

Contents

| | |
|---|------|
| Abstract | iii |
| Executive Summary | xiv |
| Abbreviations/Acronyms | xix |
| 1.0 Introduction | 1-1 |
| 1.1 Report Contents | 1-2 |
| 1.2 Background | 1-3 |
| 1.2.1 Generic Environmental Impact Statement | 1-3 |
| 1.2.2 License Renewal Evaluation Process | 1-4 |
| 1.3 The Proposed Federal Action | 1-7 |
| 1.4 The Purpose and Need for the Proposed Action | 1-8 |
| 1.5 Compliance and Consultations | 1-8 |
| 1.6 References | 1-11 |
| 2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment | 2-1 |
| 2.1 Plant and Site Description and Proposed Plant Operation During the Renewal Term | 2-1 |
| 2.1.1 External Appearance and Setting | 2-4 |
| 2.1.2 Reactor Systems | 2-4 |
| 2.1.3 Cooling and Auxiliary Water Systems | 2-6 |
| 2.1.4 Radioactive Waste Management Systems and Effluent Control Systems | 2-8 |
| 2.1.4.1 Liquid Waste Processing Systems and Effluent Controls | 2-10 |
| 2.1.4.2 Gaseous Waste Processing Systems and Effluent Controls | 2-12 |
| 2.1.4.3 Solid Waste Processing | 2-13 |
| 2.1.5 Nonradioactive Waste Systems | 2-14 |
| 2.1.6 Plant Operation and Maintenance | 2-15 |
| 2.1.7 Power Transmission System | 2-15 |

Contents

| | | |
|---------|---|------|
| 2.2 | Plant Interaction with the Environment | 2-18 |
| 2.2.1 | Land Use | 2-18 |
| 2.2.2 | Water Use | 2-18 |
| 2.2.3 | Water Quality | 2-19 |
| 2.2.4 | Air Quality | 2-20 |
| 2.2.5 | Aquatic Resources | 2-22 |
| 2.2.6 | Terrestrial Resources | 2-23 |
| 2.2.7 | Radiological Impacts | 2-29 |
| 2.2.8 | Socioeconomic Factors | 2-31 |
| 2.2.8.1 | Housing | 2-31 |
| 2.2.8.2 | Public Services | 2-34 |
| 2.2.8.3 | Offsite Land Use | 2-38 |
| 2.2.8.4 | Visual Aesthetics and Noise | 2-39 |
| 2.2.8.5 | Demography | 2-39 |
| 2.2.8.6 | Economy | 2-44 |
| 2.2.9 | Historic and Archaeological Resources | 2-47 |
| 2.2.9.1 | Cultural Background | 2-47 |
| 2.2.9.2 | Historic and Archaeological Resources at Peach Bottom Site | 2-48 |
| 2.2.10 | Related Federal Project Activities and Consultations | 2-49 |
| 2.3 | References | 2-50 |
| 3.0 | Environmental Impacts of Refurbishment | 3-1 |
| 3.1 | References | 3-4 |
| 4.0 | Environmental Impacts of Operation | 4-1 |
| 4.1 | Cooling System | 4-2 |
| 4.1.1 | Water Use Conflicts (Plants With Cooling Ponds or Cooling Towers Using Make-Up Water From a Small River With Low Flow) | 4-12 |
| 4.1.2 | Entrainment of Fish and Shellfish in Early Life Stages | 4-13 |
| 4.1.3 | Impingement of Fish and Shellfish | 4-15 |
| 4.1.4 | Heat Shock | 4-17 |
| 4.1.5 | Microbiological Organisms (Public Health) | 4-18 |

4.2 Transmission Lines 4-19

 4.2.1 Electromagnetic Fields—Acute Effects 4-23

 4.2.2 Electromagnetic Fields—Chronic Effects 4-24

4.3 Radiological Impacts of Normal Operations 4-25

4.4 Socioeconomic Impacts of Plant Operations During the License
Renewal Period 4-26

 4.4.1 Housing Impacts During Operations 4-29

 4.4.2 Public Services: Public Utility Impacts During Operations 4-31

 4.4.3 Offsite Land Use During Operations 4-32

 4.4.4 Public Services: Transportation Impacts During Operations 4-33

 4.4.5 Historic and Archaeological Resources 4-34

 4.4.6 Environmental Justice 4-38

4.5 Ground-water-Use and Quality 4-43

 4.5.1 Groundwater Use Conflicts (Plants Using Cooling Towers
 Withdrawing Makeup Water From a Small River) 4-44

4.6 Threatened or Endangered Species 4-45

 4.6.1 Aquatic Species 4-46

 4.6.2 Terrestrial Species 4-46

4.7 Evaluation of Potential New and Significant Information on Impacts of
Operations During the Renewal Term 4-47

 4.7.1 Evaluation of Potential New and Significant Radiological Impacts
 on Human Health 4-47

 4.7.1.1 Summary of Comments 4-48

 4.7.1.2 Strontium-90 in the Environment 4-49

 4.7.1.3 Regulatory Basis and Discussion of Risk 4-50

 4.7.1.4 Effluent Monitoring at Peach Bottom 4-51

 4.7.1.5 Use of “In-Body” Radionuclide Measurements to Assess
 Public Risk from Radiological Effluents from Peach Bottom
 Units 2 and 3 4-52

 4.7.1.6 Ability for Strontium-90 to Cause Cancer 4-53

Contents

| | | |
|---------|--|------|
| 4.7.1.7 | Cause-and-Effect Relationship Between Radiological Releases from Peach Bottom Units 2 and 3 and Increased Incidence in Cancers in the Area | 4-53 |
| 4.7.1.8 | Additional Discussion on Cancer | 4-55 |
| 4.7.1.9 | Conclusion | 4-56 |
| 4.8 | Summary of Impacts of Operations During the Renewal Term | 4-57 |
| 4.9 | References | 4-58 |
| 5.0 | Environmental Impacts of Postulated Accidents | 5-1 |
| 5.1 | Postulated Plant Accidents | 5-1 |
| 5.1.1 | Design-Basis Accidents | 5-2 |
| 5.1.2 | Severe Accidents | 5-3 |
| 5.2 | Severe Accident Mitigation Alternatives | 5-4 |
| 5.2.1 | Introduction | 5-4 |
| 5.2.2 | Estimate of Risk for Peach Bottom Units 2 and 3 | 5-5 |
| 5.2.2.1 | Exelon's Risk Estimates | 5-5 |
| 5.2.2.2 | Review of Exelon's Risk Estimates | 5-9 |
| 5.2.3 | Potential Plant Improvements | 5-12 |
| 5.2.3.1 | Process for Identifying Potential Plant Improvements | 5-12 |
| 5.2.3.2 | Staff Evaluation | 5-15 |
| 5.2.4 | Risk Reduction Potential of Plant Improvements | 5-17 |
| 5.2.5 | Cost Impacts of Candidate Plant Improvements | 5-18 |
| 5.2.6 | Cost-Benefit Comparison | 5-21 |
| 5.2.6.1 | Exelon Evaluation | 5-21 |
| 5.2.6.2 | Staff Evaluation | 5-23 |
| 5.2.7 | Conclusions | 5-26 |
| 5.3 | References | 5-27 |

6.0 Environmental Impacts of the Uranium Fuel Cycle and Solid Waste Management 6-1

 6.1 The Uranium Fuel Cycle 6-2

 6.2 References 6-9

7.0 Environmental Impacts of Decommissioning 7-1

 7.1 References 7-4

8.0 Environmental Impacts of Alternatives to Operating License Renewal 8-1

 8.1 No-Action Alternative 8-1

 8.2 Alternative Energy Sources 8-4

 8.2.1 Coal-Fired Generation 8-6

 8.2.1.1 Once-Through Cooling System 8-7

 8.2.1.2 Closed-Cycle Cooling System 8-19

 8.2.2 Natural-Gas-Fired Generation 8-20

 8.2.2.1 Once-Through Cooling System 8-22

 8.2.2.2 Closed-Cycle Cooling System 8-30

 8.2.3 Nuclear Power Generation 8-31

 8.2.3.1 Once-Through Cooling System 8-31

 8.2.3.2 Closed-Cycle Cooling System 8-40

 8.2.4 Purchased Electrical Power 8-41

 8.2.5 Other Alternatives 8-42

 8.2.5.1 Oil-Fired Generation 8-42

 8.2.5.2 Wind Power 8-43

 8.2.5.3 Solar Power 8-44

 8.2.5.4 Hydropower 8-45

 8.2.5.5 Geothermal Energy 8-45

 8.2.5.6 Wood Waste 8-46

 8.2.5.7 Municipal Solid Waste 8-46

 8.2.5.8 Other Biomass-Derived Fuels 8-47

 8.2.5.9 Fuel Cells 8-47

Contents

| | |
|--|------|
| 8.2.5.10 Delayed Retirement | 8-48 |
| 8.2.5.11 Utility-Sponsored Conservation | 8-48 |
| 8.2.6 Combination of Alternatives | 8-50 |
| 8.3 Summary of Alternatives Considered | 8-54 |
| 8.4 References | 8-54 |
| 9.0 Summary and Conclusions | 9-1 |
| 9.1 Environmental Impacts of the Proposed Action—License Renewal | 9-4 |
| 9.1.1 Unavoidable Adverse Impacts | 9-5 |
| 9.1.2 Irreversible or Irrecoverable Resource Commitments | 9-5 |
| 9.1.3 Short-Term Use Versus Long-Term Productivity | 9-6 |
| 9.2 Relative Significance of the Environmental Impacts of License Renewal and Alternatives | 9-6 |
| 9.3 Staff Conclusions and Recommendations | 9-8 |
| 9.4 References | 9-9 |
| Appendix A – Comments Received on the Environmental Review | A-1 |
| Appendix B – Contributors to the Supplement | B-1 |
| Appendix C – Chronology of NRC Staff Environmental Review Correspondence Related to Exelon Generation Company’s Application for License Renewal of Peach Bottom Atomic Power Station Units 2 and 3 | C-1 |
| Appendix D – Organizations Contacted | D-1 |
| Appendix E – Exelon Generation Company’s Compliance Status and Consultation Correspondence | E-1 |
| Appendix F – GEIS Environmental Issues Not Applicable to Peach Bottom Units 2 and 3 | F-1 |

Figures

| | | |
|-----|--|------|
| 2-1 | Location of Peach Bottom Site, 80-km (50-mi) Region | 2-2 |
| 2-2 | Location of Peach Bottom Site, 10-km (6-mi) Region | 2-3 |
| 2-3 | Peach Bottom Station Layout | 2-5 |
| 2-4 | Peach Bottom Transmission Line Map | 2-17 |
| 4-1 | Geographic Distribution of Minority Populations (shown in shaded areas) Within 80 km (50 mi) of Peach Bottom Site Based on 2000 Census Block Group Data | 4-40 |
| 4-2 | Geographic Distribution of Low-Income Populations (shown in shaded areas) Within 80 km (50 mi) of Peach Bottom Site Based on 1990 Census Block Group Data | 4-41 |