

TABLE OF CONTENTS

Acknowledgment.....	i
1. Introduction.....	1-1
1.1 Executive Summary.....	1-1
1.2 Review and Ongoing Improvement of the Integrated Planning Model.....	1-6
2. Modeling Framework.....	2-1
2.1 IPM Overview	2-1
2.1.1 Purpose and Capabilities	2-1
2.1.2 Applications.....	2-2
2.2 Model Structure and Formulation	2-2
2.2.1 Objective Function	2-3
2.2.2 Decision Variables	2-3
2.2.3 Constraints.....	2-4
2.3 Key Methodological Features of IPM	2-5
2.3.1 Model Plants	2-5
2.3.2 Model Run Years	2-6
2.3.3 Cost Accounting.....	2-7
2.3.4 Modeling Wholesale Electricity Markets	2-7
2.3.5 Load Duration Curves (LDCs)	2-7
2.3.6 Fuel Modeling	2-10
2.3.7 Transmission Modeling	2-10
2.3.8 Operating Reserves Modeling	2-10
2.3.9 Perfect Competition and Perfect Foresight.....	2-11
2.3.10 Scenario Analysis and Regulatory Modeling	2-11
2.4 Hardware and Programming Features	2-11
2.5 Model Inputs and Outputs	2-12
2.5.1 Data Parameters for Model Inputs	2-12
2.5.2 Model Outputs.....	2-13
3. Power System Operation Assumptions	3-1
3.1 Model Regions.....	3-1
3.2 Electric Load Modeling	3-2
3.2.1 Distributed Solar Photovoltaics	3-6
3.2.2 Demand Elasticity	3-7
3.2.3 Net Internal Demand (Peak Demand)	3-7
3.2.4 Regional Load Shapes.....	3-8
3.3 Transmission	3-8
3.3.1 Inter-regional Transmission Capability	3-8
3.3.2 Joint Transmission Capacity and Energy Limits	3-9
3.3.3 Transmission Link Wheeling Charge	3-10
3.3.4 Transmission Losses	3-10
3.3.5 New Transmission Builds	3-10
3.4 International Imports	3-12
3.5 Capacity, Generation, and Dispatch.....	3-12
3.5.1 Availability	3-12
3.5.2 Capacity Factor.....	3-13

3.5.3	Turndown	3-15
3.6	Reserve Margins	3-15
3.7	Operating Reserves.....	3-16
3.7.1	Operating Reserve Requirements	3-17
3.7.2	Generation Characteristics	3-18
3.8	Power Plant Lifetimes.....	3-19
3.9	Heat Rates.....	3-19
3.10	Existing Environmental Regulations	3-20
3.10.1	SO ₂ Regulations	3-20
3.10.2	NO _x Regulations	3-21
3.10.3	Multi-Pollutant Environmental Regulations	3-24
3.10.4	CO ₂ Regulations	3-28
3.10.5	Non-Air Regulations Impacting EGUs	3-28
3.10.6	State-Specific Environmental Regulations.....	3-30
3.10.7	New Source Review (NSR) Settlements	3-30
3.10.8	Emission Assumptions for Potential (New) Units	3-31
3.10.9	Renewable Portfolio Standards and Clean Energy Standards.....	3-31
3.10.10	Canada CO ₂ and Renewable Regulations	3-33
3.11	Emissions Trading and Banking.....	3-33
3.11.1	Intertemporal Allowance Price Calculation	3-34
3.12	45Q – Credit for Carbon Dioxide Sequestration.....	3-37
4.	Generating Resources	4-1
4.1	National Electric Energy Data System (NEEDS).....	4-1
4.2	Existing Units	4-1
4.2.1	Population of Existing Units	4-1
4.2.2	Capacity	4-4
4.2.3	Plant Location	4-5
4.2.4	Online Year	4-5
4.2.5	Unit Configuration	4-6
4.2.6	Model Plant Aggregation	4-6
4.2.7	Cost and Performance Characteristics of Existing Units	4-9
4.2.8	Life Extension Costs for Existing Units	4-16
4.3	Planned-Committed Units.....	4-17
4.3.1	Population and Model Plant Aggregation	4-17
4.3.2	Capacity	4-17
4.3.3	State and Model Region	4-18
4.3.4	Online and Retirement Year	4-18
4.4	Potential Units.....	4-18
4.4.1	Methodology for Deriving the Cost and Performance Characteristics of Conventional Potential Units	4-18
4.4.2	Cost and Performance for Potential Conventional Units	4-18
4.4.3	Short-Term Capital Cost Adder	4-19
4.4.4	Regional Cost Adjustment	4-19
4.4.5	Cost and Performance for Potential Renewable Generating and Non-Conventional Technologies.....	4-25
4.5	Nuclear Units	4-41
4.5.1	Existing Nuclear Units	4-41

4.5.2	Potential Nuclear Units	4-42
5.	Emission Control Technologies.....	5-1
5.1	Sulfur Dioxide Control Technologies - Scrubbers	5-1
5.1.1	Methodology for Obtaining SO ₂ Controls Costs	5-2
5.1.2	SO ₂ Controls for Units with Capacities from 25 MW to 100 MW (25 MW ≤ capacity < 100 MW)	5-3
5.2	Nitrogen Oxides Control Technology	5-5
5.2.1	Combustion Controls	5-5
5.2.2	Post-combustion NO _x Controls	5-5
5.2.3	Methodology for Obtaining SCR and SNCR Costs for Coal Steam Units	5-6
5.2.4	Methodology for Obtaining SCR Costs for Oil/Gas Steam Units.....	5-8
5.3	Biomass Co-firing	5-9
5.4	Mercury Control Technologies.....	5-9
5.4.1	Mercury Content of Fuels	5-9
5.4.2	Mercury Emission Modification Factors	5-10
5.4.3	Methodology for Obtaining ACI Control Costs.....	5-17
5.5	Hydrogen Chloride (HCl) Control Technologies	5-17
5.5.1	Chlorine Content of Fuels	5-17
5.5.2	HCl Removal Rate Assumptions for Existing and Potential Units	5-19
5.5.3	HCl Retrofit Emission Control Options.....	5-19
5.6	Fabric Filter (Baghouse) Cost Development	5-21
5.7	Coal-to-Gas Conversions	5-23
5.7.1	Boiler Modifications for Coal-To-Gas Conversions.....	5-23
5.7.2	Natural Gas Pipeline Requirements for Coal-To-Gas Conversions	5-24
5.8	Retrofit Assignments	5-24
6.	CO ₂ Capture, Storage, and Transport.....	6-1
6.1	CO ₂ Capture	6-1
6.1.1	CO ₂ Capture for Potential EGUs.....	6-1
6.1.2	CO ₂ Capture for Existing EGUs with CCS retrofit.....	6-2
6.2	CO ₂ Storage	6-3
6.3	CO ₂ Transport.....	6-7
7.	Coal	7-1
7.1	Coal Market Representation	7-1
7.1.1	Coal Supply Regions	7-2
7.1.2	Coal Demand Regions.....	7-3
7.1.3	Coal Quality Characteristics	7-3
7.1.4	Coal Emission Factors	7-4
7.1.5	Coal Grade Assignments	7-10
7.2	Coal Supply Curves	7-10
7.2.1	Nature of Supply Curves Developed for EPA Platform v6.....	7-10
7.2.2	Cost Components in the Supply Curves.....	7-11
7.2.3	Procedures Employed in Determining Mining Costs	7-12
7.2.4	Procedure Used in Determining Mine Productivity	7-13
7.2.5	Procedure to Determine Total Recoverable Reserves by Region and Type.....	7-13
7.2.6	New Mine Assumptions	7-14

7.2.7	Other Notable Procedures	7-14
7.2.8	Cumulative Supply Curve Development	7-16
7.2.9	EPA Platform v6 Assumptions and Outlooks for Major Supply Basins	7-18
7.3	Coal Transportation	7-19
7.3.1	Coal Transportation Matrix Overview	7-20
7.3.2	Overview of Rail Rates	7-22
7.3.3	Truck Rates.....	7-26
7.3.4	Barge and Lake Vessel Rates	7-26
7.3.5	Transportation Rates for Imported Coal	7-26
7.3.6	Other Transportation Costs	7-27
7.3.7	Long-Term Escalation of Transportation Rates	7-27
7.3.8	Market Drivers Moving Forward.....	7-29
7.3.9	Other Considerations	7-31
7.4	Coal Exports, Imports, and Non-Electric Sectors Demand	7-32
8.	Natural Gas	8-1
8.1	GMM	8-2
8.2	Translating GMM Results to IPM Natural Gas Supply Curves	8-5
8.2.1	Supply Curves for EPA Platform v6.....	8-7
8.2.2	Basis	8-8
8.2.3	Delivered Price Adders	8-9
8.3	GMM Assumptions	8-9
8.3.1	GMM Resources Data and Reservoir Description.....	8-9
8.3.2	Oil Prices.....	8-12
8.3.3	Gas Production	8-12
8.3.4	Demand Assumptions.....	8-13
8.3.5	LNG Exports and Pipeline Exports to Mexico.....	8-15
9.	Other Fuels and Fuel Emission Factor Assumptions	9-1
9.1	Fuel Oil	9-1
9.2	Biomass Fuel.....	9-2
9.3	Nuclear Fuel	9-3
9.4	Waste Fuels.....	9-3
9.5	Fuel Emission Factors	9-4
10.	Financial Assumptions	10-1
10.1	Introduction and Summary	10-1
10.2	Introduction to Risk.....	10-1
10.2.1	Deregulation - Market Structure Risks.....	10-2
10.3	Federal Income Tax Law Changes.....	10-3
10.4	Calculation of the Financial Discount Rate	10-4
10.4.1	Introduction to Discount Rate Calculations	10-4
10.4.2	Summary of Results.....	10-5
10.5	Discount Rate Components.....	10-7
10.6	Market Structure: Utility-Merchant Financing Ratio.....	10-7
10.7	Capital Structure: Debt-Equity Share	10-7
10.7.1	Introduction and Shares for Utilities and IPPs	10-7
10.7.2	Utility and Merchant	10-8

10.7.3	Merchant by Technology	10-8
10.8	Cost of Debt.....	10-9
10.8.1	Merchant Cost of Debt.....	10-9
10.8.2	Utility Cost of Debt	10-10
10.9	Return on Equity (ROE).....	10-10
10.9.1	Introduction and Beta.....	10-10
10.9.2	Risk-Free Rate and Equity Risk Premium	10-11
10.9.3	Beta.....	10-11
10.9.4	Equity Size Premium.....	10-12
10.9.5	Nominal ROEs	10-12
10.9.6	WACC/Discount Rate	10-13
10.10	Calculation of Capital Charge Rate	10-13
10.10.1	Introduction to Capital Charge Rate Calculations.....	10-13
10.10.2	Capital Charge Rate Components.....	10-14

LIST OF TABLES

Table 1-1 Key Updates in the EPA Platform v6 2022 Reference Case.....	1-2
Table 1-2 Plant Types in v6	1-4
Table 1-3 Emission Control Technologies in v6.....	1-5
Table 2-1 Model Run Year and Year Mapping in v6.....	2-6
Table 2-2 Load Duration Curves used in EPA Platform v6 2022 Reference Case	2-13
Table 3-1 Mapping of NERC Regions and NEMS Regions with v6 Model Regions	3-3
Table 3-2 Electric Load Assumptions in v6.....	3-5
Table 3-3 Regional Electric Load Assumptions in v6	3-5
Table 3-4 National Non-Coincidental Net Internal Demand in v6	3-7
Table 3-5 Annual Joint Capacity and Energy Limits to Transmission Capabilities between Model Regions in v6.....	3-9
Table 3-6 International Electricity Imports (billions kWh) in v6	3-12
Table 3-7 Availability Assumptions in v6.....	3-12
Table 3-8 Seasonal Hydro Capacity Factors (%) in v6	3-13
Table 3-9 Planning Reserve Margins in v6	3-16
Table 3-10 Operating Reserve Requirement Assumptions by Type in v6.....	3-17
Table 3-11 Operating Reserve Regions in v6	3-18
Table 3-12 Operating Reserve Contribution Assumptions by Technology in v6	3-18
Table 3-13 Lower and Upper Limits Applied to Heat Rate Data in v6	3-19
Table 3-14 State-of-the-Art Combustion Control Configurations by Boiler Type in v6	3-24
Table 3-15 G1 and G2 CSAPR Update State Budgets, Variability Limits, and Assurance Levels for Ozone-Season NO _x (Tons) – 2021 through 2054	3-25
Table 3-16 Revised CSAPR Update State Budgets, Variability Limits, and Assurance Levels for Ozone-Season NO _x for G3 states (tons)	3-25
Table 3-17 Renewable Portfolio Standards in v6	3-31
Table 3-18 State RPS Solar Carve-outs in v6	3-32
Table 3-19 Clean Energy Standards in v6	3-32
Table 3-20 Offshore Wind Mandates in v6	3-32
Table 3-21 Fossil Generation Limits (GWh) in v6	3-33
Table 3-22 Canada Renewable Electricity Requirements (%) in v6	3-33
Table 3-23 Trading and Banking Rules in v6 – Part 1	3-34
Table 3-24 CASPR Trading and Banking Rules in v6 – Part 2.....	3-34
Table 3-25 Emission and Removal Rate Assumptions for Potential (New) Units in v6	3-36
Table 3-26 Recalculated NO _x Emission Rates for SCR Equipped Units Sharing Common Stacks with Non-SCR Units in v6	3-37
Table 3-27 Regional Net Internal Demand in EPA Platform v6 2022 Reference Case.....	3-38
Table 3-28 Annual Transmission Capabilities of U.S. Model Regions in EPA Platform v6 2022 Reference Case	3-38
Table 3-29 Turndown Assumptions for Coal Steam Units in EPA Platform v6 2022 Reference Case	3-38
Table 3-30 State Power Sector Regulations included in EPA Platform v6 2022 Reference Case.....	3-38
Table 3-31 New Source Review (NSR) Settlements in EPA Platform v6 2022 Reference Case.....	3-38
Table 3-32 State Settlements in EPA Platform v6 2022 Reference Case	3-38
Table 3-33 Citizen Settlements in EPA Platform v6 2022 Reference Case	3-38
Table 3-34 Availability Assumptions in EPA Platform v6 2022 Reference Case.....	3-38
Table 3-35 BART Regulations included in EPA Platform v6 2022 Reference Case	3-38
Table 4-1 Data Sources for NEEDS v6.....	4-2

Table 4-2 Rules Used in Populating NEEDS v6	4-2
Table 4-3 Summary Population (through 2021) of Existing Units in NEEDS v6.....	4-4
Table 4-4 Hierarchy of Data Sources for Capacity in NEEDS v6	4-4
Table 4-5 Capacity-Parsing Algorithm for Steam Units in NEEDS v6	4-5
Table 4-6 Data Sources for Unit Configuration in NEEDS v6	4-6
Table 4-7 Aggregation Profile of Model Plants as Provided at Set up of v6.....	4-7
Table 4-8 VOM Assumptions in v6	4-10
Table 4-9 FOM Assumptions in v6.....	4-12
Table 4-10 Life Extension Cost Assumptions Used in v6	4-16
Table 4-11 Summary of Planned-Committed Units in NEEDS v6	4-17
Table 4-12 Performance and Unit Cost Assumptions for Potential (New) Capacity from Conventional Technologies in v6	4-20
Table 4-13 Short-Term Capital Cost Adders for New Power Plants in v6 (2019\$).....	4-21
Table 4-14 Regional Cost Adjustment Factors for Conventional and Renewable Generating Technologies in v6.....	4-22
Table 4-15 Performance and Unit Cost Assumptions for Potential (New) Renewable and Non-Conventional Technologies in v6	4-24
Table 4-16 Offshore Fixed Regional Potential Wind Capacity (MW) by Wind Class, Resource Class, and Cost Class in v6	4-25
Table 4-17 Offshore Floating Regional Potential Wind Capacity (MW) by Wind Class, Resource Class, and Cost Class in v6	4-26
Table 4-18 Offshore Fixed Average Capacity Factor by Wind Class and Resource Class in v6	4-27
Table 4-19 Offshore Floating Average Capacity Factor by Wind Class and Resource Class in v6	4-28
Table 4-20 Onshore Reserve Margin Contribution by Wind Class in v6	4-29
Table 4-21 Offshore Fixed Reserve Margin Contribution by Wind Class in v6.21	4-29
Table 4-22 Offshore Floating Reserve Margin Contribution by Wind Class in v6.21	4-29
Table 4-23 Capital Cost Adder (2019\$/kW) for New Offshore Fixed Wind Plants in v6.....	4-30
Table 4-24 Capital Cost Adder (2019\$/kW) for New Offshore Floating Wind Plants in v6.....	4-30
Table 4-25 Example Calculations of Wind Generation, Reserve Margin Contribution, and Capital Cost for Onshore Wind in WECC_CO for Wind Class 7, Resource Class 5, and Cost Class 1.	4-31
Table 4-26 Solar Photovoltaic Reserve Margin Contribution by Resource Class in v6.....	4-32
Table 4-27 Regional Assumptions on Potential Geothermal Electric Capacity in v6	4-33
Table 4-28 Potential Geothermal Capacity and Cost Characteristics by Model Region in v6.....	4-33
Table 4-29 Potential Non-Powered Dam in v6.....	4-35
Table 4-30 Potential New Stream Development in v6	4-37
Table 4-31 Bounds and Reserve Margin Contribution for Potential (New) Battery Storage in v6.....	4-37
Table 4-32 Energy Storage Mandates in v6	4-40
Table 4-33 Planned-Committed Units by Model Region in NEEDS for EPA Platform v6 2022 Reference Case	4-42
Table 4-34 Onshore Average Capacity Factor by Wind Class, Resource Class, and Vintage in EPA Platform v6 2022 Reference Case.....	4-42
Table 4-35 Onshore Regional Potential Wind Capacity (MW) by Wind Class, Resource Class, and Cost Class in EPA Platform v6 2022 Reference Case.....	4-43
Table 4-36 Wind Generation Profiles in EPA Platform v6 2022 Reference Case (kWh of Generation per MW of Capacity).....	4-43
Table 4-37 Capital Cost Adder (2019\$/kW) for New Onshore Wind Plants by Resource and Cost Class in EPA Platform v6 2022 Reference Case.....	4-43
Table 4-38 Solar Photovoltaic Regional Potential Capacity (MW) by Resource and Cost Class in EPA Platform v6 2022 Reference Case.....	4-43

Table 4-39 Solar Thermal Regional Potential Capacity (MW) by Resource and Cost Class in EPA Platform v6 2022 Reference Case	4-43
Table 4-40 Solar Photovoltaic Generation Profiles in EPA Platform v6 2022 Reference Case (kWh of Generation per MW of Capacity)	4-43
Table 4-41 Solar Photovoltaic Regional Capital Cost Adder (2019\$/kW) for Potential Units by Resource and Cost Class in EPA Platform v6 2022 Reference Case	4-43
Table 4-42 Solar Thermal Regional Capital Cost Adder (2019\$/kW) for Potential Units by Resource and Cost Class in EPA Platform v6 2022 Reference Case	4-43
Table 4-43 Solar Photovoltaic Average Capacity Factor by Resource Class and Vintage in EPA Platform v6 2022 Reference Case	4-43
Table 4-44 Solar Thermal Capacity Factor by Resource Class and Season in EPA Platform v6 2022 Reference Case	4-43
Table 4-45 Potential Electric Capacity from New Landfill Gas Units in EPA Platform v6 2022 Reference Case (MW)	4-43
Table 4-46 Characteristics of Existing Nuclear Units in EPA Platform v6 2022 Reference Case	4-43
Table 5-1 Retrofit Emission Control Options in v6	5-1
Table 5-2 Retrofit SO ₂ Emission Control Performance Assumptions in v6	5-2
Table 5-3 Illustrative Scrubber Costs (2019\$) for Representative Capacities and Heat Rates in v6	5-4
Table 5-4 Retrofit NO _x Emission Control Performance Assumptions in v6	5-5
Table 5-5 Illustrative Post Combustion NOx Control Costs (2019\$) for Coal Plants for Representative Sizes and Heat Rates under the Assumptions in v6.....	5-7
Table 5-6 Post-Combustion NOx Controls Costs (2019\$) for Oil/Gas Steam for Representative Sizes and Heat Rates under the Assumptions in v6.....	5-8
Table 5-7 Coal Units with Biomass Co-firing Option in v6	5-9
Table 5-8 Mercury Concentration Assumptions for Non-Coal Fuels in v6.....	5-10
Table 5-9 Mercury Emission Modification Factors Used in v6.....	5-11
Table 5-10 Definition of Acronyms for Existing Controls	5-12
Table 5-11 Key to Burner Type Designations in Table 5-9.....	5-13
Table 5-12 Assignment Scheme for Mercury Emissions Control Using Activated Carbon Injection in v6.....	5-15
Table 5-13 Illustrative Activated Carbon Injection (ACI) Costs (2019\$) for Representative Sizes and Heat Rates under the Assumptions in v6	5-18
Table 5-14 HCl Removal Rate Assumptions for Potential (New) and Existing Units in v6.....	5-19
Table 5-15 Retrofit HCl and SO ₂ Emission Control Performance Assumptions in v6	5-20
Table 5-16 Illustrative Dry Sorbent Injection (DSI) Costs (2019\$) for Representative Sizes and Heat Rates in v6.....	5-22
Table 5-17 Illustrative Particulate Controls Costs (2019\$) for Representative Sizes and Heat Rates in v6	5-22
Table 5-18 Cost and Performance Assumptions for Coal-to-Gas Retrofits in v6	5-23
Table 5-19 First Stage Retrofit Assignment Scheme in v6	5-24
Table 5-20 Second and Third Stage Retrofit Assignment Schemes in v6.....	5-25
Table 6-1 Cost and Performance Assumptions for Potential USC and NGCC with and without Carbon Capture in v6	6-1
Table 6-2 Performance and Unit Cost (2019 \$) Assumptions for Carbon Capture in v6	6-2
Table 6-3 Lower-48 CO ₂ Sequestration Capacity by Region (Gigatonnes) in v6.....	6-6
Table 6-4 CO ₂ Storage Cost Curves in EPA Platform v6 2022 Reference Case	6-7
Table 6-5 CO ₂ Transportation Matrix in EPA Platform v6 2022 Reference Case.....	6-7
Table 7-1 Coal Supply Regions in EPA Platform v6	7-2
Table 7-2 Coal Rank Heat Content Ranges	7-4
Table 7-3 Coal Grade SO ₂ Content Ranges	7-4

Table 7-4 Coal Quality Characteristics by Supply Region and Coal Grade in v6	7-5
Table 7-5 Coal Clustering by Coal Grade – SO ₂ Emission Factors (lbs/MMBtu)	7-7
Table 7-6 Coal Clustering by Coal Grade – Mercury Emission Factors (lbs/TBtu)	7-7
Table 7-7 Coal Clustering by Coal Grade – Ash Emission Factors (lbs/MMBtu)	7-8
Table 7-8 Coal Clustering by Coal Grade – HCl Emission Factors (lbs/MMBtu).....	7-8
Table 7-9 Coal Clustering by Coal Grade – CO ₂ Emission Factors (lbs/MMBtu)	7-9
Table 7-10 Example of Coal Assignments Made in v6	7-10
Table 7-11 Basin-Level Groupings Used in Preparing v6 Coal Supply Curves.....	7-10
Table 7-12 Rail Competition Definitions.....	7-23
Table 7-13 Assumed Eastern Rail Rates for 2020 (2019 mills/ton-mile).....	7-24
Table 7-14 Assumed Midwestern Rail Rates for 2020 (2019 mills/ton-mile)	7-24
Table 7-15 Assumed Non-PRB Western Rail Rates for 2020 (2019 mills/ton-mile).....	7-25
Table 7-16 Assumed PRB Western Rail Rates for 2020 (2019 mills/ton-mile)	7-25
Table 7-17 Assumed Truck Rates for 2020	7-26
Table 7-18 Assumed Barge Rates for 2020.....	7-26
Table 7-19 Assumed Other Transportation Rates for 2020.....	7-27
Table 7-20 EIA AEO Diesel Fuel Forecast, 2020-2050	7-30
Table 7-21 Summary of Expected Escalation for Coal Transportation Rates, 2020-2050	7-31
Table 7-22 Coal Exports in v6 (Million Short Tons)	7-32
Table 7-23 Residential, Commercial, and Industrial Demand in v6 (Million Short Tons)	7-32
Table 7-24 Coal Import Limits in v6 (Million Short Tons).....	7-33
Table 7-25 Coal Transportation Matrix in EPA Platform v6 2022 Reference Case.....	7-35
Table 7-26 Coal Supply Curves in EPA Platform v6 2022 Reference Case	7-35
Table 8-1 Supply/Demand Balance and Henry Hub Price for a GMM Run Underlying the Natural Gas Supply Curves in v6	8-5
Table 8-2 Delivered Price Adders	8-9
Table 8-3 Refiners' Acquisition Cost of Crude (RACC)	8-12
Table 8-4 United States and Canada Projected Dry Gas Production by Source (Bcf/d).....	8-13
Table 8-5 GMM United States and Canada Gas Demand Projection (Bcf/d).....	8-15
Table 8-6 LNG Export Volumes and Capacity (Bcf/d)	8-15
Table 8-7 U.S. Pipeline Exports to Mexico (Bcf/d).....	8-16
Table 8-8 EIA Style Gas Report for EPA Platform v6 2022 Reference Case.....	8-16
Table 8-9 Natural Gas Basis for EPA Platform v6 2022 Reference Case	8-16
Table 8-10 Natural Gas Supply Curves for EPA Platform v6 2022 Reference Case	8-16
Table 9-1 Fuel Oil Prices by NEMS Region in v6	9-1
Table 9-2 Waste Fuels in v6	9-3
Table 9-3 Fuel Emission Factor Assumptions in v6.....	9-4
Table 9-4 Biomass Supply Curves for EPA Platform v6 2022 Reference Case.....	9-4
Table 10-1 Summary Tax Changes	10-4
Table 10-2 Financial Assumptions for Utility and Merchant Cases	10-5
Table 10-3 Weighted Average Cost of Capital in v6	10-6
Table 10-4 Share of Annual Thermal Capacity Additions by Market.....	10-7
Table 10-5 Capital Structure Assumptions in v6.....	10-9
Table 10-6 Nominal Debt Rates in v6	10-9
Table 10-7 Utilities Used to Calculate Cost of Debt.....	10-10
Table 10-8 Estimated Annual Levered Beta for S15ELUT Utility Index Based on Daily Returns	10-11
Table 10-9 Real Capital Charge Rate – Blended (%) in v6	10-13
Table 10-10 Real Capital Charge Rate – IPP (%)	10-13

Table 10-11 Real Capital Charge Rate – Utility (%)	10-14
Table 10-12 Book Life, Debt Life, and Depreciation Schedules in v6	10-15

LIST OF FIGURES

Figure 1-1 Modeling and Data Structures in EPA Platform v6.....	1-6
Figure 2-1 Hypothetical Chronological Hourly Load Curve and Seasonal Load Duration Curve for Summer Season	2-8
Figure 2-2 Stylized Depiction of a Six Segment Load Duration Curve Dispatch Modeling	2-9
Figure 2-3 Stylized Dispatch Order in Illustrative Load Segments	2-10
Figure 3-1 EPA Platform v6 Model Regions	3-2
Figure 3-2 Modeling Process for Obtaining Projected NO _x Emission Rates	3-22
Figure 3-3 How One of the Four NO _x Modes Is Ultimately Selected for a Unit	3-23
Figure 4-1 Derivation of Plant Fixed O&M Data.....	4-12
Figure 7-1 Map of the Coal Supply Regions in v6	7-3
Figure 7-2 Coal Mine Productivity (2000-2019)	7-15
Figure 7-3 Average Annual Cost Growth Assumptions by Region (2021-2050)	7-15
Figure 7-4 Maximum Annual Coal Production Capacity per Year (Million Short Tons).....	7-16
Figure 7-5 Illustration of Preliminary Step in Developing a Cumulative Coal Supply Curve	7-17
Figure 7-6 Illustration of Final Step in Developing a Cumulative Coal Supply Curve	7-17
Figure 7-7 Example Coal Supply Curve in Stepped Format.....	7-18
Figure 7-8 Calculation of Multi-Mode Transportation Costs (Example).....	7-21
Figure 7-9 Rail Cost Indices Performance (1Q2016-1Q2020).....	7-28
Figure 7-10 Long-Run Marginal Cost Breakdown by Transportation Mode	7-29
Figure 8-1 GMM Gas Quantity and Price Response	8-2
Figure 8-2 IPM/GMM Interaction.....	8-2
Figure 8-3 Geographic Coverage of GMM.....	8-3
Figure 8-4 Demand Region Definition.....	8-6
Figure 8-5 Supply Region Definition	8-7
Figure 8-6 Supply Curves for 2028, 2030, 2035, 2040, 2045, and 2050.....	8-8

LIST OF ATTACHMENTS

Attachment 3-1 NO _x Rate Development in EPA Platform v6 2022 Reference Case.....	3-38
Attachment 4-1 Nuclear Power Plant Life Extension Cost Development Methodology in EPA Platform v6 2022 Reference Case	4-43
Attachment 5-1 Wet FGD Cost Methodology.....	5-27
Attachment 5-2 SDA FGD Cost Methodology.....	5-27
Attachment 5-3a SCR Cost Methodology	5-27
Attachment 5-3b SCR Cost Methodology	5-27
Attachment 5-4 SNCR Cost Methodology	5-27
Attachment 5-5 DSI Cost Methodology.....	5-27
Attachment 5-6 Hg Cost Methodology	5-27
Attachment 5-7 PM Cost Methodology	5-27
Attachment 6-1 CO ₂ Reduction Retrofit Cost Development Methodology.....	6-7
Attachment 7-1 Mining Cost Estimation Methodology and Assumptions	7-34