1	CRN Site Key Observation Points
Figure 5.8-2	Baseline View from KOP 5
Figure 5.8-3	View From KOP 5 with the CR SMR Project
Figure 5.8-4	View From KOP 5 with the CR SMR Project and the Average Annual Plume
Figure 5.8-5	View From KOP 5 with the CR SMR Project and the Winter Plume
Figure 5.8-6	Baseline View From KOP 7
Figure 5.8-7	View From KOP 7 with the CR SMR Project
Figure 5.8-8	View From KOP 7 with the CR SMR Project and the Average Annual Plume
Figure 5.8-9	View From KOP 7 with the CR SMR Project and the Winter Plume
Figure 5.8-10	Baseline View From KOP 8
Figure 5.8-11	View From KOP 8 with the CR SMR Project
Figure 5.8-12	View From KOP 8 with the CR SMR Project and the Average Annual Plume
Figure 5.8-13	View From KOP 8 with the CR SMR Project and the Winter Plume
Figure 5.8-14	Baseline View From KOP 16
Figure 5.8-15	View From KOP 16 with the CR SMR Project
Figure 5.8-16	View From KOP 16 with the CR SMR Project and the Average Annual Plume
Figure 5.8-17	View From KOP 16 with the CR SMR Project and the Winter Plume
Figure 5.8-18	Baseline View From KOP 19
Figure 5.8-19	View From KOP 19 with the CR SMR Project
Figure 5.8-20	View From KOP 19 with the CR SMR Project and the Average Annual Plume
Figure 5.8-21	View From KOP 19 with the CR SMR Project and the Winter Plume
Figure 5.8-22	Baseline View From KOP 22
Figure 5.8-23	View From KOP 22 with the CR SMR Project



**LIST OF FIGURES (CONTINUED)**

Figure 5.8-24	View From KOP 22 with the CR SMR Project and the Average Annual Plume
Figure 5.8-25	View From KOP 22 with the CR SMR Project and the Winter Plume
Figure 5.8-26	Baseline View From KOP 40
Figure 5.8-27	View From KOP 40 with the CR SMR Project
Figure 5.8-28	View From KOP 40 with the CR SMR Project and the Average Annual Plume
Figure 5.8-29	View From KOP 40 with the CR SMR Project and the Winter Plume
Figure 6.1-1	Thermal Monitoring Locations in Close Proximity to CRN Site
Figure 6.1-2	Thermal Monitoring Locations Used to Evaluate SMRs
Figure 6.2-1	CRN Site Local Radiological Sampling Locations (1-Mile Radius)
Figure 6.2-2	CRN Site Remote Radiological Sampling Locations (5-Mile Radius)
Figure 6.4-1	CRN Site Historical Meteorological Monitoring Locations
Figure 6.4-2	6-Mile Vicinity Topographic Map
Figure 6.4-3	Meteorological Tower 3 EDS Site Layout
Figure 9.3-1	Proposed and Alternative Candidate Site Screening Methodology
Figure 9.3-2	TVA Service Area and Direct Service Federal Customers
Figure 9.3-3	General Site Criteria Evaluation Results
Figure 9.3-4	ORR Candidate Sites
Figure 9.3-5	Redstone Arsenal Candidate Sites
Figure 9.3-6	ORR Site 2 - Potential Layout
Figure 9.3-7	ORR Site 8 - Potential Layout
Figure 9.3-8	Redstone Arsenal Site 12 - Potential Layout
Figure 9.3-9	ORR Site 3 (CRN Site) Flood Hazard Map
Figure 9.3-10	ORR Site 2 Flood Hazard Map
Figure 9.3-11	ORR Site 8 Flood Hazard Map
Figure 9.3-12	Redstone Arsenal Site 12 Flood Hazard Map
Figure 9.3-13	Minority Population Block Groups within 50 Miles of the Redstone Arsenal Candidate Site
Figure 9.3-14	Low-Income Population Block Groups within 50 Miles of the Redstone Arsenal Candidate Site
Figure 9.3-15	Redstone Arsenal Past, Present and Reasonably Foreseeable Future Projects

### ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
°F	degrees Fahrenheit
µg/L	micrograms per liter
AADT	Annual Average Daily Traffic
ac	acres
ACS	American Community Survey
ADEM	Alabama Department of Environmental Management
AEDC	Arnold Engineering Development Center
AFB	Air Force Base
ALARA	as low as reasonably achievable
ALDOT	Alabama Department of Transportation
ALS	Advanced Life Support
AMEC	Amec Foster Wheeler plc
ANA	aquatic natural area
APE	area of potential effect
ARA	aquatic reference area
ASCE	American Society of Civil Engineers
ASOS	Automated Surface Observing System
ATSDR	Agency for Toxic Substances and Disease Registry
B/CTP	Bicide/Corrosion Treatment Plant
bgs	below ground surface
BMP	best management practices
BOD	Biological Oxygen Demand
BP	Containment Bypass
BRAC	Base Realignment and Closure Program
Btu	British thermal units
BWRs	boiling water reactors
CAA	Clean Air Act
CDC	Center for Disease Control and Prevention
CDF	core damage frequency
CEQ	Council on Environmental Quality
CFD	Computational Fluid Dynamics
CFE	Early Containment Failure
CFI	Intermediate Containment Failure
CFL	Late Containment Failure
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH <sub>4</sub>	methane
Ci	curies
Cl	chloride
cm	centimeter

**ACRONYMS AND ABBREVIATIONS (CONTINUED)**

CO	carbon monoxide
CO <sub>2</sub>	carbon dioxide
COC	Cycles of Concentration
COD	Chemical Oxygen Demand
COL	Combined License
COLA	Combined License Application
CR	Clinch River
CRBRP	Clinch River Breeder Reactor Project
CRM	Clinch River Mile
CRN	Clinch River Nuclear
CRUD	corrosion related unidentified deposits
CWA	Clean Water Act
CWS	circulating water system
DAR	Daughters of the American Revolution
DASU	Data Acquisition Switch Unit
dB	decibel
dBA	a-weighted decibels
DBAs	Design basis Accidents
DBT	Design Basis Tornado
DNL	Day-Night Average Sound Level
DO	dissolved oxygen
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DRH	Division of Radiological Health
EAB	exclusion area boundary
EDS	Environmental Data Station
EIA	U.S. Energy Information Administration
EIS	Environmental Impact Statement
EMA	Environmental Monitoring and Analysis
EMF	electromagnetic field
EMS	Emergency Medical Services
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPFS	Emergency Preparedness Field Support
EPRI	Electric Power Research Institute
EPZ	emergency planning zone
ER	Environmental Report
ERB	Effluent Release Boundaries
ESE	east-southeast
ESP	Early Site Permit

**ACRONYMS AND ABBREVIATIONS (CONTINUED)**

ESPA	Early Site Permit Application
ETHRA	East Tennessee Human Resource Agency
ETTP	East Tennessee Technology Park
FBI	Federal Bureau of Investigations
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FIRMs	Flood Insurance Rate Maps
FONSI	Finding of No Significant Impact
fps	feet per second
ft	feet
ft/ft	feet per foot
ft/s	feet per second
ft <sup>2</sup> /d	feet squared per day
ft <sup>3</sup>	cubic feet
FWPCA	Federal Water Pollution Control Act
FY	Fiscal Year
g/kWh	grams of CO <sub>2</sub> per kilowatt hour
GEIS	Generic Environmental Impact Statement
GHG	greenhouse gas
gm/cm <sup>3</sup>	grams per cubic centimeter
gpd	gallons per day
gpm	gallons per minute
ha	Hectare
HABs	harmful algal blooms
HABS	Historic American Building Survey
HAER	Historic American Engineering Record
HFIR	high flux isotope reactor
HLW	high-level waste
HPA	Habitat Protection Area
hr	hour
HRCQ	highway route controlled quantity
HSP	Health and Safety Plan
HSV	Huntsville International Airport
HUC	Hydrologic Unit Code
HVAC	heating, ventilation, and air conditioning
HWEL	Headwater Elevation
I-	Interstate
IC	Intact Containment
in.	inches
IPPP	Integrated Pollution Prevention Plans
ISFSI	independent spent fuel storage installation

**ACRONYMS AND ABBREVIATIONS (CONTINUED)**

ISL	in-situ leaching
IUs	Industrial Users
JFD	Joint Frequency Distributions
KAT	Knoxville Area Transit
Kg	kilograms
kg/ha/mo	kilograms per hectare per month
kg/km <sup>2</sup> -mo	kilograms per square kilometer per month
km	kilometer
KOP	Key Observation Points
kV	kilovolt
kWh	kilowatt-hour
LCD	Local Climatological Data
LiDAR	Light Detection and Ranging
LLRW	low level radioactive waste
LLW	low-level waste
LMDCT	Linear mechanical draft cooling towers
LOCA	loss of coolant accidents
LOS	Level of Service
LPZ	low-population zone
LWR	light water reactor
ly/min	Langley's per minute
m	meter
m/s	meters per second
m <sup>3</sup>	Meters cubed
mA	milliamperes
MBtu	Million British Thermal Units
MCL	maximum contaminant levels
MEI	maximally exposed individual
mg/L	milligrams per liter
mgd	million gallons per day
mi	mile
MMT	million metric tons
mph	miles per hour
mrاد	millirads
mrem	millirem
MSA	Metropolitan Statistical Area
msl	above mean Sea Level
MT	metric ton
MTU	metric ton of uranium
mVolts	millivolts
MW	megawatts

**ACRONYMS AND ABBREVIATIONS (CONTINUED)**

MWd	megawatt-days
MWe	megawatt electric
MWh	megawatt hours
MWt	megawatt thermal
N <sub>2</sub> O	nitrous oxide
Na	Sodium
NAA	nonattainment area
NAAQS	National Ambient Air Quality Standards
NaCl	sodium chloride
NASA	National Aeronautics and Space Administration
NAVD88	North American Vertical Datum of 1988
NAWQA	National Water-Quality Assessment Program
NCA	National Climate Assessment
NCDC	National Climatic Data Center
NEI	Nuclear Energy Institute
NEPA	National Environment Policy Act
NERP	National Environmental Research Park
NESC	National Electrical Safety Code
NGVD29	National Geodetic Vertical Datum of 1929
NLCD	National Land Cover Database
NO <sub>2</sub>	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NO <sub>x</sub>	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NRHD	National Register Historic District
NRHP	National Register of Historic Places
NSA	Naval Support Activity
NSR	New Source Review
NSSS	nuclear steam supply system
NTU	nephelometric turbidity units
NWI	National Wetland Inventory
NWR	National Wildlife Refuge
NWS	National Weather Service
O&G	Oil and Grease
O&M	Operating and Maintenance
O <sub>3</sub>	ozone
ODCM	Offsite Does Calculation
ORFD	Oak Ridge Fire Department
ORNL	Oak Ridge National Laboratory

**ACRONYMS AND ABBREVIATIONS (CONTINUED)**

ORR	Oak Ridge Reservation
OSCS	Oriented Spray Cooling System
PA	Programmatic Agreement
Pb	Lead
PBA	power block area
PCB	polychlorinated biphenyls
Percent g	acceleration due to gravity
PGA	peak ground acceleration
PM	particulate matter
PM <sub>10</sub>	particulate matter with a diameter of less than 10 microns
PM <sub>2.5</sub>	particulate matter with a diameter less than 2.5 microns
PMF	Probable Maximum flood
PPD	presidential policy directive
PPE	plant parameter envelope
ppm	parts per million
PRA	probabilistic risk assessment
PSAR	Preliminary Safety Analysis Report
PSD	Prevention of Significant Deterioration
psi	Pounds Per Square Inch
PWR	pressurized water reactors
Qc	Colluvium
Qha	Holocene alluvium
RAC	Remote Access Computer
RCRA	Resource Conservation and Recovery Act
REMP	Radiological Environmental Monitoring Program
RG	Regulatory Guide
RIMS II	Regional Input-Output Modeling System
RM	Road Miles
Rn-222	Radon-222
ROS	Reservoir Operations Study
ROW	Right of Way
RTDs	Resistance temperature detectors
RV	Recreational Vehicle
Ryr	reactor year
s	second
SACTI	Seasonal and Annual Cooling Tower Impact
SCRAM	Support Center for Regulatory Atmosphere Modeling
SDWIS	Safe Drinking Water Information System
SHPO	State Historic Preservation Officer
SI	subsurface investigation
SMR	Small Modular Reactor

**ACRONYMS AND ABBREVIATIONS (CONTINUED)**

SMZ	Streamside management zones
SNA	State Natural Area
SO <sub>2</sub>	sulfur dioxide
SO <sub>x</sub>	sulfur oxide
SPCC	Spill Prevention, Control and Countermeasures
sq	square
SSAR	Site Safety Analysis Report
SSC	structures, systems, and components
SSE	south-southeast
Sv	person sievert
SVOC	semivolatile organic compound
SWPPP	Stormwater Pollution Prevention Plan
TAC	Texas Administrative Code
Tc-99	Technetium-99
TCA	Tennessee Code Annotated
TDEC	Tennessee Department of Environment and Conservation
TDOH	Tennessee Department of Health
TDOT	Tennessee Department of Transportation
TEDE	Total Effective Dose Equivalent
TLD	thermoluminescent dosimeters
TN	Tennessee State Highway
TRM	Tennessee River Mile
TROC	temperature rate of change
TRU	transuranic
TSS	Total Suspended Solids
TVA	Tennessee Valley Authority
TWPC	TRU waste processing center
TWRA	Tennessee Wildlife Resources Agency
U-235	Uranium -235
U-238	Uranium-238
U <sub>3</sub> O <sub>8</sub>	Uranium Oxide
U <sub>3</sub> O <sub>8</sub> e	Uranium Oxide equivalent
UF <sub>6</sub>	Uranium Hexafluoride
UFC	Uranium fuel cycle
UHS	Ultimate Heat Sink
UNFCCC	United Nations Framework Convention on Climate Change
UO <sub>2</sub>	Uranium Dioxide
UPF	Uranium Processing Facility
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USDA	U.S. Department of Agriculture



**ACRONYMS AND ABBREVIATIONS (CONTINUED)**

USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VES	visual and aural encounter surveys
VOCs	volatile organic compounds
WMA	Wildlife Management Area
WSEL	Water Surface Elevation
WWC	wet-weather conveyances
X/Q	atmospheric dispersion factors
yr	year