# HIGHWOOD GENERATING STATION
# Environmental Impact Statement

## TABLE OF CONTENTS

EXECUTIVE SUMMARY .....ES-1
TABLE OF CONTENTS..... i
LIST OF FIGURES ..... viii
LIST OF TABLES ..... xi

1.0 INTRODUCTION ..... 1-1
1.1 The Proposed Action..... 1-1
1.2 Key Agency Roles, Responsibilities and Decisions ..... 1-3
1.2.1 USDA Rural Development, Utilities Programs ..... 1-3
1.2.2 U.S. Army Corps of Engineers ..... 1-3
1.2.3 Montana Department of Environmental Quality ..... 1-3
1.2.4 Montana Department of Natural Resources and Conservation ..... 1-4
1.2.5 Montana State Historic Preservation Office ..... 1-5
1.2.6 Montana Department of Fish, Wildlife and Parks .... 1-5
1.3 NEPA and MEPA Processes..... 1-5
1.4 Purpose, Need for, and Benefit of the Action..... 1-6
1.4.1 Estimated Electric Loads of Cooperative Member Systems..... 1-9
1.4.1.1 Residential..... 1-9
1.4.1.2 Commercial and Industrial..... 1-11
1.4.2 Power Supply ..... 1-12
1.4.2.1 Generating-Capacity Mix..... 1-12
1.4.2.2 Natural Gas Supply, Demand and Pricing .. 1-14
1.4.3 Load and Generating Capability ..... 1-16
1.4.3.1 Growth in Generation to Serve Load Base . 1-16
1.4.3.2 Combined Base Load Generation and Power Purchase Option..... 1-16
1.4.4 Summary and Conclusion..... 1-20
1.5 Public Participation..... 1-21
1.5.1 Scoping Process ..... 1-21
1.5.1.1 RD Scoping..... 1-21
1.5.1.2 DEQ Scoping ..... 1-22
1.5.2 Forthcoming Opportunities for Public Participation..... 1-23
1.6 Issues Development ..... 1-23
1.6.1 Key Issues ..... 1-23
1.6.2 Issues Considered But Dismissed ..... 1-27

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION ..... 2-1
2.1 Alternatives Eliminated from Detailed Consideration ..... 2-2
2.1.1 Power Purchase Agreements ..... 2-2
2.1.2 Energy Conservation and Efficiency ..... 2-4
2.1.3 Renewable Non-Combustible Energy Sources ..... 2-6
2.1.3.1 Wind Energy ..... 2-7
2.1.3.2 Solar Energy ..... 2-13
2.1.3.3 Hydroelectricity ..... 2-14
2.1.3.4 Geothermal Energy ..... 2-16
2.1.4 Renewable Combustible Energy Sources ..... 2-18
2.1.4.1 Biomass ..... 2-18
2.1.4.2 Biogas ..... 2-20
2.1.4.3 Municipal Solid Waste ..... 2-22
2.1.5 Non-Renewable Combustible Energy Sources ..... 2-24
2.1.5.1 Natural Gas Combined Cycle ..... 2-24
2.1.5.2 Microturbines ..... 2-27
2.1.5.3 Pulverized Coal ..... 2-27
2.1.5.4 Integrated Gasification Combined Cycle Coal ..... 2-29
2.1.5.5 Oil ..... 2-32
2.1.6 Other Coal-Fired Power Plant Sites ..... 2-33
2.1.6.1 Decker ..... 2-36
2.1.6.2 Hysham ..... 2-37
2.1.6.3 Nelson Creek ..... 2-38
2.1.7 Salem Site Alternatives Dismissed ..... 2-39
2.1.7.1 Obtaining Potable Water From Other Sources ..... 2-39
2.1.7.2 Discharging Wastewater into the Missouri River ..... 2-40
2.1.7.3 Disposal of Sanitary Wastewater in Septic System ..... 2-40
2.1.7.4 Alternate Railroad Spur Alignments ..... 2-41
2.1.7.5 Hauling Ash to the High Plains Landfill ..... 2-41
2.1.8 Conclusion ..... 2-42
2.2 Alternatives to be Assessed in Detail ..... 2-45
2.2.1 No Action ..... 2-45
2.2.2 Proposed Action: Highwood Generating Station – Salem Site ..... 2-46
2.2.2.1 Construction ..... 2-46
2.2.2.2 Operation ..... 2-53
2.2.2.3 Wind Turbines ..... 2-58
2.2.2.4 Connected Actions ..... 2-66
2.2.3 Alternative Site – Industrial Park Site ..... 2-67
2.2.4 Comparison of Alternatives ..... 2-70

3.0 AFFECTED ENVIRONMENT ..... 3-1
3.1 Soils, Topography and Geology ..... 3-1

3.1.1 Salem Site ..... 3-2
3.1.2 Industrial Park Site ..... 3-3
3.2 Water Resources ..... 3-6
3.2.1 Missouri River ..... 3-6
3.2.2 Wetlands and Floodplains ..... 3-9
3.2.3 Listed Species Associated with Missouri River ..... 3-9
3.2.4 Surface Water Quality ..... 3-11
3.2.5 Water Rights ..... 3-12
3.2.6 Groundwater ..... 3-14
3.2.7 Water Utilities ..... 3-17
3.2.8 Salem Site – Watersheds/Aquatic Features ..... 3-17
3.2.9 Industrial Park Site – Watersheds/Aquatic Features ..... 3-20
3.3 Air Quality ..... 3-22
3.3.1 Local Meteorology ..... 3-22
3.3.2 Terminology and Federal/State Regulation of Air Pollutants ..... 3-23
3.3.3 Air Quality in Class II Areas ..... 3-28
3.3.4 Air Quality in Class I Areas ..... 3-31
3.3.5 Mercury in the Environment ..... 3-35
3.3.6 Global Climate Change ..... 3-44
3.4 Biological Resources ..... 3-47
3.4.1 Introduction ..... 3-47
3.4.2 Pre-Field Research ..... 3-48
3.4.3 Field Inventory ..... 3-49
3.4.4 Federally Listed Endangered or Threatened, and State Listed Species of Concern ..... 3-56
3.5 Acoustic Environment ..... 3-60
3.5.1 Noise Terminology ..... 3-60
3.5.2 Noise Guidelines ..... 3-62
3.5.3 Existing Acoustic Environment at Both Alternative Sites ..... 3-64
3.6 Recreation ..... 3-67
3.7 Cultural Resources ..... 3-70
3.7.1 Cultural Resources Inventory ..... 3-71
3.7.1.1 Prior Investigations ..... 3-71
3.7.1.2 Inventory Methodology ..... 3-72
3.7.2 Inventory Results ..... 3-74
3.7.3 Traditional Cultural Properties ..... 3-81
3.8 Visual Resources ..... 3-82
3.8.1 Terminology and Methodology ..... 3-82
3.8.2 Salem Site ..... 3-85
3.8.3 Industrial Park Site ..... 3-88
3.8.4 Transmission Line Interconnection Corridors ..... 3-90
3.9 Transportation ..... 3-93
3.9.1 Roads and Traffic ..... 3-93
3.9.2 Airports ..... 3-96

3.9.3 Rail ..... 3-96
3.10 Farmland and Land Use ..... 3-97
3.10.1 Farmland ..... 3-97
3.10.2 Zoning ..... 3-100
3.10.3 Salem Site ..... 3-100
3.10.4 Industrial Park Site ..... 3-101
3.11 Waste Management ..... 3-101
3.12 Human Health and Safety ..... 3-102
3.12.1 Cascade County and the City of Great Falls ..... 3-102
3.12.2 Salem Site and Industrial Park Site ..... 3-105
3.13 Socioeconomic Environment ..... 3-105
3.13.1 Cascade County and City of Great Falls – A Brief History ..... 3-105
3.13.2 Cascade County and City of Greats Falls – Demographic Data ..... 3-108
3.13.3 Cascade County and City of Great Falls – Economic Data ..... 3-110
3.14 Environmental Justice/Protection of Children ..... 3-114

4.0 ENVIRONMENTAL CONSEQUENCES ..... 4-1
4.1 Introduction ..... 4-1
4.2 Methodology ..... 4-2
4.2.1 Definitions ..... 4-5
4.2.2 EIS Significance Criteria ..... 4-6
4.3 Soils, Topography, and Geology ..... 4-8
4.3.1 No Action Alternative ..... 4-8
4.3.2 Proposed Action – HGS at the Salem Site ..... 4-8
4.3.2.1 Construction ..... 4-8
4.3.2.2 Operation ..... 4-13
4.3.3 Alternative Site – Industrial Park ..... 4-14
4.3.3.1 Construction ..... 4-14
4.3.3.2 Operation ..... 4-14
4.3.4 Conclusion ..... 4-15
4.3.5 Mitigation ..... 4-16
4.4 Water Resources ..... 4-16
4.4.1 No Action Alternative ..... 4-16
4.4.2 Proposed Action – HGS at the Salem Site ..... 4-17
4.4.2.1 Construction ..... 4-17
4.4.2.2 Operation ..... 4-21
4.4.3 Alternative Site – Industrial Park ..... 4-25
4.4.3.1 Construction ..... 4-25
4.4.3.2 Operation ..... 4-26
4.4.4 Conclusion ..... 4-27
4.4.5 Mitigation ..... 4-28
4.5 Air Quality ..... 4-28
4.5.1 No Action Alternative ..... 4-28
4.5.2 Proposed Action – HGS at the Salem Site ..... 4-29

4.5.2.1 Construction ..... 4-29
4.5.2.2 Operation ..... 4-29
4.5.2.2.1 Emissions and Compliance with Regulatory Standards ..... 4-29
4.5.2.2.2 Impacts on Air Quality in Class II Areas ..... 4-37
4.5.2.2.3 Impacts on Air Quality in Class I Areas ..... 4-45
4.5.2.2.4 Mercury Emissions ..... 4-50
4.5.2.2.5 Greenhouse Gas Emissions ..... 4-53
4.5.3 Alternative Site – Industrial Park ..... 4-56
4.5.3.1 Construction ..... 4-56
4.5.3.2 Operation ..... 4-56
4.5.4 Conclusion ..... 4-57
4.5.5 Mitigation ..... 4-57
4.6 Biological Resources ..... 4-58
4.6.1 No Action Alternative ..... 4-58
4.6.2 Proposed Action – HGS at the Salem Site ..... 4-58
4.6.2.1 Threatened and Endangered Species and State Species of Special Concern ..... 4-59
4.6.2.2 Evaluation of Specific Preferred Alternative Components ..... 4-61
4.6.3 Alternative Site – Industrial Park ..... 4-65
4.6.4 Conclusion ..... 4-66
4.6.5 Mitigation ..... 4-67
4.7 Acoustic Environment ..... 4-70
4.7.1 No Action Alternative ..... 4-71
4.7.2 Proposed Action – HGS at the Salem Site ..... 4-72
4.7.3 Alternative Site – Industrial Park ..... 4-75
4.7.4 Conclusion ..... 4-75
4.7.5 Mitigation ..... 4-78
4.8 Recreation ..... 4-78
4.8.1 No Action Alternative ..... 4-78
4.8.2 Proposed Action – HGS at the Salem Site ..... 4-78
4.8.3 Alternative Site – Industrial Park ..... 4-79
4.8.4 Conclusion ..... 4-79
4.8.5 Mitigation ..... 4-80
4.9 Cultural Resources ..... 4-81
4.9.1 No Action Alternative ..... 4-81
4.9.2 Proposed Action – HGS at the Salem Site ..... 4-81
4.9.3 Alternative Site – Industrial Park ..... 4-84
4.9.4 Conclusion ..... 4-84
4.9.5 Mitigation ..... 4-85
4.10 Visual Resources ..... 4-86
4.10.1 No Action Alternative ..... 4-86
4.10.2 Proposed Action – HGS at the Salem Site ..... 4-87
4.10.3 Alternative Site – Industrial Park ..... 4-92

4.10.4 Conclusion ..... 4-92
4.10.5 Mitigation..... 4-94
4.11 Transportation ..... 4-95
4.11.1 No Action Alternative..... 4-95
4.11.2 Proposed Action – HGS at the Salem Site..... 4-96
4.11.2.1 Construction..... 4-96
4.11.2.2 Operation..... 4-97
4.11.3 Alternative Site – Industrial Park..... 4-98
4.11.3.1 Construction..... 4-98
4.11.3.2 Operation..... 4-99
4.11.4 Conclusion ..... 4-99
4.11.5 Mitigation..... 4-100
4.12 Farmland and Land Use ..... 4-100
4.12.1 No Action Alternative..... 4-100
4.12.2 Proposed Action – HGS at the Salem Site..... 4-100
4.12.2.1 Construction..... 4-101
4.12.2.2 Operation..... 4-104
4.12.3 Alternative Site – Industrial Park..... 4-105
4.12.3.1 Construction..... 4-105
4.12.3.2 Operation..... 4-106
4.12.4 Conclusion ..... 4-106
4.12.5 Mitigation..... 4-108
4.13 Waste Management..... 4-108
4.13.1 No Action Alternative..... 4-108
4.13.2 Proposed Action – HGS at the Salem Site..... 4-108
4.13.2.1 Construction..... 4-109
4.13.2.2 Operation..... 4-109
4.13.3 Alternative Site – Industrial Park..... 4-114
4.13.3.1 Construction..... 4-114
4.13.3.2 Operation..... 4-114
4.13.4 Conclusion ..... 4-114
4.13.5 Mitigation..... 4-115
4.14 Human Health and Safety ..... 4-116
4.14.1 No Action Alternative..... 4-116
4.14.2 Proposed Action – HGS at the Salem Site..... 4-116
4.14.2.1 Construction..... 4-116
4.14.2.2 Operation..... 4-117
4.14.3 Alternative Site – Industrial Park..... 4-118
4.14.3.1 Construction..... 4-118
4.14.3.2 Operation..... 4-119
4.14.4 Conclusion ..... 4-119
4.14.5 Mitigation..... 4-120
4.15 Socioeconomic Environment ..... 4-120
4.15.1 No Action Alternative..... 4-120
4.15.2 Proposed Action – HGS at the Salem Site..... 4-122
4.15.2.1 Construction..... 4-122
4.15.2.2 Operation..... 4-123

4.15.3 Alternative Site – Industrial Park ..... 4-126
4.15.3.1 Construction ..... 4-126
4.15.3.2 Operation ..... 4-126
4.15.4 Conclusion ..... 4-127
4.15.5 Mitigation ..... 4-127

4.16 Environmental Justice / Protection of Children ..... 4-128
4.16.1 No Action Alternative ..... 4-128
4.16.2 Proposed Action – HGS at the Salem Site ..... 4-128
4.16.2.1 Construction ..... 4-128
4.16.2.2 Operation ..... 4-129
4.16.3 Alternative Site – Industrial Park ..... 4-129
4.16.3.1 Construction ..... 4-129
4.16.3.2 Operation ..... 4-129
4.16.4 Conclusion ..... 4-130
4.16.5 Mitigation ..... 4-131
4.17 Unavoidable Adverse Impacts ..... 4-131
4.18 Irreversible and Irretrievable Commitments of Resources ..... 4-135
4.19 Relationship Between Short-Term Use of the Environment and the Maintenance and Enhancement of Long-Term Productivity ..... 4-137

5.0 CUMULATIVE IMPACTS ..... 5-1
5.1 Introduction ..... 5-1
5.2 Past, Present and "Reasonably Foreseeable" Future Actions ..... 5-8
5.2.1 Past and Present Actions and Trends ..... 5-8
5.2.2 Reasonably Foreseeable Future Actions and Trends ..... 5-12
5.3 No Action Alternative ..... 5-15
5.4 Proposed Action – HGS at the Salem Site ..... 5-15
5.5 Alternative Site – Industrial Park ..... 5-20

6.0 REFERENCES CITED ..... 6-1

7.0 LIST OF PREPARERS ..... 7-1

## APPENDICES

Appendix A: Acronyms and Abbreviations ..... A-1
Appendix B: Glossary ..... B-1
Appendix C: Relevant Federal and State Environmental Laws and Regulations ..... C-1
Appendix D: List of Persons/Agencies Consulted ..... D-1
Appendix E: Index of Terms ..... E-1
Appendix F: Fish, Wildlife, and Vegetation Resources Inventory ..... F-1

Appendix G: Cultural Resource Inventory and Evaluation ..... G-1
Appendix H: Native American Presence in Cascade County and the Great Falls Area During the Historic Period..... H-1
Appendix I: DEQ Supplementary Preliminary Determination on Air Quality Permit for HGS.....I-1
Appendix J: Significance Criteria.....J-1
Appendix K: Preliminary Cause-Effects-Questions Diagram ..... K-1

## LIST OF FIGURES

Figure 1-1. SME's Service Area in Montana..... 1-2
Figure 1-2. Upcoming Capacity Deficit Faced by SME's Cooperative Member Systems ..... 1-9
Figure 1-3. SME Cooperative Member System Requirements by Customer Classification Through 2015 ..... 1-13
Figure 1-4. Comparative Cost/Equity Buy Options..... 1-19
Figure 1-5. Open House Scoping Meeting in Great Falls Civic Center on October 13, 2004..... 1-22
Figure 2-1. Summary of the Results of SME's November 2003 RFP 10-year Evaluation..... 2-2
Figure 2-2. "How We Use Energy in Our Homes"- Educational Pie Chart on the *Energize Montana* Website..... 2-4
Figure 2-3. The Role of Renewable Energy Consumption in the Nation's Energy Supply, 2004..... 2-6
Figure 2-4. Modern Wind Turbine at Judith Gap, Montana ..... 2-7
Figure 2-5. Installed Wind Generating Capacity by State, in MW, as of Jan. 2005 ..... 2-8
Figure 2-6. Wind Farm on West Virginia's Backbone Mountain, Visible from Blackwater Falls State Park..... 2-10
Figure 2-7. Montana Wind Resources ..... 2-12
Figure 2-8. Solar Photovoltaic System ..... 2-13
Figure 2-9. Concentrating Solar Power (solar thermal trough) System in California's Mojave Desert..... 2-13
Figure 2-10. Bureau of Reclamation's Hungry Horse Dam & Reservoir on the South Fork of the Flathead River ..... 2-14
Figure 2-11. One of PPL Montana's Great Falls Dams that Generate Hydroelectricity along the Missouri River (Rainbow Dam at Rainbow Falls) ..... 2-15
Figure 2-12. CalEnergy Navy I Flash Power Plant at the Coso Geothermal Field in California (85 MW net capacity)..... 2-17
Figure 2-13. MSW: Pile of Used Newspapers..... 2-22
Figure 2-14. Major Elements of Natural Gas Combined Cycle System 2-26
Figure 2-15. Diagram Depicting Components of a "Generic" Pulverized Coal Power Plant ..... 2-28
Figure 2-16. Gasification-based System Concepts ..... 2-30
Figure 2-17. Composite Map of Montana Depicting Features Relevant for Power Plant Development..... 2-34

Figure 2-18. Locations of Four Main Potential Sites in the Site Screening Study ..... 2-35
Figure 2-19. Artist's Renderings of a Coal-Fired Power Plant at the Four Candidate Locations ..... 2-36
Figure 2-20. Looking West onto the Yellowstone River Near the Hysham Candidate Site ..... 2-37
Figure 2-21. View of Salem Site Looking Toward Highwood Mtns. ... 2-47
Figure 2-22. Another View of the Salem Site ..... 2-47
Figure 2-23. Vicinity Map of Highwood Generating Station ..... 2-48
Figure 2-24. Preliminary Site Configuration of the HGS ..... 2-49
Figure 2-25. Relative and Approximate Heights, Elevations and Sizes of the Main CFB Plant Features (Preliminary)..... 2-50
Figure 2-26. Morony Dam and Reservoir at Site of Proposed Water Intake Structure ..... 2-51
Figure 2-27. CFB Process with Hydrated Ash Reinjection ..... 2-54
Figure 2-28. 1.5 MW GE Wind Turbines at Judith Gap, Montana ..... 2-58
Figure 2-29. Preliminary HGS Wind Turbine Site Plan ..... 2-59
Figure 2-30. Graymont's Indian Creek Lime Plant near Townsend..... 2-66
Figure 2-31. Preliminary Layout of the Industrial Park Site ..... 2-68
Figure 2-32. View of the Industrial Park Site ..... 2-69
Figure 2-33. View from the Industrial Park Site West Toward Suburban Subdivision North of Great Falls ..... 2-69
Figure 3-1. Landscape of the Missouri River Canyon ..... 3-1
Figure 3-2. Soils Map of the Salem Site ..... 3-4
Figure 3-3. Soils Map of the Industrial Park Site ..... 3-5
Figure 3-4. Missouri River Downstream of Great Falls ..... 3-6
Figure 3-5. Black Eagle Falls Dam on the Missouri River ..... 3-7
Figure 3-6. Missouri River Flow near Great Falls ..... 3-8
Figure 3-7. DEQ-Designated Impaired and Threatened Waters near Great Falls ..... 3-12
Figure 3-8. Geologic Cross-Section in Vicinity of the Salem Site ..... 3-15
Figure 3-9. Kootenai Formation Groundwater Elevation Contours ..... 3-15
Figure 3-10. Madison Limestone Groundwater Elevation Contours..... 3-16
Figure 3-11. Watersheds in the Project Area ..... 3-18
Figure 3-12. Aquatic Features of the Salem Site and Environs ..... 3-19
Figure 3-13. Aquatic Features of the Industrial Park Site and Environs 3-21
Figure 3-14. Great Falls NWS Station Wind Rose ..... 3-23
Figure 3-15. Class I Area: Big Salmon Lake in Bob Marshall Wilderness Area ..... 3-32
Figure 3-16. Federal Mandatory Class I Air Quality Areas Within 250 Km of the Proposed SME CFB Power Plant ..... 3-33
Figure 3-17. Class I Area: Glacier National Park's St. Mary Lake with Wild Goose Island ..... 3-34
Figure 3-18. The Global Mercury Cycle ..... 3-36
Figure 3-19. Historic Mercury Concentrations from 160-m Ice Core in Upper Fremont Glacier, Wind River Range, Wyoming ... 3-37
Figure 3-20. Sources of Global Mercury Emissions ..... 3-38

Figure 3-21. Pie Chart of U.S. and Utility Mercury Emissions Compared to Total Global Emissions ..... 3-39
Figure 3-22. Declines in Anthropogenic U.S. Mercury Emissions Since 1990 ..... 3-39
Figure 3-23. Mercury Deposition in the U.S. (2001) by Source ..... 3-40
Figure 3-24. Mercury Exposure Pathways ..... 3-41
Figure 3-25. Average Global Temperature Trend from 1880 to 2000 .. 3-44
Figure 3-26. The Greenhouse Effect ..... 3-45
Figure 3-27. Transmission Line Crossing of Incised Drainage ..... 3-50
Figure 3-28. Proposed Raw Water Intake Route ..... 3-53
Figure 3-29. Morony Reservoir at Site of Proposed Intake ..... 3-53
Figure 3-30. Bald Eagle ..... 3-57
Figure 3-31. Mule Deer ..... 3-58
Figure 3-32. Measured 24-hour Ambient Noise Levels – Salem Site ... 3-66
Figure 3-33. Measured 24-hour Ambient Noise Levels – Industrial Park Site ..... 3-66
Figure 3-34. Giant Springs State Park astride the Missouri River ..... 3-67
Figure 3-35. Fishing the Missouri River from Giant Springs State Park near Great Falls ..... 3-68
Figure 3-36. Lewis and Clark Interpretive Center ..... 3-69
Figure 3-37. River Side Railroad State Park in Great Falls ..... 3-69
Figure 3-38. Sign at Entrance to Lewis and Clark Expedition Portage Staging Area near Salem Site ..... 3-70
Figure 3-39. Area of Potential Effect of the HGS at the Salem Site ..... 3-75
Figure 3-40. View of the Great Falls Portage NHL, with Morony Dam in Center and Belt Creek Canyon in Distance ..... 3-78
Figure 3-41. View toward East-Northeast of 242A262, the Historic Chicago, Milwaukee, St. Paul & Pacific Railroad ..... 3-78
Figure 3-42. Salem Site Looking South ..... 3-86
Figure 3-43. Salem Site Looking North ..... 3-86
Figure 3-44. Salem Site Looking East with Highwood Mountains Visible in Distance ..... 3-87
Figure 3-45. Industrial Park Site Looking Northeast Toward IMC Malt Plant ..... 3-88
Figure 3-46. Industrial Park Site Looking SE toward Great Falls ..... 3-89
Figure 3-47. Industrial Park Site Looking North ..... 3-89
Figure 3-48. Typical Landscape West of Salem Site ..... 3-91
Figure 3-49. Representative Habitat and Landscape Along Proposed Route of Both Transmission Lines near Salem Site ..... 3-91
Figure 3-50. Missouri River Downstream of Rainbow Falls; Existing Transmission Lines Visible Spanning River ..... 3-92
Figure 3-51. 230 kV Transmission Lines Prominent in Scenery North of Missouri River and East of Great Falls Switchyard ..... 3-92
Figure 3-52. Great Falls Switchyard from Lewis and Clark National Historic Trail Interpretive Center Parking Lot ..... 3-93
Figure 3-53. Salem Road Looking South near HGS Site ..... 3-95
Figure 3-54. Railroad Routes in Montana ..... 3-97

Figure 3-55. Typical Agricultural Land Use near Proposed Sites ..... 3-98
Figure 3-56. Farmstead Northwest of Proposed Salem Site ..... 3-100
Figure 3-57. Environmental Health Concerns ..... 3-103
Figure 3-58. Great Falls, Montana today ..... 3-106
Figure 3-59. Minuteman III in its Silo ..... 3-107
Figure 3-60. Cascade County Courthouse in Great Falls ..... 3-107
Figure 3-61. Great Falls Labor Market and 30-mile (48 km) Radius Surrounding Area ..... 3-113
Figure 4-1. Preliminary Cause-Effects-Questions Diagram for Proposed Southern Montana Electric Generating Station .. 4-4
Figure 4-2. Construction Schematic of Ash Waste Monofill ..... 4-9
Figure 4-3. Proposed Drainage Schematic for Salem Site ..... 4-19
Figure 4-4. HGS $L_{dn}$ Noise Contours at Salem Site ..... 4-73
Figure 4-5. HGS $L_{dn}$ Noise Contours at Industrial Park Site ..... 4-76
Figure 4-6. Artist's Rendition of HGS within Great Falls NHL Looking East toward Highwood Mountains ..... 4-83
Figure 4-7. View of Open Landscape within NHL north of Proposed HGS, Looking North toward Missouri River, that would remain unaffected by Proposed Action 4-83
Figure 4-8. View of Salem Site Looking South without HGS ..... 4-87
Figure 4-9. View of Salem Site Looking South with HGS ..... 4-87
Figure 4-10. Viewshed of the HGS at the Salem Site ..... 4-89
Figure 4-11. View Southeast toward Great Falls Portage NHL Depicting HGS and Other Landscape Features ..... 4-90
Figure 4-12. Simplified Rendition of View from Portage Staging Area south toward HGS ..... 4-90
Figure 4-13. December 2005 View from Great Falls Portage Staging Area looking south toward proposed HGS Site ..... 4-91
Figure 4-14. View from Great Falls Portage Staging Area looking north toward Confluence of Missouri R. & Belt Creek ... 4-91
Figure 4-15. Viewshed of the SME Generating Plant at the Industrial Park Site ..... 4-93
Figure 5-1. Visibility Trends for Western U.S. Class I Visibility Areas, 1992-2001 ..... 5-10
Figure 5-2. Missouri River – Annual Runoff at Sioux City, Iowa ..... 5-12
Figure 5-3. Average Flows of the Missouri River at Great Falls, 1957-2005 ..... 5-18

## LIST OF TABLES

Table 1-1. SME's Cooperative Member Systems Requirements: Peak Demand in MW, 2004-2018 ..... 1-7
Table 1-2. SME System Energy Requirements by Customer Classification ..... 1-17
Table 2-1. SME System Investments in Energy Conservation ..... 2-5
Table 2-2. Electric Power Cost ($/MWh) Projections for

Renewable, Non-Combustible Energy Resources ..... 2-6
Table 2-3. Unadjusted and Adjusted Undeveloped Hydropower Capacity in Montana ..... 2-16
Table 2-4. Electric Power Cost ($/MWh) Projections for Renewable, Combustible Energy Resources ..... 2-18
Table 2-5. Estimated Annual Air Emissions for a 250-MW Generating Station Using Biomass or Municipal Solid Waste..... 2-19
Table 2-6. Electric Power Cost Projections for Non-Renewable, Combustible Energy Resources ..... 2-24
Table 2-7. Estimated Annual Air Emissions for a 250-MW Generating Station from Non-Renewable, Combustible Energy Sources ..... 2-25
Table 2-8. Levelized Costs for New Utility Power Generation Plants in Montana ..... 2-43
Table 2-9. Comparison of Alternative Power Generation Technologies in Meeting the Purpose and Need of the Proposed Action..... 2-44
Table 2-10. Best Available Control Technology (BACT) for HGS ..... 2-56
Table 2-11. Estimated Annual Emissions of Criteria Pollutants ..... 2-56
Table 2-12. Wind Power Firming Cost..... 2-63
Table 2-13. Comparison of Environmental Impacts of Alternatives..... 2-71
Table 3-1. Water-Related Regulations..... 3-10
Table 3-2. Great Falls and Highwood Temperature and Precipitation Summary/Period of Record: 1971-2000 ..... 3-22
Table 3-3. General Sources and Health/Environmental Effects of Criteria Pollutants ..... 3-27
Table 3-4. NAAQS, MAAQS, and PSD Increments..... 3-29
Table 3-5. Cascade County Monitoring Data ..... 3-30
Table 3-6. Six Cascade County Major Industrial Emissions Sources ... 3-31
Table 3-7. Federal Class I Mandatory Class I Areas Considered..... 3-32
Table 3-8. PSD Class I Significance Levels and Increments..... 3-34
Table 3-9. Montana Species of Concern Recorded Within 10 Miles of Great Falls, MT..... 3-49
Table 3-10. Wildlife Species Observed During Project Area Surveys.. 3-51
Table 3-11. Fish Species in Morony Reservoir; Gillnet Sampling 1992 to 2005 Catch per Unit Effort (CPUE) ..... 3-54
Table 3-12. Noxious Weeds Seen During the Field Reconnaissance... 3-59
Table 3-13. Common Noise Levels and Their Effects on the Human Ear ..... 3-60
Table 3-14. Recommended Land Use Noise Levels..... 3-61
Table 3-15. Summary of Railroad Noise Standards (40 CFR 201) ..... 3-62
Table 3-16. Noise Level Limitations for Structures and Open Spaces – Great Falls Municipal Code ..... 3-63

Table 3-17. Maximum Permissible Noise Levels for Motor Vehicles – Great Falls Municipal Code ..... 3-63
Table 3-18. Measured Short-term Ambient Noise Levels at

Salem and Industrial Park sites ..... 3-65
Table 3-19. Long-term 24-hour Ambient Noise Levels at Salem and Industrial Park Sites ..... 3-65
Table 3-20. Cultural Sites Documented Within SME's Project Area ... 3-77
Table 3-21. BLM's VRM Scenic Quality Inventory and Evaluation Chart ..... 3-83
Table 3-22. VRM Scenic Quality Inventory and Evaluation Chart for Salem Site..... 3-87
Table 3-23. VRM Sensitivity Level Analysis for Salem Site..... 3-88
Table 3-24. VRM Scenic Quality Inventory and Evaluation Chart for Industrial Park Site ..... 3-90
Table 3-25. VRM Sensitivity Level Analysis for Industrial Park Site .. 3-90
Table 3-26. LOS for General Two-Lane Highway Segments ..... 3-94
Table 3-27. Cascade County Health Profile ..... 3-104
Table 3-28. Cascade Count Population Growth, 1900-2000 ..... 3-108
Table 3-29. Socioeconomic Characteristics of State of Montana, Cascade County, and City of Great Falls..... 3-109
Table 3-30. Profile of Selected Economic Characteristics, Cascade County, 2000 ..... 3-110
Table 3-31. Major Employers in Great Falls ..... 3-111
Table 3-32. Industry Annual Average Employment in Great Falls ..... 3-112
Table 3-33. Average Annual Unemployment Rate for the Great Falls MSA vs. U.S. Unemployment Rate ..... 3-113
Table 4-1. Criteria for Rating Impacts ..... 4-7
Table 4-2. BACT Summary for CFB Boiler..... 4-33
Table 4-3. BACT Summary for Auxiliary Combustion Devices ..... 4-36
Table 4-4. PSD Significant Emission Rates ..... 4-38
Table 4-5. Class II Significant Impact Modeling Results..... 4-41
Table 4-6. Maximum Modeled Impacts Compared to Monitoring *de minimis* Levels ..... 4-41
Table 4-7. SME NAAQS/MAAQS Compliance Demonstration ..... 4-42
Table 4-8. Class II PSD Increment Compliance Demonstration ..... 4-43
Table 4-9. Predicted Adverse Impacts on Class I Increments ..... 4-46
Table 4-10. SME Preliminary Visibility Results ..... 4-48
Table 4-11. SME Final Visibility Results (Refined Methodology)..... 4-49
Table 4-12. Current and Projected Future Maximum Mercury Emissions from Coal-Fired Power Plants in Montana..... 4-52
Table 4-13. Summary of Direct Impact on Biological Resources ..... 4-67
Table 4-14. Predicted Noise Levels at Nearby Receptors – Salem Site 4-74
Table 4-15. Predicted Noise Levels at Nearby Receptors – Industrial Park Site..... 4-77
Table 4-16. Impacts on Cultural Resources..... 4-84
Table 4-17. BLM VRM Visual Resource Contrast Rating Classifications..... 4-86
Table 5-1. Summary of Direct and Indirect Impacts from No Action, Proposed Action, and/or Alternate Site Alternatives ..... 5-3

Table 5-2. Summary of the Potential Long-term Cumulative Impacts from the No Action Alternative ..... 5-16
Table 5-3. Summary of the Potential Long-term Cumulative Impacts to which the Proposed Action would Contribute Incrementally ..... 5-17
Table 5-4. Summary of the Potential Long-term Cumulative Impacts to which the Alternative Site for SME's Power Plant would Contribute Incrementally ..... 5-21