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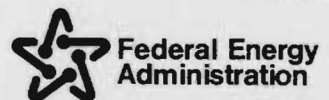
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**National
Energy
Outlook**

National Energy Outlook



February
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Federal Energy
Administration

FEDERAL ENERGY ADMINISTRATION

WASHINGTON, D. C. 20461

PREFACE

Just over a year ago, the Federal Energy Administration published the Project Independence Report. This report was the first comprehensive Federal energy forecast and policy assessment to incorporate the effects that the sudden dramatic energy events, such as the oil embargo, were to have on our energy future. That report formed the basis for the development of the President's national energy goals and a comprehensive program to achieve them. It also focused national debate on the Nation's options and their impacts.

During the last year, a number of significant international and domestic events have occurred which will change our energy future. This year's National Energy Outlook captures these changes and represents the first of an annual series of energy forecasts. This report is not a plan of action, but evaluates alternative energy policies.

The forecasts through 1990 are based on improved versions of the national energy supply and demand models FEA has developed during the last two years, and uses the most up-to-date data which are collected. FEA is continuing to improve the Federal Government's ability to forecast and evaluate alternative energy futures and provide detailed assessments for government, industry, and public use. Only with such comprehensive assessments can this Nation discern future energy trends, evaluate the effectiveness of existing programs, and evaluate the desirability of new energy policy actions.


FRANK G. ZARB
ADMINISTRATOR



FINDINGS AND CONCLUSIONS: EXECUTIVE SUMMARY xxi

Chapter I: OVERVIEW

Introduction 1
 Recent Energy Trends 1
 Oil 1
 Coal 5
 Natural Gas 5
 Electric Power 9
 International Energy Perspective 11
 Forecasting Our Energy Future 13
 The Analytical Base 13
 Alternative Scenarios 14
 Energy Through 1985: The FEA Forecast 14
 International Oil Price 14
 Energy Consumption 15
 Petroleum Consumption 17
 Electricity Consumption 18
 Coal Consumption 21
 Natural Gas Consumption 21
 Effects of Conservation 23
 Oil Supply 25
 Natural Gas Supply 28
 Coal Supply 32
 Nuclear Power 36
 Emerging Technologies 38
 The Projected Import Situation 30
 Energy Prices 42
 Capital Requirements 43
 Environmental Impacts 45
 Post-1985 Trends and Issues 45

Chapter II: OIL

Introduction 49
 Perspective 49
 The Present Situation 50
 Pre-Embargo Period 50
 Post-Embargo Period 52
 Effects of the Energy Policy and Conservation Act of 1975 60
 Business-As-Usual Supply Outlook 61
 Business-As-Usual Supply Possibilities 62
 Reserves and Resources 68
 OCS Leasing 74
 Drilling Capacity 75
 Enhanced Recovery 77
 North Alaskan Development 79

| | |
|--|-----|
| Supply Uncertainties: The Optimistic and Pessimistic Supply Outlooks | 86 |
| Uncertainty Effects on Total Crude Production | 86 |
| Components of Oil Supply Uncertainty | 89 |
| Major Areas of Uncertainty in the Oil Supply Outlook | 90 |
| The Estimating Approach and the FEA Model | 98 |
| Long-Term Demand Forecast | 100 |
| Summary and Implications of Alternative Outlooks | 103 |

Chapter III: NATURAL GAS

| | |
|---|-----|
| Introduction | 111 |
| Natural Gas--Background and Current Situation | 111 |
| Consumption | 111 |
| Natural Gas Production and Distribution Industry | 117 |
| Current Regulatory Environment | 117 |
| Natural Gas Production and Reserve Additions: The Basis for the Shortages | 119 |
| Curtailments to Date | 121 |
| Near-Term Outlook | 126 |
| Long-Term Outlook for Natural Gas | 128 |
| Long-Term Outlook for Natural Gas Demand | 128 |
| Long-Term Outlook for Supplies of Natural Gas and Pipeline Supplements | 131 |
| Delivering Alaskan Natural Gas | 146 |
| The Role of Imported Liquefied Natural Gas (LNG) | 151 |
| Synthetic Gas From Coal | 154 |
| The Potential for Increased Use of Substitute Natural Gas | 156 |
| Gas from Tight Formations | 157 |
| Gas from Devonian Shale Formations | 158 |
| Summary | 159 |

Chapter IV: COAL

| | |
|--|-----|
| Coal Through 1975 and Short-Term Outlook | 163 |
| Historical Perspective (Through 1972) | 163 |
| Recent Events (1973-75) | 165 |
| Short-Term Outlook (1976-1978) | 173 |
| Consumption Forecasts | 174 |
| Reference Scenario | 175 |
| Time Path | 179 |
| Effect of Oil Prices | 181 |
| Effect of Different Policy Scenarios | 185 |
| Policy Implications | 193 |
| Production Forecasts | 195 |
| Reserves and Supply Curves | 195 |
| Reference Scenario | 196 |
| Time Path | 202 |
| Effect of Oil Prices | 205 |
| Effect of Different Scenarios | 206 |
| Policy Implications | 211 |
| Summary | 211 |

Chapter V: ELECTRIC UTILITIES

| | |
|--|-----|
| Introduction | 215 |
| The Significance of Electricity | 215 |
| The Evolution of Utility Problems | 216 |
| Plant Cost Increases | 222 |
| Capacity Utilization | 224 |
| Fuel Cost Increases | 224 |
| Rate Increases and Demand Effects | 227 |
| The Utility Financial Situation | 232 |
| Expansion Requirements | 232 |
| Deferrals and Cancellations | 234 |
| Capacity Growth | 236 |
| Load Management | 238 |
| Electricity Forecast--1985 | 238 |
| Demand | 239 |
| Supply | 244 |
| Price | 246 |
| Capital | 246 |
| Public Regulation and Utility Cost Structure | 248 |
| Alternatives to Central Utility Electricity | 249 |
| Summary | 249 |

Appendix V-A: NUCLEAR FUEL CYCLE

| | |
|--|-----|
| Introduction | 253 |
| Uranium Reserves and Resources | 255 |
| Mining | 258 |
| Uranium Enrichment Services | 262 |
| Spent Fuel Reprocessing | 266 |
| Long-Term Waste Storage | 270 |
| Summary | 270 |

Appendix V-B: FINANCIAL SITUATION OF THE INVESTOR-OWNED ELECTRIC UTILITIES

| | |
|---|-----|
| Introduction | 273 |
| Internal Financing | 274 |
| AFDC and CWIP | 275 |
| Sources of External Funds | 277 |
| The Impact of Utilities' External Financing Demands on the Capital Market | 278 |
| Long-Term Debt | 280 |
| Preferred Stock | 284 |
| Common Stock | 284 |
| Summary | 289 |

Chapter VI: FINANCING OUR ENERGY FUTURE

| | |
|--|-----|
| The Capital Shortage Question | 293 |
| Capital Requirements for the Energy Sector | 294 |

| | |
|--|-----|
| Energy-Sectoral Capital Requirements | 298 |
| Oil and Natural Gas | 298 |
| Coal Industry | 306 |
| Electric Utilities | 310 |
| Synthetic Fuels | 315 |
| Other | 316 |
| Conservation | 318 |
| Appendix VI-A: COMPARISON OF CAPITAL STUDIES | 321 |
| Appendix A: PIES INTEGRATING MODEL | A-1 |
| Appendix B: ECONOMIC ASSUMPTION (DRI SUMMARY FORECAST) | B-1 |
| Appendix C: PIES ECONOMETRIC DEMAND MODEL | C-1 |
| Appendix D: COAL, OIL, AND GAS SUPPLY | D-1 |
| Appendix E: SCENARIO DESCRIPTION | E-1 |
| Appendix F: THE PIES REPORT: A GUIDE | F-1 |
| Appendix G: PIES SUMMARY TABLES | G-1 |
| Appendix H: CONTRIBUTORS TO REPORT | H-1 |

ILLUSTRATIONS

Executive Summary

| | |
|--|--------|
| S-1 What are the roots of our energy problem? | xxii |
| S-2 How did we become so vulnerable to imports? | xxiii |
| S-3 How much energy will the Nation consume? | xxiv |
| S-4 How will the U.S. meet its growing energy demands by 1985? | xxv |
| S-5 How much energy can be saved? | xxvi |
| S-6 What will oil imports be by 1985? | xxvii |
| S-7 Where will new oil supplies come from? | xxviii |
| S-8 How quickly will the country run out of oil? | xxix |
| S-9 Is natural gas about to be depleted? | xxx |
| S-10 Where will new coal production come from? | xxxi |
| S-11 What will be the sources of electricity in the future? | xxxii |
| S-12 How much can new technologies contribute? | xxxiii |
| S-13 How much will energy supply investment cost? | xxxiv |

Chapter I

| | |
|--|----|
| I-1 Domestic Production of Crude Oil | 3 |
| I-2 Petroleum Demand Forecast vs. Actual Demand | 4 |
| I-3 Annual U.S. Coal Production & Consumption | 6 |
| I-4 Average Coal Prices (F.O.B. Plant) | 7 |
| I-5 U.S. Natural Gas Annual Marketed Production | 8 |
| I-6 Average Annual Reserve Additions of Natural Gas | 10 |
| I-7 Nuclear Power Generation by Year Percentage of Total Electric Power Generation | 12 |
| I-8 1985 Utility Fuel Mix; \$13 Oil Imports | 20 |
| I-9 1985 Oil Production (Reference Scenario) | 26 |
| I-10 Domestic Oil Production Under Different Scenarios | 29 |
| I-11 Natural Gas Production Under Different Scenarios, \$13 Oil Imports | 30 |
| I-12 Regional Growth in Coal Production | 33 |
| I-13 Nuclear Power's Role in Generating Electricity | 37 |
| I-14 Energy Outlook Under Different Oil Prices | 40 |
| I-15 Cost of Energy Supply Investments | 44 |
| I-16 Electricity Generation by Energy Source (Reference Scenario, \$13 Oil Imports) | 46 |

Chapter II

| | | |
|-------|--|-----|
| II-1 | Average Wellhead Price of U.S. Crude | 51 |
| II-2 | Oil Drilling Trends. | 53 |
| II-3 | U.S. Proved Reserves of Crude Oil. | 54 |
| II-4 | U.S. Crude Oil Production. | 55 |
| II-5 | U.S. Petroleum Products Consumption. | 56 |
| II-6 | U.S. Oil Consumption by Source | 57 |
| II-7 | Total U.S. Petroleum Imports By Regional and Organizational Sources. | 58 |
| II-8 | Petroleum Imports. | 59 |
| II-9 | Crude Oil Production at Three Prices (BAU) | 67 |
| II-10 | Petroleum Resources of the United States | 71 |
| II-11 | Drilling Activities for Oil (BAU). | 76 |
| II-12 | North Alaska Production Areas. | 80 |
| II-13 | North Alaska Crude Production (BAU). | 83 |
| II-14 | North Alaska Drilling and Logistical Effort (BAU). | 85 |
| II-15 | Crude Oil Production Under Alternative Outlooks. | 88 |
| II-16 | Drilling Activities for Oil Under Alternative Outlooks | 93 |
| II-17 | Outlooks for North Alaska Crude Production | 97 |
| II-18 | Projected Petroleum Consumptions (Reference Scenario). | 101 |
| II-19 | Outlook for Petroleum Consumption By Sector (Reference Scenario) . | 102 |
| II-20 | Crude Oil Production at Three Prices (BAU) | 104 |
| II-21 | Drilling Activities for Oil (BAU). | 106 |
| II-22 | Outer Continental Shelf Leasing Schedules. | 107 |
| II-23 | Capital Expenditures By the Petroleum Industry | 108 |
| II-24 | Crude Oil Production Under Alternative Outlooks. | 109 |

Chapter III

| | | |
|--------|---|-----|
| III-1 | Growth in U.S. Natural Gas Consumption 1920-1974 | 112 |
| III-2 | Regional Distribution of Natural Gas Consumption, 1974 | 116 |
| III-3 | Overview - U.S. Natural Gas System | 118 |
| III-4 | U.S. Natural Gas Reserves (Excluding Alaska) | 120 |
| III-5 | Average Annual Reserve Additions of Natural Gas. | 122 |
| III-6 | Major Natural Gas Producing Regions and Pipelines With Significant Curtailments | 124 |
| III-7 | Non-Associated Natural Gas Production From the Lower 48 States and the OCS at Three Wellhead Price Levels | 134 |
| III-8 | Non-Associated Natural Gas Production at \$2.00 For the Lower 48 States and the OCS Under Three Sets of Assumptions | 141 |
| III-9 | Proposed Arctic Gas System | 148 |
| III-10 | Proposed El Paso System. | 149 |
| III-11 | Potential Marketed Production of Natural Gas and Its Supplements . | 162 |

Chapter IV

| | | |
|------|--|-----|
| IV-1 | Coal's Declining Share of Total United States Energy Consumption . | 164 |
| IV-2 | Coal Consumption By Sector 1935-72 | 166 |
| IV-3 | Electrical Generation by Fuel, 1955-73 | 167 |
| IV-4 | Census Regions | 177 |
| IV-5 | Representative Coal Supply Curves. | 197 |
| IV-6 | Coal Supply Regions. | 198 |

Chapter V

| | | |
|-----|--|-----|
| V-1 | Comparison of Nuclear Plant Cost Estimates | 218 |
| V-2 | Key Factors of Power Cost Rise | 219 |
| V-3 | Ratio of Market Value to Book Value of Electric Utility Stock. . . | 230 |
| V-4 | Gigawatts Energy -- Change in Planned Electric Generating Capacity Additions: Comparison of 1974 and 1975 Forecasts. | 233 |

Appendix V-A

| | | |
|------|---|-----|
| VA-1 | The Light Water Reactor Nuclear Fuel Cycle | 254 |
| VA-2 | Domestic Uranium Delivery Commitments. | 259 |
| VA-3 | Uranium Requirements and Delivery Commitments. | 260 |
| VA-4 | Range of Reported U ₃ O ₈ Prices in 1974 and 1975 | 261 |
| VA-5 | Separative Work Unit (SWU) | 264 |
| VA-6 | The Fast Breeder | 267 |

Chapter VI

| | | |
|------|--|-----|
| VI-1 | Energy's Annual Share of Business, Plant and Equipment | 295 |
| VI-2 | Petroleum Industry Capital, Exploration and Development Expenditures in the United States 1965-1984. | 299 |

Appendix A

| | | |
|-----|--|------|
| A-1 | Electric Utility and Demand Regions | A-2 |
| A-2 | Refinery Regions | A-3 |
| A-3 | Integrating Model Framework | A-4 |
| A-4 | Flow of Material | A-6 |
| A-5 | Supply Model Structure | A-7 |
| A-6 | Supply Functions Approximation and Resultant Cost Curves | A-10 |
| A-7 | Annual Load Duration | A-14 |
| A-8 | Demand Function Approximation | A-17 |

Appendix C

| | | |
|-----|--|------|
| C-1 | Demand Model-Basic Configuration | C-3 |
| C-2 | Transportation Model Configuration | C-13 |
| C-3 | Demand Model Simulation Price Path Construction and Elasticity Computation | C-19 |

Appendix D

| | | |
|-----|---|-----|
| D-1 | PIES Coal Supply Regions | D-2 |
| D-2 | Midwest Low-Sulfur PIES Coal Supply Curve | D-5 |
| D-3 | Oil and Gas Regions | D-7 |
| D-4 | Structure of FEA Gas Supply Model | D-9 |

TABLES

Chapter I

| | | |
|------|--|----|
| I-1 | Energy Demand by Sector, 1985 | 16 |
| I-2 | Energy Growth Rates by Sector, Reference Scenario | 16 |
| I-3 | Petroleum Consumption Across Prices, Reference Scenario | 17 |
| I-4 | 1985 Coal Consumption at \$13 Oil Imports, Reference Scenario | 21 |
| I-5 | Impact of Energy Conservation Actions | 23 |
| I-6 | Effects of Conservation Actions at \$13 Imported Oil Prices | 25 |
| I-7 | Factors Affecting Oil Production Estimates | 28 |
| I-8 | Potential Natural Gas Supply Sources | 32 |
| I-9 | Sulfur Distributing of Production | 34 |
| I-10 | Surface/Underground Mining Forecast at \$13 Oil, Imports, Reference Scenario | 34 |
| I-11 | Regional Coal Production, 1985 | 35 |
| I-12 | 1985 Expected Oil Imports Reference Scenario | 39 |
| I-13 | 1985 Oil Imports Under Different Scenarios, \$13 Oil Imports | 41 |
| I-14 | Energy Price Forecast, Reference Scenario | 42 |

Chapter II

| | | |
|-------|--|-----|
| II-1 | Business-As-Usual Supply Outlook Assumptions | 61 |
| II-2 | Oil Supply Outlooks and PIES Energy Scenarios | 62 |
| II-3 | BAU Oil Production Possibilities at \$13 Oil Imports | 64 |
| II-4 | 1985 BAU Oil Production at Alternative Import Prices | 66 |
| II-5 | USGS-725: Reserves and Undiscovered Resources | 70 |
| II-6 | BAU Proved Reserves Added, 1975-1989 | 73 |
| II-7 | Business-As-Usual Leasing | 74 |
| II-8 | 1985 BAU Production from Enhanced Recovery at Alternative Oil Prices | 78 |
| II-9 | Potential Tertiary Reserve Additions and Production | 79 |
| II-10 | Possible North Alaska Reserves at \$13 Oil Imports | 81 |
| II-11 | Optimistic and Pessimistic Outlook Assumptions | 87 |
| II-12 | Alternative 1985 Production at \$13 Oil Imports | 90 |
| II-13 | Contribution to Estimating Uncertainty from Geologic, Drilling, Leasing and Alaska Scenarios | 91 |
| II-14 | USGS-725: Alternative Geological Outlooks | 92 |
| II-15 | Impact of Alternative Supply Outlooks on Drilling Activity at \$13 Oil Prices | 92 |
| II-16 | OCS Leasing Schedules Under Alternative Scenarios | 94 |
| II-17 | 1985 Production from Enhanced Recovery Under Alternative Outlooks at \$13 Oil Prices | 94 |
| II-18 | 1985 Components of North Alaska Uncertainty | 96 |
| II-19 | Historical and Forecasted Annual Oil Demand Growth Rates by Economic Sector | 103 |

| | | |
|--------|--|-----|
| III-1 | Sectoral Growth in Natural Gas Consumption (Tcf/Yr) | 113 |
| III-2 | Extent of Housing Customer Restrictions, 1974 | 114 |
| III-3 | Regional Utility Natural Gas Consumption (Bcf/Yr) | 117 |
| III-4 | Curtailement Trends | 121 |
| III-5 | Projections of Natural Gas Shortages During Winter of 1975-1976 in Most-Affected States | 125 |
| III-6 | Gas Supply and Deliverability Summary, Volumes Dedicated to Interstate Pipeline Companies as of Year End 1974 (Bcf/Yr) | 127 |
| III-7 | 1985 Natural Gas Demand by Sector and Oil Import Price (Tcf/Yr) | 129 |
| III-8 | 1985 Natural Gas Demand at \$13 Oil Imports (Tcf/Yr) | 131 |
| III-9 | 1985 Nonassociated Natural Gas Supply Response Business-As- Usual (Tcf/Yr) | 135 |
| III-10 | Business-As-Usual, Nonassociated Gas Production Estimates (Bcf/Yr) | 136 |
| III-11 | Optimistic and Pessimistic Outlook Assumptions | 137 |
| III-12 | Reserves and Undiscovered Resources of Natural Gas for the United States (Tcf) | 138 |
| III-13 | Alternatives Geological Outlooks (Tcf) | 138 |
| III-14 | Nonassociated Gas Production From Existing Reserves in 1974 | 139 |
| III-15 | Nonassociated Gas Production, 1985 (Tcf) | 139 |
| III-16 | Nonassociated Gas Production Estimates, 1985 (Bcf/Yr) | 140 |
| III-17 | Projected Footage Drilled for Gas Wells Cumulative from 1985 | 142 |
| III-18 | Nonassociated Gas Reserve Additions (Tcf) | 143 |
| III-19 | Reference Scenario Production | 144 |
| III-20 | Projected Interstate/Intrastate Sales Under Different Policies, 1985 | 145 |
| III-21 | Natural Gas Production and Prices for Alternative Scenarios (\$13 Oil Imports) | 146 |
| III-22 | Oil and Gas Data for Potential LNG Supply Sources | 152 |
| III-23 | Alternative LNG Supply Cases (Tcf/Yr) | 153 |
| III-24 | Costs of Synthetic Gas Processes (\$/Mcf) | 155 |
| III-25 | Potential Supply of Natural Gas and Supplements | 160 |

Chapter IV

| | | |
|------|---|-----|
| IV-1 | Coal Production by Region and Mining Method, 1945-72 | 168 |
| IV-2 | Coal Consumption and Production | 170 |
| IV-3 | National Average Prices of Delivered Coal and Residual Oil to Electric Utilities | 171 |
| IV-4 | Coal Consumption by Sector | 172 |
| IV-5 | Coal Production | 172 |
| IV-6 | Short-Term Forecast | 173 |
| IV-7 | 1985 Coal Consumption, Reference Scenario, \$13 Oil Imports | 175 |

| | | |
|-------|---|-----|
| IV-8 | 1985 Utility Coal Consumption by Census Regions, Reference Scenario, \$13 Oil Imports | 176 |
| IV-9 | Sulfur Content of Utility Coal, 1985 Reference Scenario, \$13 Oil Imports | 178 |
| IV-10 | Long-Term Contract Delivered Coal Prices to the Electric Utility Sector, 1985 Reference Scenario, \$13 Oil Imports | 179 |
| IV-11 | Coal Consumption, Reference Scenario, \$13 Oil Imports | 180 |
| IV-12 | Electricity Consumption Growth Rates, Reference Scenario, \$13 Oil Imports | 180 |
| IV-13 | Utility Coal Consumption by Sulfur Content, Reference Scenario, \$13 Imports | 181 |
| IV-14 | Electric Utility Sector Fossil Fuel Consumption, 1985 Reference Scenario | 183 |
| IV-15 | Delivered Fuel Prices in 1985 to Utility Sector in Mid-Atlantic Region | 184 |
| IV-16 | Coal Consumption Under Various Scenarios, 1985, \$13 Oil Imports | 185 |
| IV-17 | Electric Utility Fuel Consumption, 1985, \$13 Oil Imports | 186 |
| IV-18 | Illustrative Baseload Electricity Generation Costs | 187 |
| IV-19 | Effects of Changes in Key Factors Affecting Utility Coal Consumption, 1985, \$13 Oil Imports | 188 |
| IV-20 | Effect of Electrification on Utility Coal Consumption, 1985, \$13 Oil Imports | 189 |
| IV-21 | Effect of Hypothetical Environmental Regulations on Utility Coal Consumption, 1985, \$13 Oil Imports | 190 |
| IV-22 | Coal Prices (FOB Mine), 1985, \$13 Oil Imports | 191 |
| IV-23 | Illustrative Costs of Generating Electricity with Coal | 191 |
| IV-24 | Shift in Oil Price Break Points (Mid-Atlantic Region) | 191 |
| IV-25 | Coal and Oil Consumption in Utility Sector, 1985, \$13 Oil Import | 192 |
| IV-26 | Demonstrated Coal Reserve Base | 192 |
| IV-27 | Low Sulfur Coal Reserves | 195 |
| IV-28 | Coal Prices at Different Production Levels, 1985, \$13 Oil Imports | 196 |
| IV-29 | Coal Production by Region, 1985 Reference Scenario, \$13 Oil Imports | 199 |
| IV-30 | Sulfur Distribution of Coal Production, 1985 Reference Scenario, \$13 Oil Imports | 200 |
| IV-31 | Production by Type of Mining, 1985 Reference Scenario, \$13 Oil Import | 201 |
| IV-32 | Prices by Region and Coal Type, 1985 Reference Scenario, \$13 Oil Imports | 202 |
| IV-33 | Coal Production by Region, Reference Scenario, \$13 Oil Imports | 203 |
| IV-34 | Prices in Selected Regions, Reference Scenario, \$13 Oil Imports | 204 |
| IV-35 | Coal Production by Region, 1985 Reference Scenario | 205 |

| | | |
|-------|---|-----|
| IV-36 | Regional Variation of Coal Prices with Oil Prices, 1985 Reference Scenario | 206 |
| IV-37 | Coal Production Under Various Scenarios, 1985, \$13 Oil Imports | 207 |
| IV-38 | Coal Production, 1985, \$13 Oil Imports | 208 |
| IV-39 | Sulfur Content of Steam Coal Production, 1985, \$13 Oil Imports | 208 |
| IV-40 | Relative Economics of Baseload Coal Plant Types East North Central Utility Region, 1985, \$13 Oil Imports | 210 |
| IV-41 | Regional Electricity Prices in 1985 | 210 |

Chapter V

| | | |
|------|--|-----|
| V-1 | Operating Costs for Utility Generating Plants | 220 |
| V-2 | Historical Growth: Peak Load and Total Electric Demand | 223 |
| V-3 | Backlog of Electric Utility Rate Cases | 225 |
| V-4 | Price Increases and Demand Changes: 1973-74 | 226 |
| V-5 | Percent Increase (Decrease) in Demand for Electricity by Consuming Sector | 227 |
| V-6 | Required After Tax Returns vs. Actual Returns | 228 |
| V-7 | Earnings and AFDC for Investor-Owned Utilities | 229 |
| V-8 | Electric Utility Construction Expenditures and Long-Term Financing | 232 |
| V-9 | Scheduled Generating Capacity Additions 1976-79 | 234 |
| V-10 | Comparison of Recent Electric Demand Growth Studies | 239 |
| V-11 | Percent Contribution for Each Fuel to Regional and Total U.S. Electricity Generation | 241 |
| V-12 | Electric Power Plant Capacity Additions 1974-84, \$13 Oil Imports | 243 |
| V-13 | Capital Requirements of the Electric Utility Industry | 246 |

Appendix V-A

| | | |
|------|---|-----|
| VA-1 | Uranium Ore Reserves and Resources | 256 |
| VA-2 | Distribution of U ₃ O ₈ Production in Ore by States, 1974 | 256 |

Appendix V-B

| | | |
|------|--|-----|
| VB-1 | Plant Expenditures and Internally Generated Funds of Electric Utilities | 274 |
| VB-2 | Growth in Revenues and Expenditures of Investor-Owned Electric Utilities | 274 |
| VB-3 | Internally Generated Funds of Investor-Owned Electric Utilities | 276 |

| | | |
|-------|--|-----|
| VB-4 | Construction Expenditures and External Financing by Investor-Owned Electric Utilities | 277 |
| VB-5 | Capital Outlays in Electric Utilities and Other Industries | 279 |
| VB-6 | Electric Utility Long Term Financing As Percent of Total for all U. S. Industries | 280 |
| VB-7 | Debt and Preferred Coverage Ratios, Investor-Owned Utilities | 282 |
| VB-8 | Effect of Bond Refunding Requirements on Interest Costs to Investor-Owned Electric Utility Companies | 284 |
| VB-9 | Combined Returns of Utility Equities | 285 |
| VB-10 | Estimated Cost of Common Equity to Investor-Owned Electric Utilities | 287 |
| VB-11 | Predicted Versus Actual Dividend Growth | 288 |
| VB-12 | Estimated Weighted Average Cost of Capital to Investor-Owned Electric Utilities | 290 |
| VB-13 | The Effect of New Issues on the Payout Ratio | 291 |

Chapter VI

| | | |
|-------|---|-----|
| VI-1 | New Plant and Equipment Expenditures for Energy Extraction and Processing Industries | 296 |
| VI-2 | Cumulative Capital Requirements for Energy, 1975-1984 | 297 |
| VI-3 | Petroleum Industry Capital, Exploration and Development Expenditures in the United States | 300 |
| VI-4 | Forecasts of Petroleum Industry Capital Expenditures, 1975-1984 | 301 |
| VI-5 | Sources and Uses of Funds for Worldwide Operations of Group of Thirty Large Petroleum Companies, 1965-1974 | 302 |
| VI-6 | Worldwide Return on Equity of Petroleum Companies | 303 |
| VI-7 | Costing Summary of Base Case Mine Models | 307 |
| VI-8 | New Coal Mine Requirements 1975-1984 | 309 |
| VI-9 | Capital Requirements for New Mines 1975-1984 | 309 |
| VI-10 | Cost of New Electrical Generating Plants | 311 |
| VI-11 | Capital Requirements of the Electric Utility Industry | 312 |
| VI-12 | Comparison of Estimates of the Capital Needs of Electric Utilities 1975-1984 | 313 |
| VI-13 | External Capital Requirements of the Electric Utility Industry, 1975-1984 | 313 |
| VI-14 | Nuclear Fuel Cycle Capital Requirements, 1975-1984 | 317 |
| VI-15 | Gas Utility Production Expenditures, 1975-1984 | 318 |
| VI-16 | Comparison of Cumulative Capital Requirements for Energy Conservation through 1984 with Total Expected Investment | 320 |

Appendix VI-A

| | | |
|-------|--|-----|
| VIA-1 | Comparison of Results of Capital Requirements Studies | 321 |
| VIA-2 | Summary of Assumptions, Results, and Policy Recommendation in Studies of Capital Adequacy | 322 |

Appendix A

| | | |
|-----|---|-----|
| A-1 | Legend for Supply Model Schematic of Figure A-5 | A-8 |
|-----|---|-----|

Appendix C

| | | |
|-------|--|------|
| C-1 | 1974 Energy Consumption by Fuel by Sector | C-2 |
| C-2 | Fuels Modeled Jointly by Sector | C-4 |
| C-3 | Parameter Estimates from Energy Demand Model | C-7 |
| C-4 | Numerical Computed Elasticities for U.S.: 1985 | C-10 |
| C-5 | Summary of Other Fuels Relationships | C-11 |
| C-6 | Summary of Transportation Fuel Relationships | C-15 |
| C-7 | Transportation Model Elasticities (Long Run) | C-17 |
| C-8 | Summary of Other Fuel Relationships | C-17 |
| C-9a | Growth Rates of Selected Macroeconometric Variables Compounded Annually | C-21 |
| C-9b | Regional Growth Rates of Selected Variables | C-21 |
| C-10a | Growth Rates in Quantities and Prices: 1960-1972 | C-23 |
| C-10b | Growth Rates in Quantities and Prices: 1972-1974 | C-24 |
| C-10c | Growth Rates in Quantities and Prices: 1974-1985 (\$13 Reference Case) | C-25 |
| C-11 | Growth Rates in Fuel Consumption for 1974-1985 If Prices Remained at 1974 Real Levels | C-26 |
| C-12a | Regional Quantity Growth Rates: 1960-1972 | C-27 |
| C-12b | Regional Price Growth Rates: 1960-1972 | C-28 |
| C-13a | Quantity Growth Rates: 1974-1985 | C-29 |
| C-13b | Price Growth Rates: 1974-1985 | C-30 |
| C-14 | Fraction of H/C Distillate Allocated to the Residential Sector | C-31 |
| C-15a | Econometric Results - Residential Sector | C-33 |
| C-15b | Econometric Results - Commercial Sector | C-34 |
| C-15c | Econometric Results - Industrial Sector | C-35 |

Appendix D

| | | |
|-----|--|------|
| D-1 | Coal Supply Regions and Product Classes for PIES Model | D-4 |
| D-2 | Finding Rate Data for Oil and Natural Gas | D-11 |
| D-3 | Operating Costs Per Gas and Oil Wells | D-12 |

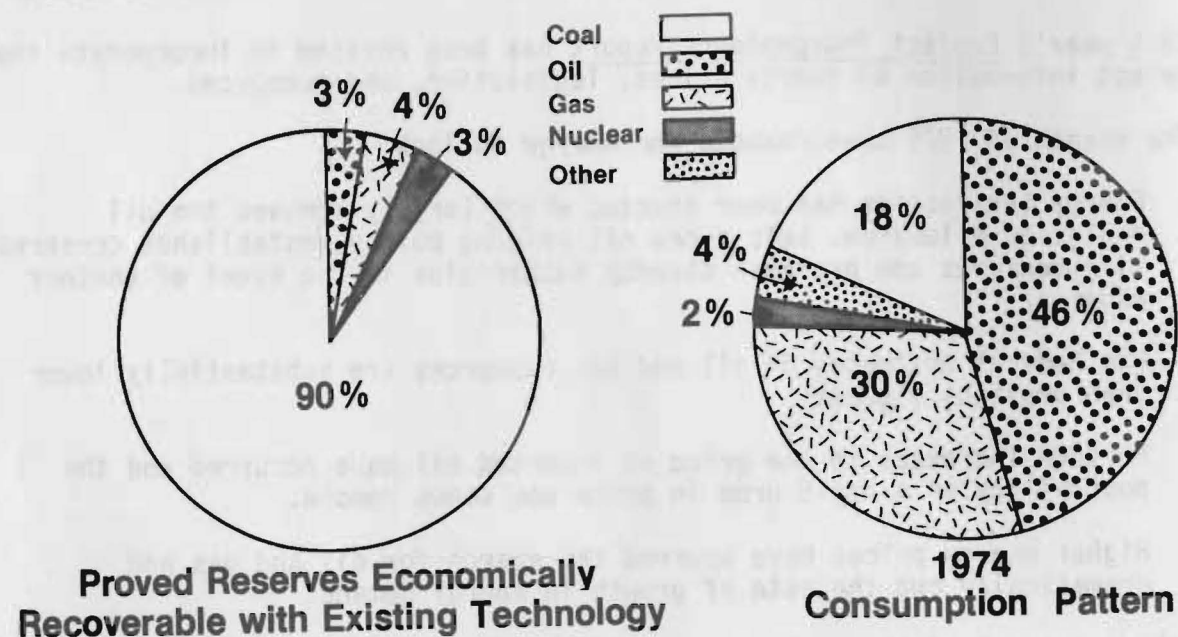
Appendix F

| | | |
|-----|--|-----|
| F-1 | Markups of PIES Report Wholesale Prices to Obtain Delivered Sector Prices | F-5 |
| F-2 | Prices: 1985 Reference Scenario, \$13 Oil Imports | F-6 |

FINDINGS AND CONCLUSIONS

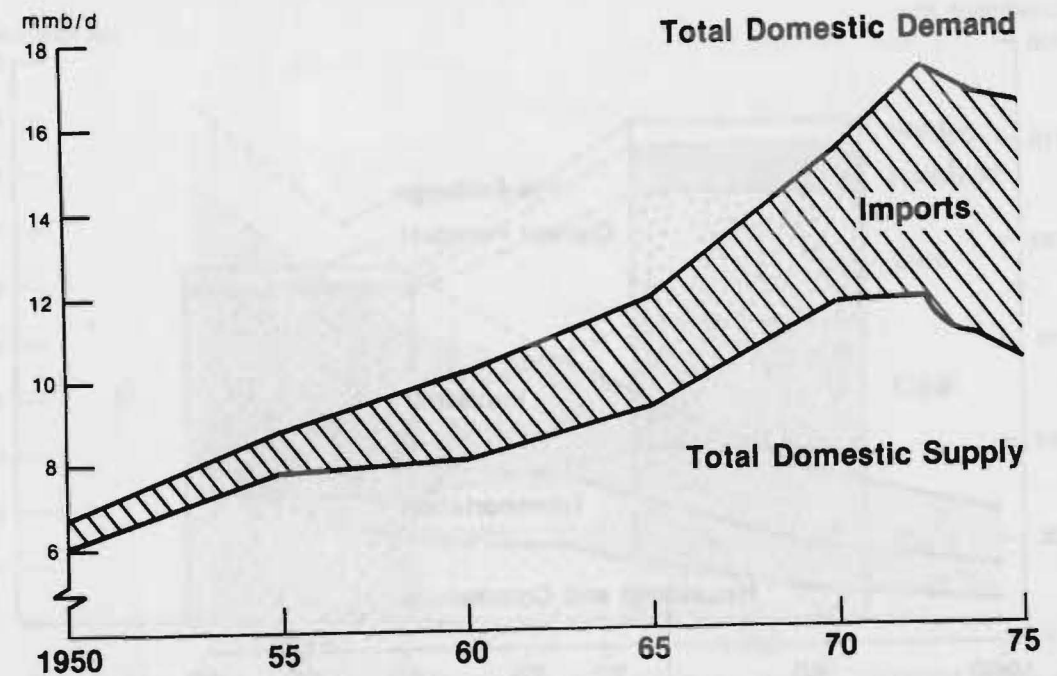
- Last year's Project Independence Report has been revised to incorporate the latest information on energy prices, legislation, and resources.
- The events of 1975 have changed the energy outlook:
 - Energy legislation has been enacted which largely removes the oil depletion allowance, sets a new oil pricing policy, establishes conservation measures and provides standby authorities in the event of another embargo.
 - New Federal estimates of oil and gas resources are substantially lower than previous figures.
 - Further increases in the price of imported oil have occurred and the possibility of a rapid drop in price now seems remote.
 - Higher energy prices have spurred the search for oil and gas and dramatically cut the rate of growth in energy demand.
- Taking account of these changes, the FEA analysis shows that energy independence can still be achieved:
 - Over the next 10 years, the Nation can greatly expand its domestic energy production and cut the rate of growth in energy demand, and still meet its economic objectives.
 - Our dependence in the next few years would have increased, but the recently enacted legislation will hold our vulnerability to about current levels.
 - The post-1985 prospects for maintaining independence are less certain, unless technological and economic breakthroughs occur.
- If we do not establish policies to stimulate domestic energy production and cut energy use, or if regional growth restrictions, less reserves than expected, or extended price controls occur, our dependence on foreign oil could rise dramatically above today's levels.
 - The uncertainties and energy impacts associated with each of these factors is large and makes accurate forecasting difficult.
 - But unless the Nation weighs the impacts of alternative policy assumptions, it cannot choose a national energy policy which balances economic, energy, environmental, and social objectives.
- The figures which follow briefly summarize the major findings of this year's National Energy Outlook.

What Are the Roots of Our Energy Problem?



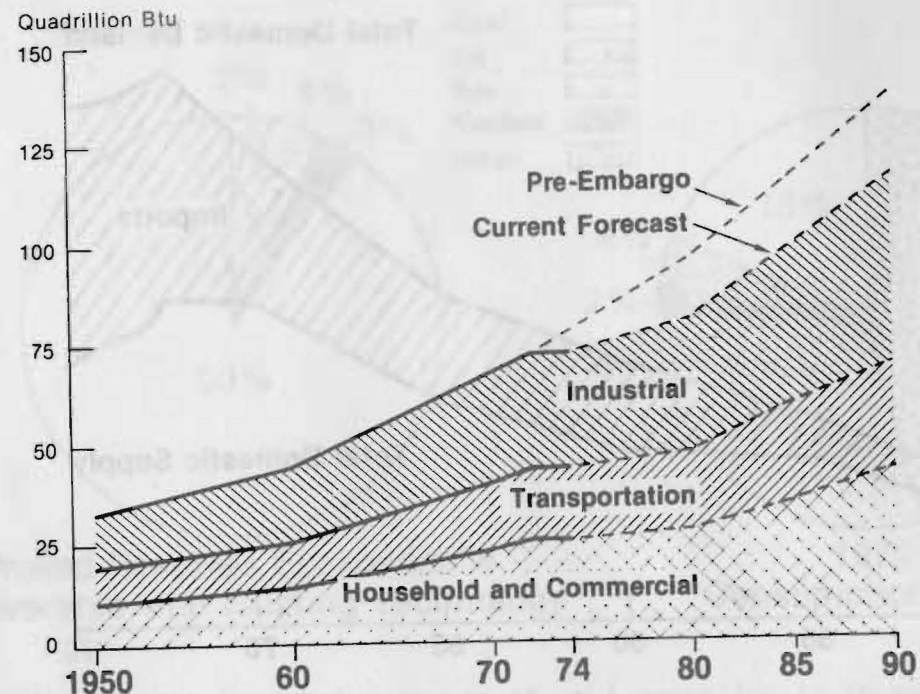
- The United States has vast reserves of coal amounting to three times the energy contained in the Middle East's oil reserves, and currently accounting for more than 90 percent of U.S. proved energy reserves.
- Yet, over the last 75 years, the United States has switched from using coal for over 90 percent of its energy needs to depending on oil and gas for 75 percent of its energy.
- Thus, the Nation depends upon its least abundant energy resources to provide most of its energy needs.
- The result has been a growing dependence on imported energy, the availability and price of which are controlled by a few Middle East countries.
- Our task between now and 1985 is to find and develop more oil and gas and stimulate conservation to offset currently dwindling production of these fuels, as our economy is converted to the more abundant resources, such as coal and nuclear power.
- In the post-1985 period, our task is to develop new technologies that can dramatically expand our economically usable reserves of oil and uranium and make greater use of non-depletable resources, such as solar and geothermal energy.

How Did We Become So Vulnerable To Oil Imports?



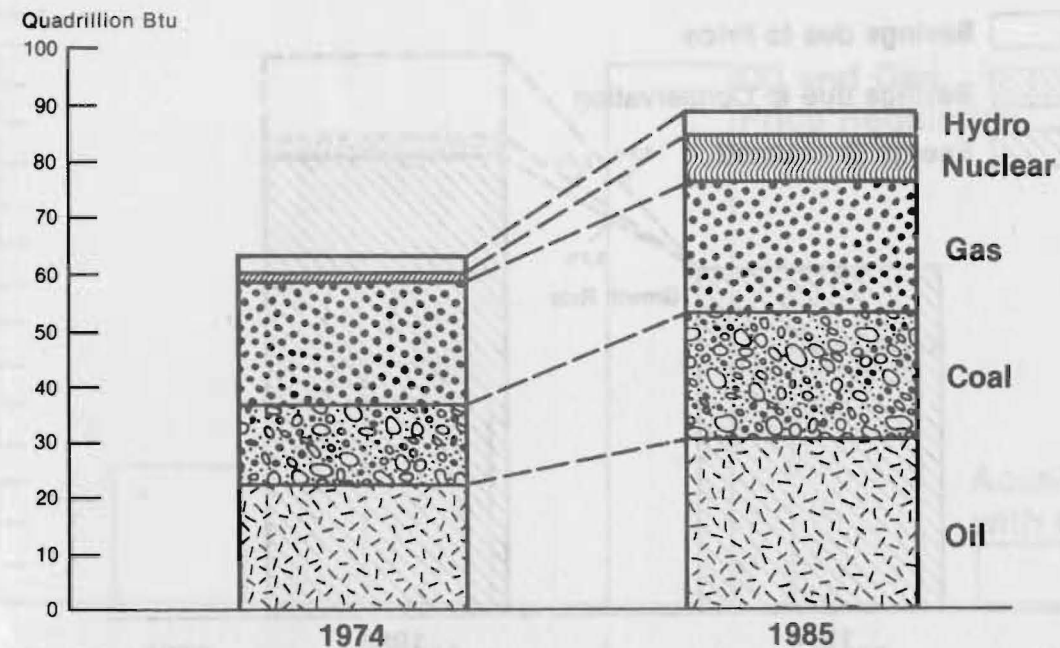
- The availability of inexpensive imported oil served as a disincentive to domestic production which peaked at 9.6 million barrels per day (MMB/D) in 1970, has been declining ever since, and now stands at 8.2 MMB/D.
- Meanwhile, petroleum demand grew at an annual rate of 4.6 percent in the 1960's and early 1970's, in response to low prices, air pollution restrictions on coal use, and the growing use of automobiles.
- The combination of declining domestic production and rising demand led to a rapid growth in imports:
 - From 1.8 million barrels per day (MMB/D), or 19 percent of consumption, in 1960.
 - To 3.4 MMB/D, or 23 percent of consumption, in 1970.
 - To a high of 6.0 MMB/D, or 37 percent of consumption, in 1975.
- The Arab oil embargo in 1973/74 demonstrated that the U. S. is vulnerable to severe supply disruptions and oil price increases.
- Today, the United States spends about \$37 billion, or \$125 per person, for imported oil; as compared to about \$3 billion, or \$15 per person, in 1970.

How Much Energy Will the Nation Consume?



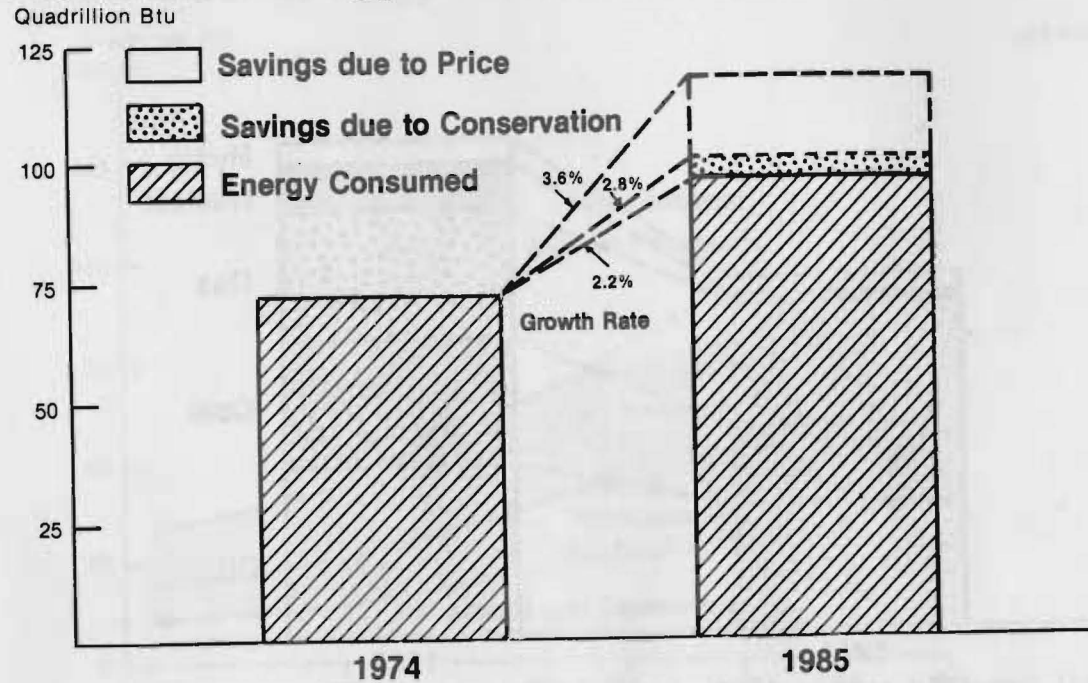
- Energy demand grew at a rate of 3.6 percent in the 20 years before the 1973 embargo, and in 1975 the United States consumed about 73 quadrillion Btu's (quads).
 - Electricity consumption grew at twice the rate of all energy demand (about 7 percent per year).
- By 1985, as a result of higher prices, energy demand will be much lower than historic growth rates even with continued economic expansion.
 - With a continuation of current oil prices (about \$13 per barrel in 1975 dollars), demand will be 98.9 quads in 1985 -- a 2.8 percent growth rate.
 - Electricity will still grow about twice as fast as overall energy demand, but at reduced levels of 5.4 percent per year.
 - Consumption will gradually shift from oil and gas to coal and nuclear power.
- If world oil prices decline to \$8 per barrel, or if oil and gas prices are regulated substantially below market prices, energy demand would grow faster -- at an annual rate of between 3.0 and 3.2 percent.
- The largest reductions in energy growth will be in the Household/Commercial and Transportation Sectors, which will respond most sharply to higher energy prices.

How Will the U.S. Meet Its Growing Energy Demands by 1985?



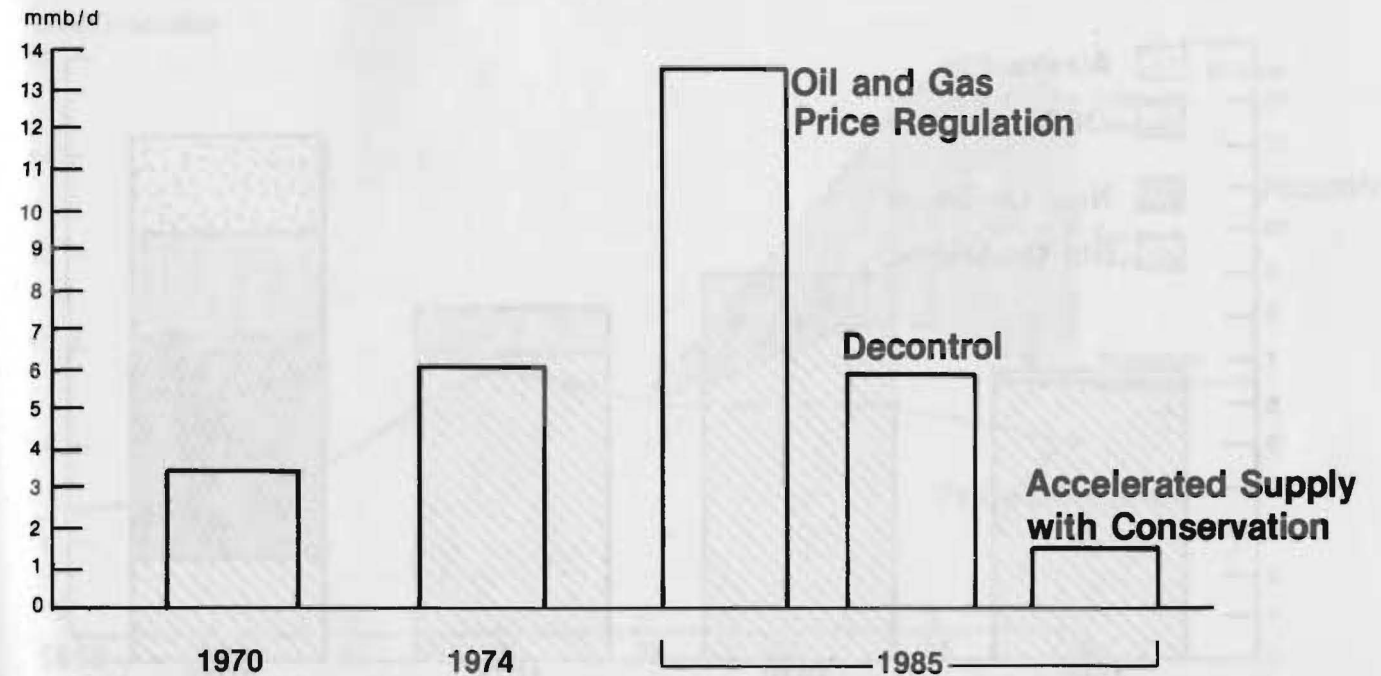
- Total domestic supply is forecast to increase by 40 percent between now and 1985, with all major fuels playing a large role:
 - Coal production could increase to over one billion tons, from current levels of 640 million tons.
 - Oil production could reach 13.9 MMB/D, if Outer Continental Shelf leasing is strongly pursued and market prices prevail.
 - Natural gas production could reach 22.3 trillion cubic feet (Tcf) if new gas prices are deregulated, but will be 17.9 Tcf under current regulations.
 - Although nuclear power has experienced significant delays, it could grow from current levels of 8.6 percent to about 26 percent of electricity generation.
 - Emerging technologies such as the conversion of coal into oil or gas, solar, and geothermal energy, will be important in the post-1985 period, but will not produce much energy in the next ten years.
- Each of these supply increases, while technically and economically feasible, requires significant growth of the energy producing sectors and will not be forthcoming unless pricing and government regulatory policies encourage it. Institutional barriers and policy uncertainty will also delay development.
- If one or more domestic energy sources do not achieve these projected levels, imports will make up the shortage because other domestic fuel sources could not compensate for the loss.

How Much Energy Can Be Saved?



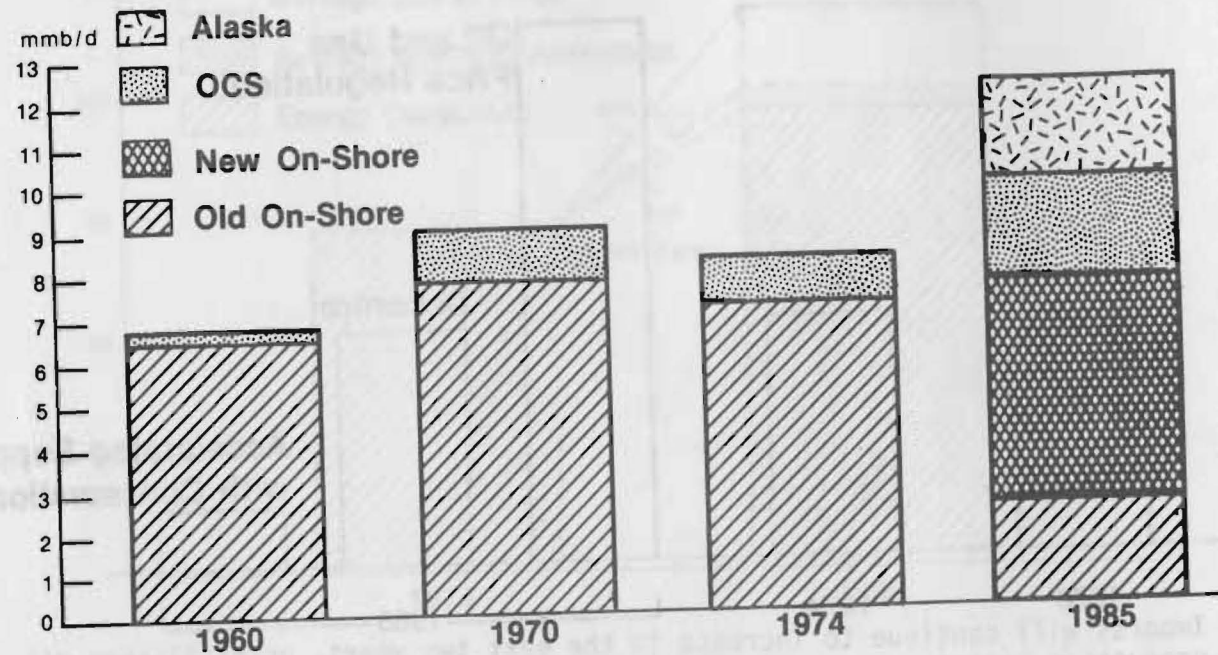
- Higher energy prices should significantly cut energy demand growth during the next ten years, reducing the growth rate to 2.8 percent from the historical rate of 3.6 percent.
- An active conservation program could further reduce energy demand by the equivalent of 3 million barrels per day, reducing the annual energy growth rate to 2.2 percent through 1985.
 - Savings could be achieved in all the major sectors: residential, commercial, industrial and transportation.
 - Actions which improve automobile efficiency and the efficiency of homes and office buildings would have the greatest impact in the next ten years.
- While conservation can reduce energy demand, it does not appear feasible to cut the growth rate to zero or to obviate the need for expanding existing supplies of energy.

What Will Oil Imports Be by 1985?



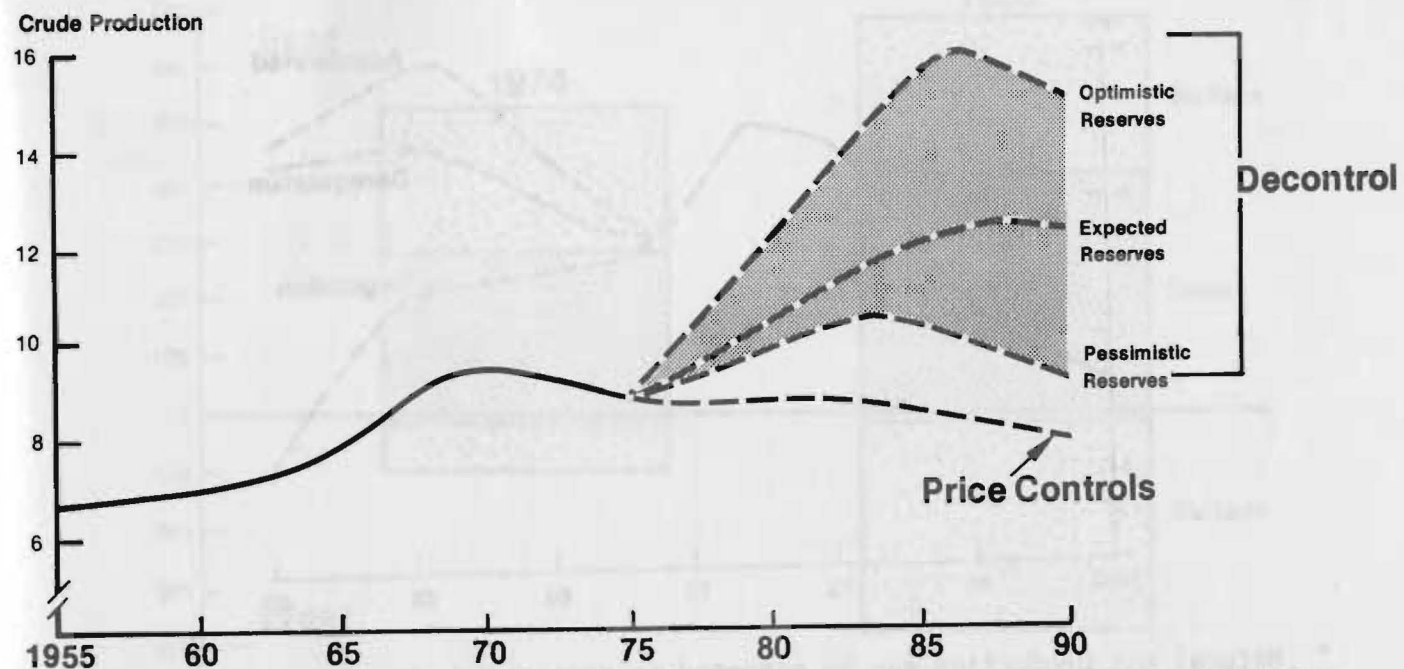
- Imports will continue to increase in the next two years, until Alaskan oil production begins.
 - There is little that can be done to cut imports through 1977, although conserving energy and increasing oil recovery in existing fields will provide some help.
- We have much greater ability to cut imports by 1985, if appropriate policy actions are taken:
 - If oil and gas prices are regulated at low levels, imports could reach 13.5 MMB/D in 1985.
 - With gradual deregulation of oil and gas prices, and a continuation of current world oil prices, imports could drop to 5.9 MMB/D, slightly below today's level.
 - A maximum effort to increase supply and cut demand could reduce imports to about 1.0 MMB/D, making the United States invulnerable by 1985.
- By 1990, however, imports could increase as domestic production from older fields again declines. This decline will need to be offset by the growing use of nuclear power, synthetic fuels, solar and other emerging technologies.

Where Will New Oil Supplies Come From?



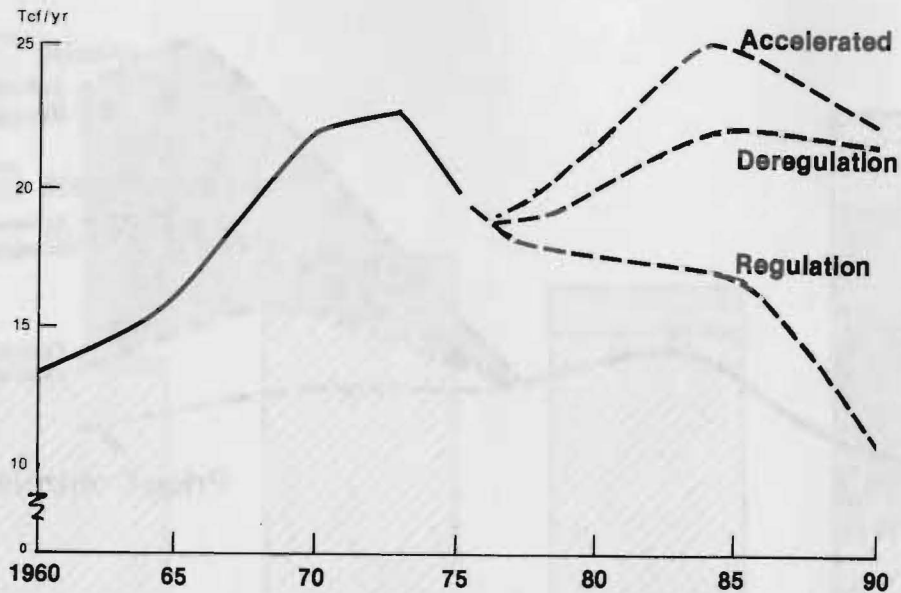
- Domestic crude oil production could increase to 12.3 MMB/D in 1985 (from 8.4 MMB/D in 1975), if today's market prices are allowed to stimulate domestic production and an aggressive OCS leasing and development program is followed.
- While total production will increase from today's levels, oil supply from existing onshore reserves could decline to 2.4 MMB/D by 1985, as older fields are depleted.
 - But, more intensive use of secondary and tertiary recovery in current fields and new discoveries onshore can keep onshore production about constant.
- If the current OCS leasing and development schedules are followed, OCS production could more than double by 1985, to about 2.3 MMB/D.
- Alaska will be the greatest new source of production, increasing to about 2.4 MMB/D by 1985.

How Quickly Will This Country Run Out of Oil?



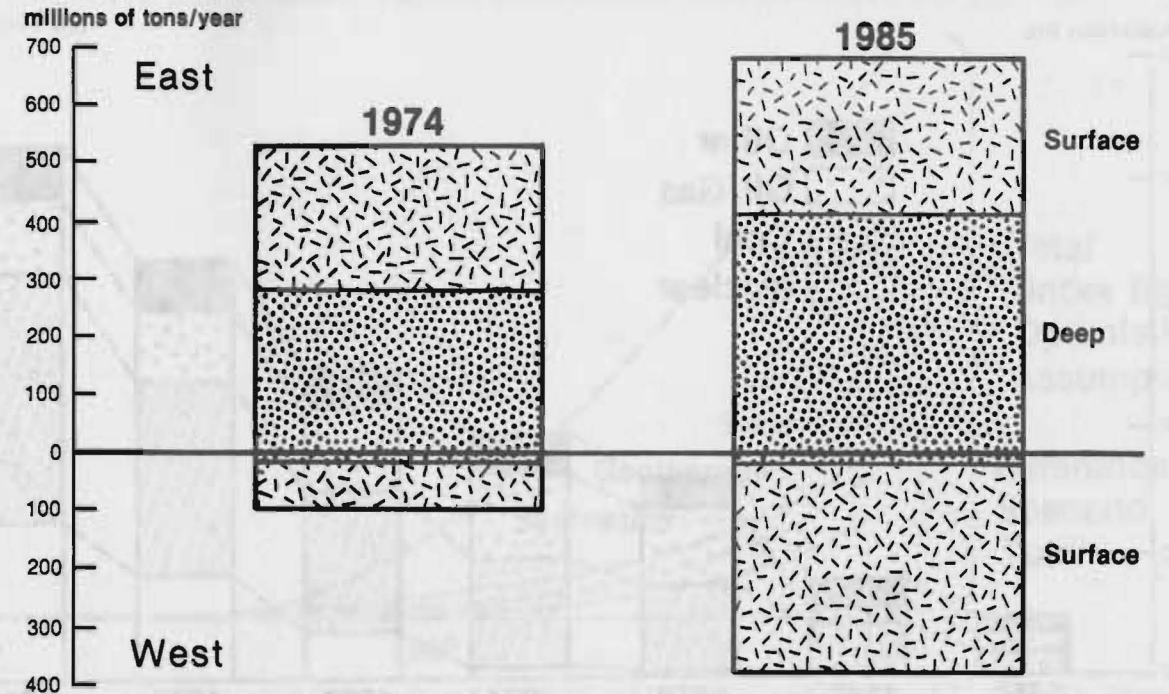
- The amount of oil we discover and produce depends on how much oil is in the ground (reserves) and whether oil prices are high enough to justify their production.
- If oil prices remain at current levels and the Federal Government's best estimate of known and expected reserves proves correct, domestic production could reach 12.3 MMB/D (or 13.9 MMB/D including natural gas liquids) by 1985 and begin to decline in the late 1980's.
- If world prices fall to \$8 per barrel or domestic prices are regulated over a long period, production is never likely to be much above today's levels, and will decline again in the early 1980's. Crude production could be as low as 8.3 MMB/D in 1985 under these circumstances.
 - This decline will occur because the more expensive enhanced recovery techniques and some frontier area production, such as that from Alaska, would not be economic at lower prices.
- It is highly uncertain how much oil remains to be found and produced:
 - If reserves are much lower than expected, production could not peak much above historic levels and would decline rapidly thereafter, even at high world oil prices.
 - If reserves are much higher than expected, oil production could be maintained at least at today's levels for many years.

Is Natural Gas About to be Depleted?



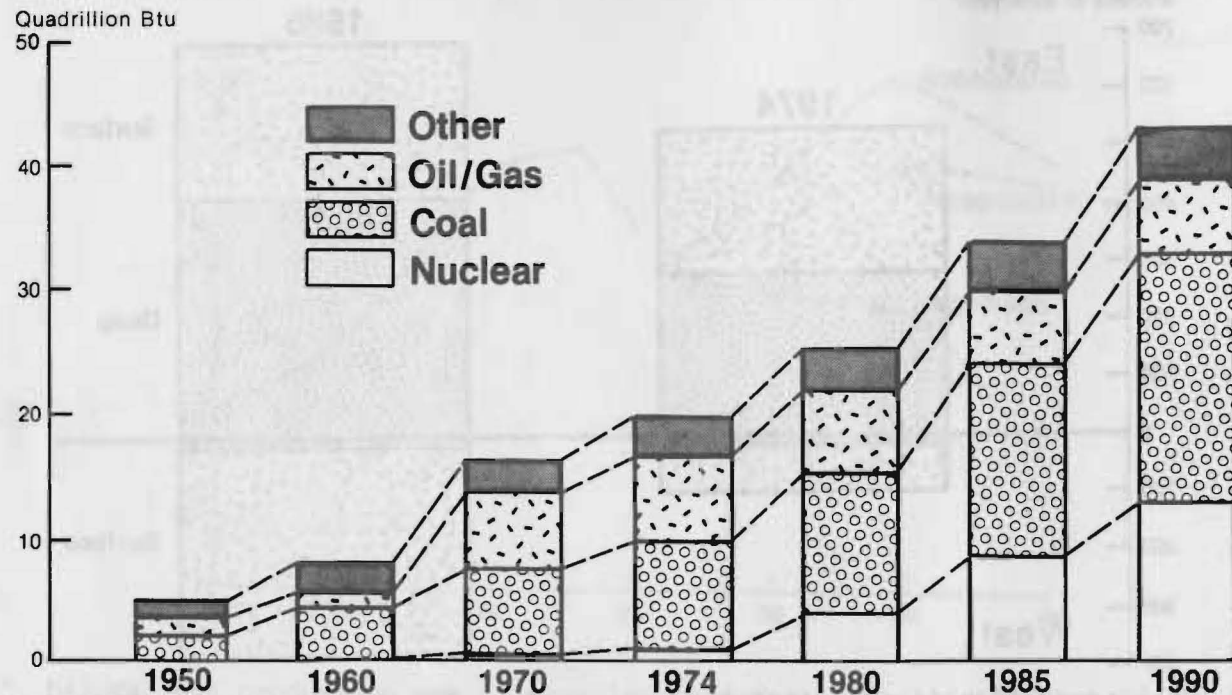
- Natural gas production can be expected to decrease during the next few years, but then increase to 22.3 Tcf in 1985 if prices are deregulated (as compared to 20.1 Tcf in 1975).
 - Most of the new gas production will come from the Gulf of Mexico and intensive production from onshore fields.
 - If OCS leasing is accelerated and resource availability proves more favorable than expected, natural gas production could reach 25.5 Tcf in 1985.
- If present regulations continue, natural gas production could decline to 17.9 Tcf in 1985. The lower the price, the more rapid will be the decline in natural gas exploration and production.
- Because of limited reserves and uncertain supplemental gas supplies, natural gas production is likely to peak in the 1980's and then probably decline again.
- Supplemental gas supplies could play an important role in the 1980's and later:
 - Gas from Alaska could supply over 1 Tcf before 1985, if needed transportation systems are completed.
 - Liquefied natural gas could supply about 2 Tcf by 1985.
 - If financial incentives are provided, over 1 Tcf of synthetic gas from coal could be delivered by 1985, and this source could supplement dwindling supplies of naturally occurring gas in the post-1985 period.

Where Will New Coal Production Come From?



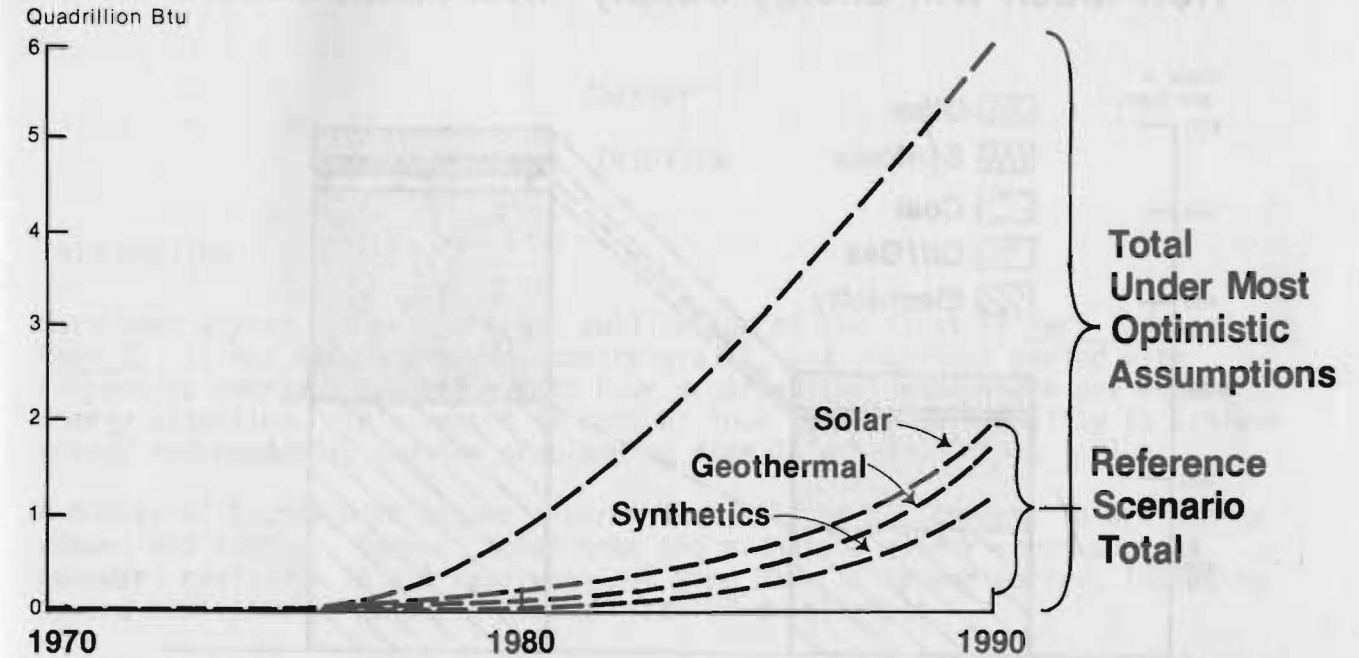
- Coal production is projected to increase from 603 million tons in 1974 to 1040 million tons in 1985.
 - Coal production will not increase this fast if long-term utility demand is uncertain and if major environmental and transportation issues are unresolved.
 - More coal could probably be produced, but will not be because its markets are limited primarily by the growth in electric power and synthetic fuels.
- The major expansion of production will occur in the Western regions, increasing from 92 million tons in 1974 to about 380 million tons in 1985.
 - Western coal production will continue to be mainly surface mining.
- Eastern mining could expand by about 30 percent.
 - Underground mining should reverse recent trends and increase more than surface mining in the East, since low-cost surface reserves are being depleted.

What Will Be the Sources of Electricity in the Future?



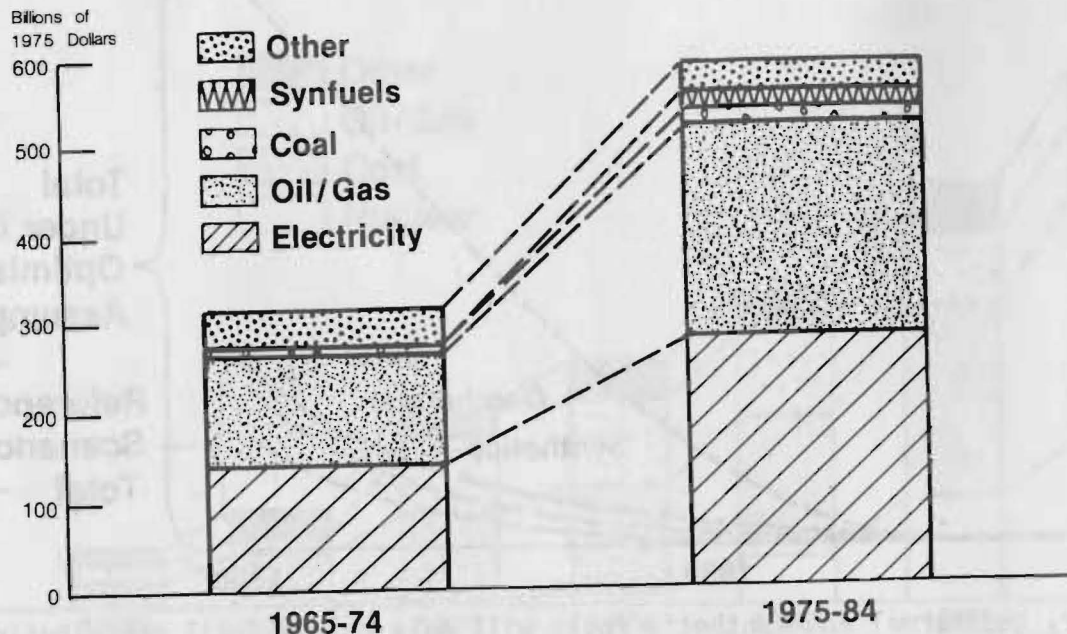
- Electricity could continue to grow at about twice the rate of total energy demand; but its growth rate will be reduced to about 5.4 percent, compared to its historical rate of about 7 percent.
- The use of natural gas and oil to generate baseload electricity could be phased out due to higher prices, and be replaced with less expensive nuclear and coal plants.
- Coal's use in electric generation could increase by 77 percent in the next 10 years.
 - Over 700 million tons of coal could be used to generate electricity in 1985, as compared to 392 million tons in 1974.
- Nuclear energy could represent about 26 percent of electric power generation in 1985, as compared to 8.6 percent in 1975.
 - However, nuclear power accounts for a 30 percent smaller contribution than previously projected, reflecting actual cancellations and deferrals caused by reductions and uncertainty in demand growth, financial difficulties, and licensing delays.
- Electricity will represent a continually increasing share of energy in the future, rising from 28 percent in 1974 to 37 percent in 1990.

How Much Can New Technologies Contribute?



- Solar, geothermal and synthetic fuels will make only a small contribution to domestic energy supplies by 1985 (about 1 percent).
- The major contribution from solar, geothermal and synthetic fuels will not be felt until after 1990.
- The technology for these sources exists, but must be proven economically viable on a commercial scale. It will take several years to build the first full-size plants; hence a large industry will not be possible during the next 10 years.
- It is likely that few, if any, synthetic fuel plants will be built by 1985 without Federal financial assistance.
- Unless commercial size plants are started now and proven economic by 1985, it will not be possible for these new sources to replace dwindling supplies of oil and gas in the post-1985 period.

How Much Will Energy Supply Investment Cost?



- Energy investments in the U.S. will be about 580 billion (in 1975 dollars) in the next ten years.
 - While this investment seems large, it is about 30 percent of fixed business investment, which is energy's historical share.
 - In certain sectors, such as utilities, large demands will be placed on the capital markets.
- Oil, gas, and electric utility capital spending will almost double in the next 10 years.
- The largest portion of the energy investment will be in the electric utility sector which could account for 47 percent of the total.
- Oil and gas investment depends greatly on the pricing and policy strategies adopted and could range from about \$160 to \$315 billion.
- Coal investment could increase to \$18 billion or only 3 percent of the total, but representing a 200 percent increase from the 1965-1974 total of \$6 billion.
- Investments to increase energy efficiency could also be significant, perhaps an additional \$250 billion through 1985.
 - Conservation investments are difficult to separate from non-energy investments and will be spread throughout the economy.