Y4
G74/9
C63

1037-A

DOCUMENTS

GOVERNMENT
Storage

JAN 11 1979

FARRELL LIBRARY
KANSAS STATE UNIVERSITY

95th Congress
2d Session

COMMITTEE PRINT

THE COAL INDUSTRY: PROBLEMS AND PROSPECTS

A BACKGROUND STUDY

PREPARED FOR THE

PERMANENT SUBCOMMITTEE ON INVESTIGATIONS

OF THE

COMMITTEE ON GOVERNMENTAL AFFAIRS
UNITED STATES SENATE

BY

THE ENVIRONMENT AND NATURAL RESOURCES POLICY DIVISION
CONGRESSIONAL RESEARCH SERVICE
LIBRARY OF CONGRESS

KSU LIBRARIES
A11900 795970

DECEMBER 1978

Printed for the use of the Committee on Governmental Affairs

U.S. GOVERNMENT PRINTING OFFICE
35-270 WASHINGTON : 1978

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C., 20402
Stock Number 052-070-04767-4

AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

DOCUMENTS

JAN 11 1979

FARRELL LIBRARY
KANSAS STATE UNIVERSITY

COMMITTEE ON GOVERNMENTAL AFFAIRS

ABRAHAM RIBICOFF, Connecticut, *Chairman*

HENRY M. JACKSON, Washington
EDMUND S. MUSKIE, Maine
THOMAS F. EAGLETON, Missouri
LAWTON CHILES, Florida
SAM NUNN, Georgia
JOHN GLENN, Ohio
JIM SASSER, Tennessee

CHARLES H. PERCY, Illinois
JACOB K. JAVITS, New York
WILLIAM V. ROTH, JR., Delaware
TED STEVENS, Alaska
CHARLES McC. MATHIAS, JR., Maryland
JOHN C. DANFORTH, Missouri
H. JOHN HEINZ III, Pennsylvania

RICHARD A. WEGMAN, *Chief Counsel and Staff Director*

PERMANENT SUBCOMMITTEE ON INVESTIGATIONS

HENRY M. JACKSON, Washington, *Chairman*

SAM NUNN, Georgia, *Vice Chairman*

THOMAS F. EAGLETON, Missouri
LAWTON CHILES, Florida
JOHN GLENN, Ohio
JIM SASSER, Tennessee

CHARLES H. PERCY, Illinois
JACOB K. JAVITS, New York
WILLIAM V. ROTH, JR., Delaware
CHARLES McC. MATHIAS, JR., Maryland
JOHN C. DANFORTH, Missouri

OWEN J. MALONE, *Chief Counsel*
DOROTHY FOSDICK, *Professional Staff Director*
STUART M. STATLER, *Chief Counsel to the Minority*
RUTH YOUNG WATT, *Chief Clerk*
ROLAND L. CRANDALL, *Staff Editor*

MEMORANDUM

DECEMBER 4, 1978.

To: Members of the Permanent Subcommittee on Investigations.
From: Senator Henry M. Jackson, chairman.
Subject: The Coal Industry.

This Committee print presents a study of the coal industry in the United States prepared by the Congressional Research Service of the Library of Congress. The study was prepared at the request of Senator Charles H. Percy, the ranking Minority member of the Subcommittee.

The study contains information on the current state of the coal industry, including the coal resource base, trends in coal production and the demand for coal, and coal mining technology. In addition, it addresses a number of complex issues including labor-management relations, Federal coal leasing policy, and Government regulation of the coal industry.

This CRS study is printed at Senator Percy's request in order to make it readily available to the members of the Committee on Governmental Affairs and other interested persons.

U.S. SENATE,
COMMITTEE ON GOVERNMENTAL AFFAIRS,
SENATE PERMANENT SUBCOMMITTEE ON INVESTIGATIONS,
Washington, D.C., December 4, 1978.

Hon. HENRY M. JACKSON,
Chairman,
Senate Permanent Subcommittee on Investigation,
Washington, D.C.

DEAR MR. CHAIRMAN: The coal industry in this nation faces a number of serious challenges. In order to obtain a preliminary assessment of those challenges, I requested the Congressional Research Service of the Library of Congress to undertake the study which I hereby submit. This study should be of invaluable assistance to the President's Commission on the Coal Industry, which was established by President Carter last April, during its in-depth evaluation of this critical industry.

President Carter has singled out coal as an increasingly significant energy source in the years ahead. He has urged that coal production be doubled by the year 1985.

It will be an exceedingly difficult undertaking to achieve that goal. Over the last decade, a number of factors have caused productivity to decline markedly and the price of coal to double. If those trends continue, it may not be economically feasible to reach the President's goal. On the other hand, some of the factors contributing to the rise in the cost of coal have also led to significant improvements in the quality of the environment and the health and safety of mine workers. Such improvements are vitally important, and must not be sacrificed in a panicked rush to increase production.

In short, there is a price to be paid for environmentally and socially responsible coal development. We must better identify the components of that price, and determine if those costs can be reduced without sacrificing the objectives of a responsible national coal development policy. This CRS report points to a number of areas where such improvements can be made.

One of the most critical of those areas involves labor-management relations. Wildcat and contract strikes have hurt coal production significantly and have introduced a damaging element of instability into the industry. However, as the report indicates, the relative calm which has followed the ratification of the 1978 UMWA–BCOA contract is an encouraging sign. Innovative programs are now being tried which may demonstrate that high productivity and high levels of worker safety and health are not incompatible. Improved grievance procedures seem to have resulted in more grievances being solved quickly at the mine site. There seems to be a new spirit of cooperation emerging among industry and labor leaders, to their mutual benefit and to the benefit of the American economy.

While the current state of calm should be welcomed and encouraged, it should not deter the Coal Commission from taking a hard look at several fundamental labor-management issues. The Commission must

assess the extent to which these issues have actually been resolved, rather than merely pushed aside while both sides recover from the effects of the 111-day strike of last winter. The Commission should look closely at the results obtained under the new grievance procedures. Similar scrutiny should be given to programs designed to increase productivity, and to the new health benefits program. Such an assessment will give a good indication of the extent to which the current state of good will can be expected to continue. It may also suggest measures which could help to make it permanent.

Another area where improvements must come involves government regulation of the coal industry. This report contains detailed descriptions of many of the environmental and health and safety laws which relate to the industry. Those laws have vitally important objectives which must not be compromised. However, it is clear that the regulatory process can be made less burdensome to the industry without sacrificing its important goals. Regulations which have proven over time to be ineffective or overly cumbersome should be identified and either thrown out or rewritten. Exceedingly broad regulations should be tightened up to prevent different enforcement officers from giving widely varying interpretations of them. Efforts should be made to improve the calibre of enforcement officials, and to eliminate unnecessary delays, excessive paperwork and overlapping authority in the regulatory process.

In sum, literally thousands of regulations affecting the coal industry have been issued in the last decade. Entire enforcement agencies have been assembled in the same short period. The time has come to subject those agencies and the regulations they enforce to an intensive review.

The report provides excellent information on several other key problem areas involving coal leasing practices, transportation, the socio-economic impacts of rapid coal development, and scarcity of water as it related to coal transportation and use in Western states. In its inquiry, the Coal Commission should investigate these issues thoroughly.

The report thus contains valuable information on a number of issues which are of vital importance to the coal industry. The Coal Commission's efforts to investigate those issues, and the industry's efforts to resolve them, have potentially immense significance. Coal can and should play as large a role as is possible in America's energy future. It can give us independence from foreign oil supplies, and provide a stable source of energy for generations to come. Coal is already the economic bedrock of a number of states, including my home state of Illinois. It is a proven creator of job opportunities for so many of our nation's most hard-working and dedicated citizens.

It would be disasterous to allow coal's potential to be curtailed by the problems currently facing the industry. Although those problems are difficult, responsible solutions to them can be found. Hopefully, the Coal Commission will bring focus to the efforts of industry, labor, and government to find appropriate solutions.

Sincerely,

CHARLES H. PERCY
Ranking Minority Member,
Permanent Subcommittee on Investigations.

THE LIBRARY OF CONGRESS,
CONGRESSIONAL RESEARCH SERVICE,
Washington, D.C., November 1, 1978.

Hon. CHARLES H. PERCY,
U.S. Senate,
Washington, D.C.

DEAR SENATOR PERCY: In response to your request, I am pleased to forward the following background report entitled, "The Coal Industry: Problems and Prospects."

The recent emphasis on energy independence has generated an interest in both the Congress and the Executive Branch in the ability of our domestic energy industries, especially the coal mining industry, to provide an adequate share of fuel supplies for the Nation. This attention has focused on many of the problems of the coal mining industry in labor, management, mining technology, regulation, safety, and other areas. We hope that the attached study will provide a sound background paper for the Congressional members of President Carter's Coal Commission.

An attempt has been made to match the study to the scope of the Commission's efforts, omitting detailed discussion of problems which do not affect coal producers directly. For example, water will be a major concern for coal use and coal transportation in the West, but does not appear to pose a constraint for coal producers, and is thus mentioned only in passing.

The study was coordinated by Mr. David Gushee and Mr. Duane Thompson, both of the Environment and Natural Resources Policy Division. Certain sections were authored or co-authored by the following individuals: Barbara Bascle, Senior Specialist Division; Dr. Everett Kassalow, Senior Specialist Division; Geraldine Carr, Science Policy Division; Maria H. Grimes, Malcolm Simmons, and Wendell Fletcher, all of the Environment and Natural Resources Policy Division. Assistance in planning the project was provided by Dr. Allen F. Agnew, Senior Specialist in mines and mining. The selected bibliography was prepared by Kristin Vajs of the Library Services Division and the manuscript was typed by Fleada Scott, Assistant Division Secretary in the Environment and Natural Resources Policy Division.

Sincerely,

GILBERT GUDE,
Director.

CONTENTS

	Page
1. Executive summary	1
2. The coal resource base	3
Coal areas	3
Energy content	6
Sulfur content	8
Alaska	10
Properties of coal affecting its desirability	12
3. Structure of the coalmining industry	14
History	14
Ownership—companies, reserves, and divestiture	17
Future trends in the structure of the industry	19
4. Production	20
History	20
Production costs	22
Productivity	24
5. Coal mine technology	25
Underground mining technology	25
Surface mining technology	28
6. Anthracite	30
7. Labor in the coal industry	32
Employment in the coal industry	33
Special manpower training programs to anticipate and break bottlenecks	34
Future growth of coal employment, and "Eastern tilt?"	35
Earnings of coal miners outstrip most other industries	36
Union, management, and labor relations in the coal industry	36
The United Mine Workers and Western strip mines	39
Working conditions and productivity: What can be done?	42
8. Coal demand	48
History:	
Boiler fuel	48
Iron and steel	49
Coal, oil, and gas prices	50
Demand outlook	52
Electricity generation	52
Industrial boiler fuel	53
Iron and steel	55
Synthetic oil and gas from coal	55
Chemical feedstocks	56
9. The Regulatory Matrix	57
Introduction	57
Coal development and land use policy	58
Coal-related land needs	60
Coal development and agriculture	62
Socioeconomic impacts	63
Hazards—natural and otherwise	66
Role of the Federal lands	67
Surface rights and Federal mineral holdings	71
Federal coal leasing	72
Background	72
The Mineral Leasing Act of 1920	73
Federal Coal Leasing Amendments Act of 1975	73
Coal leasing activities of the Interior Department	74
Recent court decisions affecting Federal coal leasing policy	79

9. The Regulatory Matrix—Continued Page
Recent developments 80
Surface mining 81
Legislative history of the Surface Mining Control and Reclamation Act 83
Current legislation 90
Background and recent debate 90
The coal industry and air quality: Statutory provisions and regulations affecting the mining and processing of coal 108
Coal extraction 109
Coal preparation 111
Coal transportation 112
Facilities siting 112
Prevention of economic-disruption and unemployment 112
Enforcement procedures applicable to the coal industry 114
Coal mine health and safety 114
Appendix 119
Bibliography 127

TABLES

Title
Coal reserves of the United States 5
Annual production of the top 50 bituminous coal operating groups from 1955 through 1976 15
Coal operating groups from 1955 through 1976:
Summary of capital investment, operating capacity: underground (longwall) mining 22
Conventional underground mining (72-inch coal bed) 23
Conventional underground mining (48-inch coal bed) 23
Surface mining 23
Technology trends in underground coal mining 27
Anthracite production 1900–1976 30
Employment in selected industries, 1947–1977 33
Indexes of employment, selected industries, 1947–1977 33
Average hourly earnings, selected industries, 1947–1977 36
Productivity in U.S. coal mining, selected indicators 43
Coal consumption by consumer class 48
Energy input to electric sector 49
U.S. and world steel production 50
History of coal, oil, and gas prices 50
Holdings of Federal coal leases 76
Top 10 coal prospecting permittees as of November 1970 76
State surface mining reclamation programs 92
Relative costs of coal including preparation 111
Injury statistics in coal mining 116

FIGURES

Coalfields of the conterminous United States 3
Comparison on moist, mineral-matter-free basis of heat values and proximate analyses of coal of different ranks 7
Remaining coal resources of the United States, by tonnage and heat value 9
Coalfields of Alaska 10
Production of bituminous coal and lignite from 1947 to 1977 20
Production of coal, bituminous and lignite, 1978, per week 21
Public and Indian leasing activity 75

1. Executive Summary*

Opportunity does not knock on the coal industry's door every day. In fact, opportunity has been an infrequent visitor to this beleaguered industry for most of the past half century. But it appears that opportunity is knocking now.

The Arab oil embargo of 1973–74 has focused the Nation's attention on its need to import oil and thus on its vast coal resources as a way to reduce oil imports. The current trade and current account balances are in deficit, in large part from the cost of oil imports, and the prospect of continued and perhaps even worsening deficits brings a sense of urgency to increasing coal's role in the Nation's energy mix. Higher world oil prices have improved coal's economic attractiveness.

As a result, coal production and consumption (strike effects excluded) are rising at a healthy rate. President Carter, as did Presidents Nixon and Ford before him, has called for a national policy of even greater reliance on coal. In response, the Congress has strengthened existing regulatory legislation designed to prohibit the burning of oil and gas in boilers and other combustors where coal can do the job. Although the Congress did not accept the President's recommendation to tax oil and gas used in such facilities so that coal would find even greater use, it has provided a new set of tax incentives to improve coal use economics and has given the Department of Energy some administrative discretion in cases where coal and oil use economics are close to each other.

Despite these improving circumstances, moves, however, coal's future is beset by forces which threaten to frustrate the Nation's objective of greatly increased coal use. Newly legislated regulatory requirements have added large costs to coal production and use. The regulatory processes themselves, often imperfectly implemented within agencies and poorly coordinated between agencies, have added and continue to add additional costs, have created extensive delays, and have introduced great uncertainty as to what will be required and when approvals will be given.

Productivity has declined markedly. Other costs in the coal cycle are also rising. The latest contract settlement adds 38 percent over three years to labor costs. Freight rates are rising. Mining equipment costs have escalated. Lease costs are higher, States are imposing new and/or larger severance taxes, black lung benefits paid in part as an excise tax and in part as an internal cost are now required. The influx of new, younger workers into the labor force is increasing training costs.

The history of labor unrest in the industry, particularly with respect to strikes associated with contract renegotiation and widespread wildcat strikes at the more local levels, has created an atmosphere of doubt about "supply security." This is ironic in that one

---

*David Gushee, Specialist in Energy Policy, Congressional Research Service (subsequently appointed Senior Specialist in Environmental Policy and Chief, Environment and Natural Resources Division).

of the problems with reliance on imported oil is also "supply security," even though of a different nature.

In the face of these rising costs for coal, the world oil price has been declining in constant dollars for the past several years, may well continue to decline for at least the next several years, and may not rise again in real terms for a decade or more, thus gradually eroding coal's current economic advantage.

Coal's markets are not guaranteed. In each major market sector, it has competition—from nuclear in electricity generation, from oil (and gas when available) in industrial markets, from imported steel in the U.S. steel market, and from other exporters in the coal export markets.

With costs of mining, transporting, and using coal rising from pressures both within and external to the coal industry itself, and with oil prices stable or perhaps even declining in real terms, coal's markets will shrink in size or be filled from alternative sources if actions are not taken to improve productivity and to comply with regulatory requirements at minimum necessary cost.

Thus, for coal to fulfill its potential for growth will require that solving its regulatory and its labor/management problems not add unnecessarily to costs. And therein lies the nub of the problem, for control on many of the basic cost factors is not in the hands of the coal industry, on either the management side or the labor side. And for some of those where internal control is theoretically possible, historical patterns of bitterness and distrust are so great as to be almost insurmountable without outside help.

The President's Commission on the Coal Industry, as an external factor, provides an opportunity for the coal industry and others involved in its future to rise to the challenge. The Nation as a whole is concerned about labor productivity declines, and regulatory overkill. The coal industry's problems in these respects can be treated as specific examples in an important industry of general national concerns. Placing the discussions into a more general framework can hopefully enlarge perspectives for all concerned and introduce new flexibility in approaches to solving the problems.

2. The Coal Resource Base*

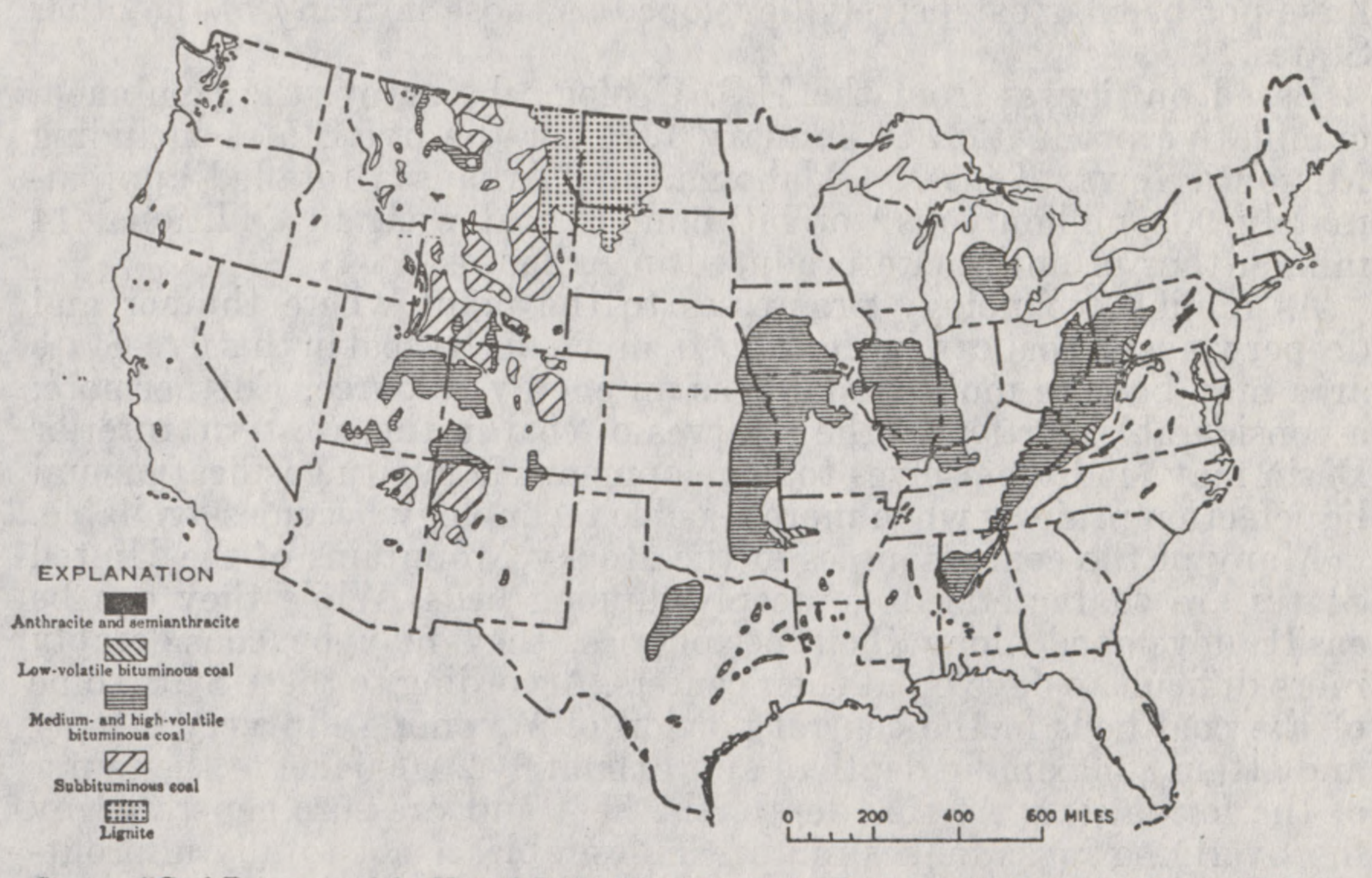
It is solidly evident to anyone associated with the coal industry that the total coal resources in the United States are extensive by virtually any measure. Coal deposits of one form or another can be found in all of the States, with the exclusion of Minnesota, Wisconsin, three of the New England States, South Carolina, Florida, and Hawaii. According to the U.S. Geological Survey, "Coal-bearing rocks underlie about 13 percent of the land area of the 50 United States and about 14 percent of the land area of the 48 conterminous States." [1]

Some of the coal-bearing States have extensive resources of coal, two of them being West Virginia, which has approximately 69% of its land area underlain with coal-bearing rocks, and Illinois, with 67% of its surface underlain by coal-bearing strata.[2]

COAL AREAS

From the information in figure 1, it can be determined that the majority of coal in the conterminous United States occurs in three general areas.

FIGURE 1.—Coalfields of the conterminous United States



Source: "Coal Resources of the United States," Jan. 1, 1967, by Paul Averitt, Geological Survey Bulletin 1275, 1969, p. 5.

---

*Duane Thompson, Analyst, Environment and Natural Resources Division, CRS.

[1] "Coal Resources of the United States, January 1, 1974," Geological Survey Bulletin 1412, by Paul Averitt, 1975, p. 4.

[2] Ibid., p. 7.

The easternmost location of significant coal resources in the United States is an area along the Appalachian mountain chain ranging from the northern edge of Pennsylvania on the north to cental Alabama on the south. This includes the areas of eastern Kentucky and Tennessee, most of West Virginia, southeastern Ohio, the southwestern corner of Virginia, and a large area in north-central Alabama.The coal in this formation is primarily bituminous in rank ranging from high-volatile/high-sulfur coal in the southeastern portion of Ohio to low-volatile/low-sulfur coal in portions of Pennsylvania and West Virginia.

In the Midwest, we find a considerable expanse of coal in the Illinois basin, which includes not only coal in that State, but also that located in the Western portion of Indiana and Kentucky. The coal in this basis is bituminous in rank and is generally classified as being high-sulfur. According to the U.S. Bureau of Mines, none of the coal minable by underground methods in Western Kentucky is classified as having less than one percent sulfur (by weight) and only a small portion of that minable by surface mining methods falls into the category of having less than one percent sulfur. In Illinois, the greatest percentage of coal is also classified as high-sulfur with approximately 42 billion of the total of 65 billion tons of reserves having a sulfur content greater than three percent.[3]

In Indiana, over 80% of the coal reserves minable by both the underground and surface mining methods is classified as having a sulfur content greater than one percent by weight.

Iowa, Missouri, eastern Kansas, and eastern Oklahoma are also significantly underlain with coal reserves. These reserves, however, have not been as extensively developed as those in many of the other States.

Based on figures from the U.S. Geological Survey, the combined, cumulative production to January 1974 for the five States including Missouri, Iowa, Kansas, Oklahoma, and Arkansas totalled approximately 900 million tons[4] of bituminous coal with an additional 14 million tons of anthracite produced in Arkansas.

As mining technology progresses to the point where thinner and deeper veins of coal can be developed, much of the coal in this five-State area may become more valuable as an energy resource. Furthermore, a considerable portion of the reserves of coal in the western Interior Basin may lend themselves to development via in-situ gasification and liquefaction projects when more feasible technology becomes available.

Many of the coal resources in the Rocky Mountains of the United States are characterized as steeply dipping beds. While they can be easily developed along their peripheries, they may be considerably more difficult to develop at their centers. According to the USGS, some of the coal beds in the central portion of Wyoming dip very steeply and attain a maximum depth of approximately 20,000 feet at the center of the formations. At this depth, the heat and pressure generated by the overlying rocks makes mining undesirable, if not totally unprofitable. In these areas, future extensive coal development may depend

---

[3] "Demonstrated Coal Reserve Base of the United States, by Sulfur Category, on January 1, 1974," U.S. Bureau of Mines, May 1975, p. 5.

[4] Because of the variation in the reporting methods for the States involved, it is extremely difficult to determine the total cumulative production.

on advancements in conventional mining technology along with the application of in-situ gasification and liquefaction, which would eliminate the need to physically extract the resource.

Unlike the coal in the Interior Basins, however, much of the coal in the Rocky Mountains and the Southwest could be classified as low-sulfur, by weight.

The sulfur content of these coals are outlined in the following table.

Many of the reserves in Montana and Wyoming are very near the surface of the ground and are extremely thick. These characteristics make them very desirable for development by surface mining methods. In some parts of the Eastern Powder River Basin, for example, the beds of subbituminous coal may be overlain by no more than twenty or thirty feet of overburden and the coal itself may be upwards of 100 feet thick. This condition provides for a very favorable stripping ratio and decreases production costs. Furthermore, the acquisition costs of these reserves, in many instances, has been quite favorable for many coal companies that had the foresight to lease them prior to the enactment of the Coal Leasing Amendments Act of 1975. This subject will be covered in detail elsewhere in the report.

TABLE 2-1.—COAL RESERVES OF THE UNITED STATES, BY SULFUR CONTENT[1]

State	Method of mining	Percent of known reserves equal to or less than 1 percent sulfur (by weight)
Bituminous coal:		
Colorado	Underground	75
	Surface	83
Wyoming	Underground	27
	Surface	(2)
Montana	Underground	11
	Surface	(2)
Utah	Underground	58
	Surface	21
New Mexico	Underground	98
	Surface	92
Subbituminous coal:		
Arizona	Underground	(2)
	Surface	49
Alaska	Underground	96
	Surface	100
Montana	Underground	(2)
	Surface	99

[1] In addition to the reserves of lower sulfur coal listed in the table, less significant reserves exist in Washington and Oregon that could be considered low-sulfur coals.
[2] None listed.

The thickness of the reserves also means that a surface mining operation can produce significant tonnages of coal annually without disturbing a large expanse of land at any one time. For example, if subbituminous coal weighs approximately 1,770 tons-per-acre-foot [5] one acre of coal one foot thick, a mining operation producing one million tons of coal annually from a vein of coal ninety feet thick would only disturb about 6.3 acres. A prime example of an operation located on an extremely thick seam of coal is the Wyodak Mine in

[5] Source: Coal Resources of the United States, January 1, 1967, U.S. Geological Survey, by Paul Averitt p. 21.

northeastern Wyoming (Campbell County). In what could be considered one of the best of all possible cases, the mine, in 1975, produced 786,572 tons of subbituminous coal by removing 40 feet of overburden from an 80-foot seam. Based on the parameter of 1,770 tons-per-acre-foot, approximately five and one half acres were disturbed by the actual removal of coal.

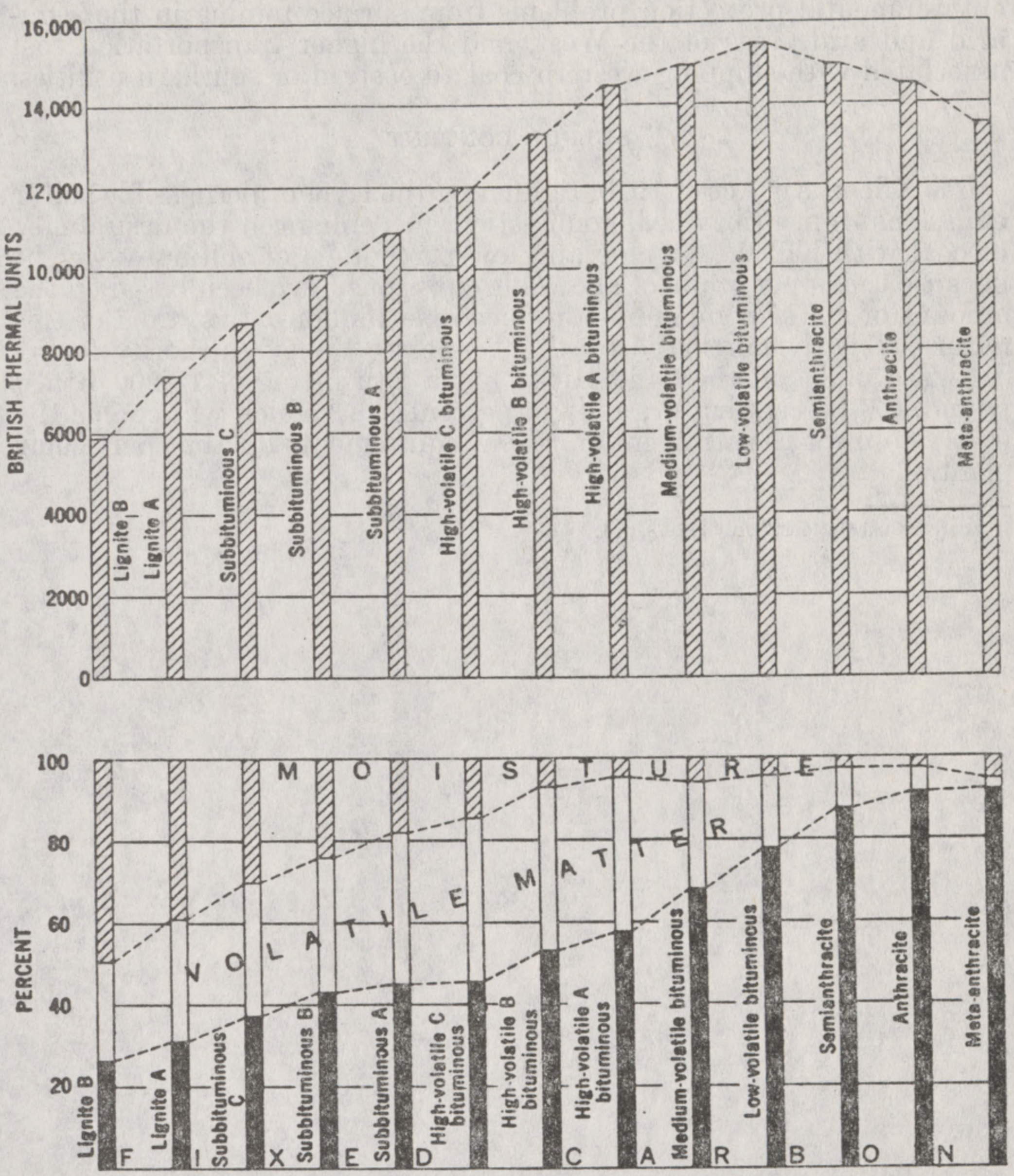
Despite the immensity of the reserves in the Western United States, their ultimate contribution to the utility fuel mix must be qualified for a number of reasons.

ENERGY CONTENT

First, subbituminous coal and lignite reserves in the West are significantly lower in energy content. Generally, the bituminous coals in the Eastern United States are rated at somewhere between 11,000 to 13,000 Btu's per pound with the exception of high-quality metallurgical coal, used primarily by steel companies or exported, which is rated as high as 14–15,000 Btu's per pound.

Subbituminous coal and lignite, however, are generally rated at 9,500 and 6,500 Btu's per pound respectively, consequently, it requires considerably more of this lower value coal to provide the same energy. In addition, the lower-ranked Western coals contain significant amounts of moisture, which likewise detracts from their energy value. This relationship between the different ranks of coal, their energy content, and their major constituents including moisture, volatile matter, and fixed carbon, are outlined in Figure 2.

FIGURE 2.—Comparison on moist, mineral-matter-free basis of heat values and proximate analyses of coal of different ranks



Source: "Coal Resources of the United States," Jan. 1, 1974, U.S. Geological Survey Bulletin 1412 fig. 3, p. 17.

These relationships have a significant effect on the resources and reserves of coal-energy in each of the different States. For example, in the case of North Dakota and Montana, the tonnage of coal resources of each of the States exceeds that of the nearest competitor (Illinois) by almost two-to-one. From an energy content standpoint, however, Illinois coal has as much energy as coal in North Dakota or Montana. Wyoming, which has experienced an enormous expansion in coal development, has even less total coal energy than Illinois.

This disparity is one of the principal arguments advanced by some public officials who would prefer to develop eastern instead of western coal reserves.

35-270—78——2

Other disadvantages of the development of western coal are the environmental protection problems from surface mining in the semi-arid and arid areas of the West, and the higher transportation cost associated with shipping western coal to eastern or southern utilities.

SULFUR CONTENT

The Clean Air Act of 1970, tightening the level of permissible sulfur emissions from utility coal combustion, has enhanced the desirability of coal with high heat value and low percentage of sulfur by weight because the upper limits of allowable emissions have been based on the amount of sulfur compounds produced-per-million-Btu's. Coal of this nature, recently purchased by the Tennessee Valley Authority for its Shawnee plant on the Ohio River, has a Btu rating of 13,200 Btu's/pound, 0.7 percent sulfur, and 7.5 percent ash [6] which will enable the utility to meet the stringent emission requirements for that particular plant.

---

[6] Source: Coal Outlook," July 3, 1978, p. 1.

FIGURE 3.—Remaining identified coal resources of the United States, January 1, 1974, by States, according to tonnage (upper bar) and heat value (lower bar)

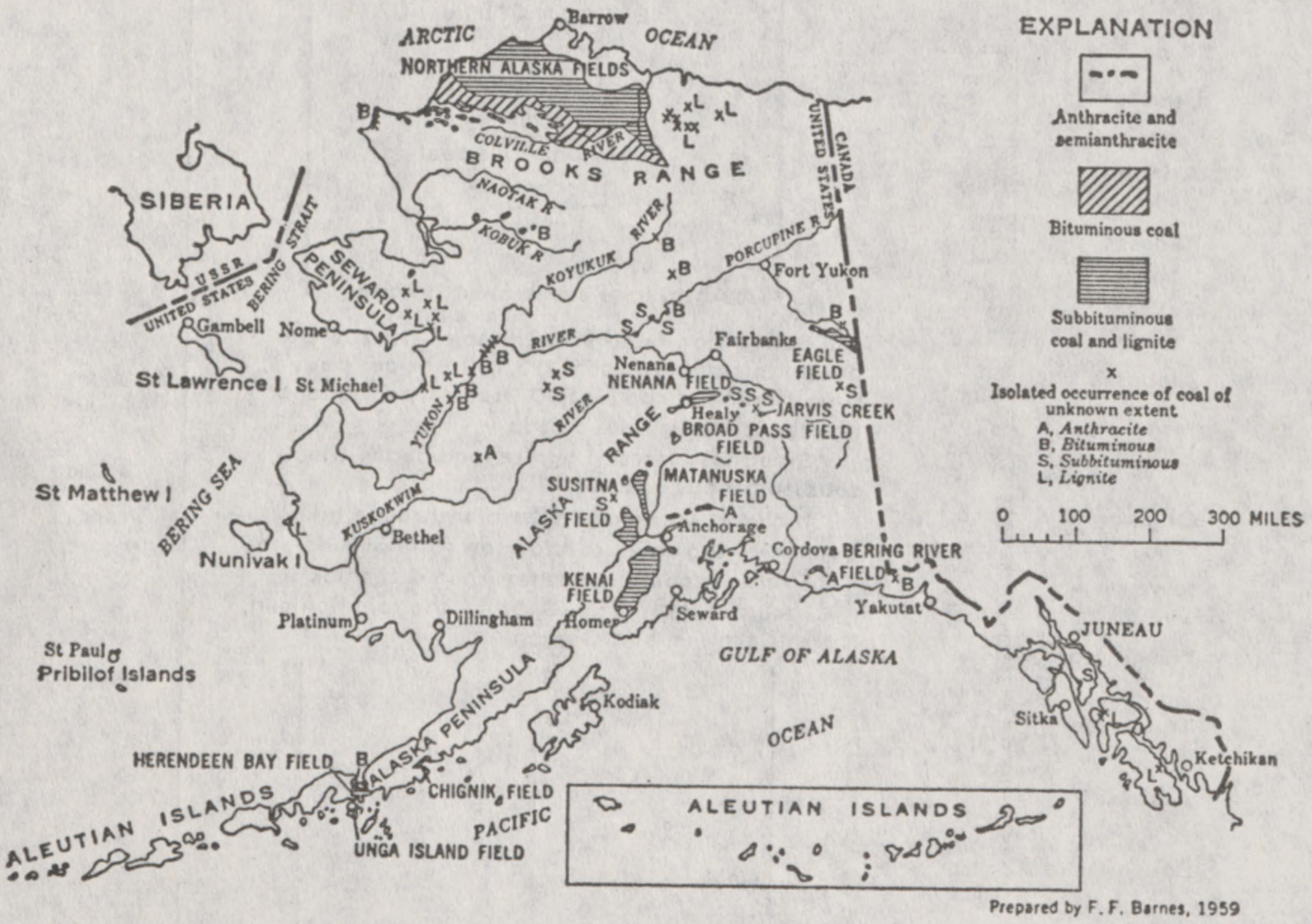
Although coal of this quality is usually considered metallurgical grade, the current slump in demand for steel and advancements in coking technology (such as "formed" coke) may enable steel companies to shift to lower quality coal for coking, thus releasing larger amounts of "met" coal for the steam market. During the past year, some of the larger metallurgical coal producers have sold significant reserves of premium coal for the steam use because of the bleak short and intermediate-term demand outlook from conventional consumers. Although many utilities may not be able to secure steam coal as "clean" as that purchased by T.V.A., the utilities may, however, be able to lower their costs of building and operating scrubbers by procuring the best grades of low-sulfur/high-energy coal available to them.

The Clean Air Act Amendments of 1977, however, by combining emission limitation of sulfur per million Btu with a required percentage reduction of sulfur regardless of original sulfur content, will reduce pressures to convert met coal to steam coal uses.

ALASKA

Although it has not been previously mentioned, Alaska also contains significant coal resources and reserves. To date, however, in the absence of comprehensive studies to determine the feasibility of developing Alaskan coal, only one operator, the Usibelli Company, is producing significant amounts. The various coal fields and their locations are outlined in Figure 4.

FIGURE 4.—Coalfields of Alaska



Source: "Coal Resources of the United States," Jan. 1, 1974, U.S. Geological Survey Bulletin 1412, p. 6.

The characteristics of Alaskan coal are outlined in a report on the mineral potential of Alaska, which was prepared by the Alaska Field

Operations Center of the U.S. Bureau of Mines. According to that report:

> Alaska coals are characterized by low sulfur content, large resource tonnages, and predominantly subbituminous grades. In general, most subbituminous coals have high moisture and ash contents. However, some potentially important deposits of bituminous coals having coking characteristics do occur on the North Slope of the Brooks Range.

PRODUCTIVE AREAS

The two coalfields that have produced the greatest quantities of coal are the Matanuska field north of Anchorage and the Nenana field, south of Fairbanks. From 1916 to 1969, approximately 7.5 million tons of coal were produced from the Matanuska field. Most of this was high volatile bituminous coal from the Wishbone Hill district near Jonesville. Original resources of bituminous coals in the Wishbone Hill district totaled 112 million tons. Nearly all activity ceased in 1969 when the power plants at Anchorage were converted from coal to natural gas.

The Nenana field came into production in 1918 and is productive today. Approximately 18.0 million tons of subbituminous coal have been produced. Annual production is about 700,000 tons. The principal markets are electric generating plants at Fairbanks and at the military bases near Fairbanks, and a mine-mouth electric generating plant. Original resource estimates for this field totaled approximately 6.9 billion tons. The coal-bearing formations contain a large number of coal beds ranging in thickness from a few inches to 60 feet.

AREAS WITH POTENTIAL

> Estimated coal resources of Alaska total 130 billion tons, roughly the energy equivalent of 350 billion barrels of crude oil. About 85 percent of these resources are subbituminous and lignite coals, and over 90 percent occur north of the Brooks Range and west of the Colville River. Figure 2 shows the distribution of coal-bearing rocks in Alaska and the estimated relative importance for development. The area considered to have the greatest potential for immediate development is the Beluga-Chuitna area of the Susitna field west of Anchorage. Other areas of high potential are the Matanuska field north of Anchorage and the Nenana field south of Fairbanks. The close proximity of these deposits to tidewater or rail transportation is a major factor favoring their utilization.

Other reports on Alaskan coal conclude that there is very little likelihood of extensive development in that area in the near future. Many of the coal development problems in Alaska are unique to that geographic region and have not been encountered by mine developers. Little is known of the reclamation techniques that would have to be applied to perma-frost or even if reclamation is possible. Of the coal fields that are known, however, the most likely to be developed over the next ten years are the Healy-Nenana and the Susitna coal fields, the former being the location of the Usibelli mining operation and the latter being located close enough to the coast to facilitate transportation to market.

PROPERTIES OF COAL AFFECTING ITS DESIRABILITY

Without going into too much detail, it can be said that the chemical and physical properties of coal vary greatly and can affect its applications for electric power generation, the production of steel, or the manufacture of various other non-energy products. Basically, the constituents of coal causing these effects could be classified as impurities within coal itself, include such things as sulfur and other residuals, and when present in intolerable amounts, preclude the use of coal in certain applications. Aside from the impurities, various coals have other properties that affect their applications, such as swell factors, caking properties, and grindability.

Sulfur, one of the impurities in coal, can occur in three different forms, organic, sulfate, and pyritic. The organic sulfur is that which was present in the decayed and metamorphosed plant-matter forming the coal. Organic sulfur constitutes from 30 to 70 percent of the total sulfur present in coal and is the most difficult to remove with conventional coal cleaning methods including washing. It can, however, be removed chemically with solvent refining methods. Sulfate sulfur is a product of oxidation when the coal is removed from the ground, is water soluble, and can be removed by conventional cleaning. Pyritic sulfur occurs in coal as the mineral pyrite, is usually discrete particles and, because of its greater specific gravity, can be separated from the coal by a crushing and flotation process which allows the coal to rise to the top of floatation cells while the pyrite particles sink.

Prior to the enactment of clean air laws, coal having less than one percent sulfur, *by weight*, was generally classified as low-sulfur. More recently, however, the sulfur content of coal is being expressed as a function of its energy content, for example, pounds of sulfur per-million Btu's of heat content.

The heat content of coal is of primary importance to its consideration as a fuel and is usually a function of three other constituents in the mineral; fixed carbon, volatile matter, and moisture. Up to a certain point, the higher the percentage of fixed carbon, the more energy coal contains. Moisture, on the other hand, detracts from the energy content of coal and is an especially important consideration in the transportation of coal over long distances. The objective is to transport energy, not water. The rank of coal that has the highest ratio of fixed carbon to volatile matter and water is anthracite (hard coal), whereas lignite, the lowest rank of coal, has the greatest amount of water and impurities. The heat content alone, however, is not the sole determinant of a particular coal's desirability. Some coals, although high in Btu's, may be a caking type and could foul boiler tubes much faster than a non-caking coal that may have less energy. Furthermore, certain trace elements can be corrosive to boiler parts. In such cases, a tradeoff may be necessary between energy content, boiler design, and the cost of boiler maintenance over the life of the installation.

In addition to the physical and chemical characteristics of coal, its distance from consumers and its location within the earth also determine its desirability. If the distance between the minesite and the receiving facility is not great, the savings to be derived from the low transportation cost may overcome many of the other variables discussed. For example, lignite is relatively low in energy (approximately 6500 Btu's/pound) and has a relatively high moisture content. Without

some type of beneficiation that reduces this moisture, thereby increasing the relative energy content, lignite cannot be transported long distances to market. It can be and is being used, however, by mine-mouth generating stations where the distance from the minesite to the receiving facility is so short that transportation charges are virtually insignificant.

With regard to the location of coal within the earth, overburden also can be a very important consideration in mine development. If the rock and other material overlying coal is extremely resistant to mining or is too thick, it can render the coal useless unless the quality and value of the coal can overcome the cost of mining it. If the coal beds are thick enough, however, more overburden is tolerable since the amount of overburden that can be removed economically is directly proportional to the amount of coal recovered. The quality of the coal beds, i.e. faulting and folding, also plays an important part in the feasibility of the operation. If the beds are disrupted geologically, it may be difficult or even impossible to develop the deposits with conventional mining equipment or at least at a cost too great to justify the venture. Included in this category would be flooding of the mining operation, and in the case of deeper underground minable seams, heat generated by the pressure of overlying rocks. Finally, some seams, regardless of the quality of the coal, may be considered too dangerous to mine by underground methods because they release high levels of explosive methane gas.

3. Structure of the Coal Mining Industry*

The structure of the coal mining industry is rapidly changing in step with changes in the character of demand for the fuel. Included in these developments are longer-range planning in order to meet longer-range demand, drastic increases in the size of the mining operations and in the percentages of the total U.S. output attributable to the industry leaders, greater attention to the quality and desirability of the coal being mined, and the coupling of the production and consumption cycles, all of which are being achieved through greater sophistication in the management of coal mining operations.

HISTORY

Importance as a fuel was not attributed to coal until some time after the industrialization of the 1840's. Until that time, wood was still considered the primary fuel for home heating use and the development of coal as a competing fuel was limited. If a locality had access to coal and the mineral could be easily mined, the residents would burn coal in preference to wood although little of the fuel was transported significant distances from the source. The industry could best be characterized as having a large number of extremely small mines supplying very localized markets. Because of the widespread nature of the industry, little attention was given it unless local labor disputes disrupted the supply of coal for home-heating purposes. The industrialization of the United States along with the advent of the railroads generated a greater demand for fuel than could be supplied by wood. Petroleum and petroleum products had not yet entered the picture.

For about a century and a quarter from the first commercial mining of coal in this country, about 1758 to 1885, a great industry composed of many small units was gradually created; one that became largely important in the mineral production as well as in the national economic structure. It always supplied all the fuel the country needed when it was needed and when transport facilities were available, as has been the case also since 1885. Because of the immense area in which its units worked, its growth was not realized by the public generally, who little understood its background and the conditions of its development, and paid little attention to it except at periods of probable scarcity of fuel and of labor disturbances.**

Although the actual number of coal mines in the United States remains large, the underlying trend in the structure of the industry, has been toward larger mines supplying the bulk of total production.

This change has been brought about by the insistance of electric utility companies to have coal guaranteed in quantity, years in advance of the actual consumption. Needless to say, the larger mining companies can more easily provide this assurance of continuing supply. Whereas the marketing of coal in the past was largely happenstance, coal today is destined for a particular consumer as much as thirty years

---

*Duane Thompson, Analyst, Environment and Natural Resources Division, CRS.

**Source: "The First Century and a Quarter of American Coal Industry," by Howard N. Eavenson, private printed, Pittsburgh, Pa., 1942, p. 419.

before it leaves the ground. This development is evidenced by the drastic increase in the amount of coal that is locked up by contracts both long- and short-term between the operator and the consuming facility. According to the Department of Energy, formerly the Office of Coal in the Bureau of Mines, approximately 85 percent of the coal mined in the United States is marketed under these contract arrangements, with the remaining 15 percent being sold in the spot market. According to Dr. Richard L. Gordon,[1] of 76 consuming-utilities surveyed in 1970, 66 produced portions of their coal with either long-term contracts (in excess of 10 years), short-term contracts (1 to 10 years), or by arranging for captive coal deliveries. Almost 90 percent of the coal consumed by these companies was purchased through these types of arrangements. Coal contracting tends to favor the larger mine operators for a number of reasons, primarily because the larger firms are much more likely to execute their contract commitments. Because of greater surge capacity, the larger mining firms can shift production from one pit to another if breakdowns or other disruptions occur thereby insuring continued delivery. Furthermore, the large operator is much less vulnerable to complete shutdowns resulting from wildcat strikes. Also, it is much easier for large multi-pit operatiors to meet strict contract specifications by blending coal from their different locations in order to control such things as Btu, ash, and sulfur content, whereas the small operator is limited to mining only that coal extant at his one mining site.

Although the actual number of coal mines has increased over the decades from 1880 to the present, the production has increased by a far greater percentage. According to the Bureau of Mines, the number of operating coal mines during 1976 was 6200, almost double the number operating in 1880. The coal that these 6200 mines produced, however, amounted to roughly 15 times the 1880 tonnage. Whereas the number of mines per-million-tons-of-coal produced in 1880 was about 70, the number of mines per-million-tons-of-coal produced in 1976 was only nine. The growth in the output of the top fifty operating companies from 1955 through 1976 is outlined in Table 3–1 below.

TABLE 3–1.—ANNUAL PRODUCTION OF TOP 50 BITUMINOUS COAL OPERATING GROUPS FROM 1955 THROUGH 1976[1]

Year	Top 50 tonnages	Total bituminous	Percent top 50
1976	429.4	665.0	64.5
1975	418.6	648.4	64.5
1974	393.3	603.4	65.5
1973	409.1	591.7	69.2
1972	399.4	595.3	67.0
1971	357.4	552.1	64.7
1970	402.7	602.9	66.8
1965	319.3	512.0	62.3
1960	248.9	415.5	59.9
1955	254.5	464.6	54.7

[1] Derived from information in the "1977 Keystone Coal Industry Manual," McGraw Hill, 1977, p. 546.

The combined production share of the top fifty operating groups rose from 54.7 percent in 1955 to 64.5 percent in 1976. In terms of actual growth, however, the top fifty producers increased their production by

[1] "U.S. Coal and the Electric Power Industry," by Richard L. Gordon, Resources for the Future, Inc., by the Johns Hopkins University Press, 1975, pp. 55–61.

68 percent (average annual increase=2.52 percent) during the period, while the industry increased its production by 43 percent (average annual increase=1.72 percent). During the period, it was also evident that the top fifty had lesser fluctuations than the whole industry, and in some cases, (1967–68) increased their production while, collectively, industry suffered a setback in production.

Among other changes which have taken place in the character of the coal mining industry over the period from 1885 to the present, include the transition from an industry based on underground mining to one relying on surface mining for the bulk of its production. Surface mining has long had a number of advantages (recently reduced) over underground operations including lower operating costs, shorter lead-times for the development of mines, and greater recovery of the resource. Primarily, the lower operating costs result from the considerably higher rates of productivity associated with surface operations.

Surface coal mining is a capital intensive instead of a labor intensive activity. Extremely large earth moving machinery is used in the form of mammoth draglines, dozers, coal loading shovels, and haul trucks. During continuous operation, the largest dragline today can move 39 million pounds of overburden each hour, yet, a full crew for the machine consists of only two men, complimented by a bulldozer operator on the ground. The largest track-type tractor can doze almost twice as much material as its predecessor while coal haul-trucks can transport more coal than can be accommodated by the standard rail car. These developments in equipment size and efficiency amount to the same or smaller number of men being able to produce more coal during each shift, consequently increasing productivity and lowering labor costs. Productivity figures by the Bureau of Mines indicate that recent productivity for surface mining operations is approximately three times that of underground operations, the latter being around nine tons-per-man-day.

With respect to the lead time necessary for the planning and development of coal mines, until the passage of the Surface Mining Control and Reclamation Act of 1977, surface mines could be brought on-line much faster than underground ones. Generally, the estimated development time for an underground mine is approximately five to six years whereas that for a surface mine was in the neighborhood of two to three years. Since the enactment of the Surface Mining Law, however, these figures have changed and the developers of surface mines may no longer enjoy this advantage. These changes in the regulatory aspects of mine development are covered more thoroughly in other sections of this report.

From the standpoint of resource recovery, surface mines have long been recognized as the most efficient. Underground mines developed with conventional mining methods (room-and-pillar) are required to leave almost as much coal in order to support the roof of the mine as can be extracted. Although longwall and shortwall underground mining methods have improved the recovery factor, the greatest percentage of coal mined underground still comes from room-and-pillar mines. Surface mines, however, recover somewhere between 85 and 90 percent of the resource since all of the overburden is removed and no coal remains in the ground to support the roof. For a given amount of input, the returns can be significantly larger for surface mining than for underground operations.

OWNERSHIP, COMPANIES, RESERVES AND DIVESTITURE

Changes in the ownership of coal mining companies and coal reserves have likewise taken place over the past few years. Entries into the coal mining industry, through acquisition, have been made most significantly by electric utilities and oil companies. An earlier report by the Congressional Research Service [2] revealed that 77 percent of the coal mining companies producing over three million tons annually are controlled by non-coal interests.

These developments have sparked an interest in the subject of coal company acquisitions, especially by oil companies. During the period from 1962 through 1975, annual coal production by oil companies grew from 56.4 million tons to 108.0 million tons, an increase of 91.6 percent.[3]

Because of the drastic increases in the price of coal immediately following the oil embargo, some familiar with coal mining speculated that the coal owning interests of the oil industry may have intentionally influenced the price of coal in order to enhance oil as a fuel. Opponents of horizontal integration view multi-fuel energy companies as an unhealthy development in the energy and especially the coal industry, particularly if the oil industry can become entrenched enough in coal mining to effectively eliminate competition by raising coal prices. Equally disturbing to opponents of horizontal integration has been the rate at which oil companies have acquired coal reserves, particularly in the West, that have yet to be developed. Topping the list of coal reserves owners in Consolidation Coal Company, a subsidiary of Continental Oil and which, according to the 1977 Keystone Coal Industry Manual, has amassed in the neighborhood of 13 billion tons of coal, an amount greater than that of Burlington Northern Railroad, the long-time leader. Other oil companies likewise, have purchased significant reserves. According to Keystone, nine of the top twenty holders of coal reserves are oil companies. Out of the total reserve ownership for the top twenty, 35.28 or 40 percent of the 88.235 billion tons are controlled by the oil firms in the group.

Proponents of horizontal integration, however, perceive the entry of the oil companies into the coal mining industry as a healthy development for a number of reasons. First, in order to meet the production goals of the Administration, a massive infusion of outside capital will be necessary, since the coal industry is just now recovering from a thirty-year slump during which survival was the primary objective. Second, the oil industry contains a vast reservoir of management talent that may be more capable of coping with the ever-increasing amounts of Federal, State, and local regulation that have befallen the industry over the last few years. Furthermore, to mine and market coal in the amounts needed by large utility consumers, it may be necessary to encourage the growth of mining operations and affiliation with larger corporations. Finally, to prohibit oil companies from investing in competing forms of energy may limit their useful life to that of our domestic recoverable petroleum reserves.

---

[2] "National Energy Transportation, Volume I—Current Systems and Movements," prepared by the Congressional Research Service for the Committee on Energy and Natural Resources, May 1977, pp. 93 and 94.

[3] "Petroleum Industry Involvement in Alternative Sources of Energy," prepared by the Congressional Research Service for the Committee on Energy and Natural Resources, September 1977, p. 286.

In order to address this perplexing problem, since 1973, several studies have been conducted to determine if competition has been curtailed by oil companies entering the coal industry, and by irresponsible Federal coal leasing during the 1960's. Included among these are studies by the General Accounting Office, the Department of Justice, the Federal Trade Commission, and the National Coal Association.

In its report, the NCA pointed out the desirability of allowing energy companies to continue their investment practices in the coal industry for a number of reasons, including access to new sources of capital, along with the fact that, since the Federal Government continued to be the major owner of coal reserves, it could, in its leasing practices, require the diligent development of leased reserves, thus insuring an ample supply that would tend to hold prices down to a level that would clear the market. In addition, the Federal Coal Leasing Amendments Act of 1975 contains acreage limitations, both Federal and State, that would apply to developers.

The General Accounting Office, in its report, December 30, 1977, concluded that:

> A viable state of competition exists in the coal industry. Unless circumstances change domination by any firm or group of firms is unlikely.
>
> Control of current production is shared by numerous firms and ownership of coal reserves is dispersed even more. On a nationwide basis, pertroleum firms account for less than 20 percent of total production and even less of coal reserves.

The Office did, however, point out that if any concentration in the industry did occur, it would be more likely in the Western United States than in the East.

The study prepared by the Justice Department pursuant to Section 8 of the Federal Coal Leasing Amendments Act of 1975 (FCLAA) also indicated that competition within the industry was currently healthy, but did, however, temper that conclusion with the caveat that leasing of Federal coal should be resumed in order to provide more of an opportunity for entry into the market by companies that heretofore have been eliminated because of the leasing moratorium. Leasing more Federal coal, however, with the requirements of the FCLAA of 1975 for diligent development lest the lease be forfeited, may further complicate the problems of a demand-constrained industry.

Regardless of the competiveness of the industry at present, some attention should be paid to the potential of oil producers to extend their influence in the coal mining industry. For example, in the case of Exxon, a recent Forbes article indicated that by 1985, the Company hoped to be earning approximately $120 million from its coal operations which, for all of its magnitude, still would represent only 3% of the total earnings of Exxon at that time.[4]

This illustrates that, given the opportunity and the sanction by the Government, the petroleum industry has the capability to further its entry into coal, especially since many of the small operators, not being able to cope with the sophisticated planning and reclamation requirements that have been established, may be forced to discontinue operations.

---

[4] "Does Exxon Have a Future?", *Forbes*, Aug. 15, 1977, pp. 37–41.

FUTURE TRENDS IN THE STRUCTURE OF THE INDUSTRY

Because of the economies of scale to be derived from larger operations, the trend toward large, dedicated suface mines is very likely to continue in the absence of countervailing legislation. In addition, due to the mounting complexities of the planning, permitting, bonding, funding, and reclamation phases of mining, the trend could very easily accelerate. Small operators are finding it increasingly difficult to comply with the Federal performance standards which have been described in other sections of this report. The day when construction companies can bulldoze a hillside and produce a few thousand tons of coal, jumping in and out of the spot market between building contracts, is over. Mining companies will now be required to concern themselves with the complete mining cycle, including reclamation. Mining therefore, has developed into what one major producer calls "interim land use". In the midst of all of the large operations, which will supply most of the major fuel-burning installations, the difficulties of the small coal miner may lead to the accelerated growth of coal brokering, to coordinate the activities of many small producers and many small consumers. The broker could help maintain an orderly market that would assure the small consumer of adequate fuel supplies and, at the same time, provide the small mine operators with some degree of assurance that their coal will be marketed. Arrangements between brokers and small operators might be used as collateral to obtain capital for mine development or expansion.

4. Production*

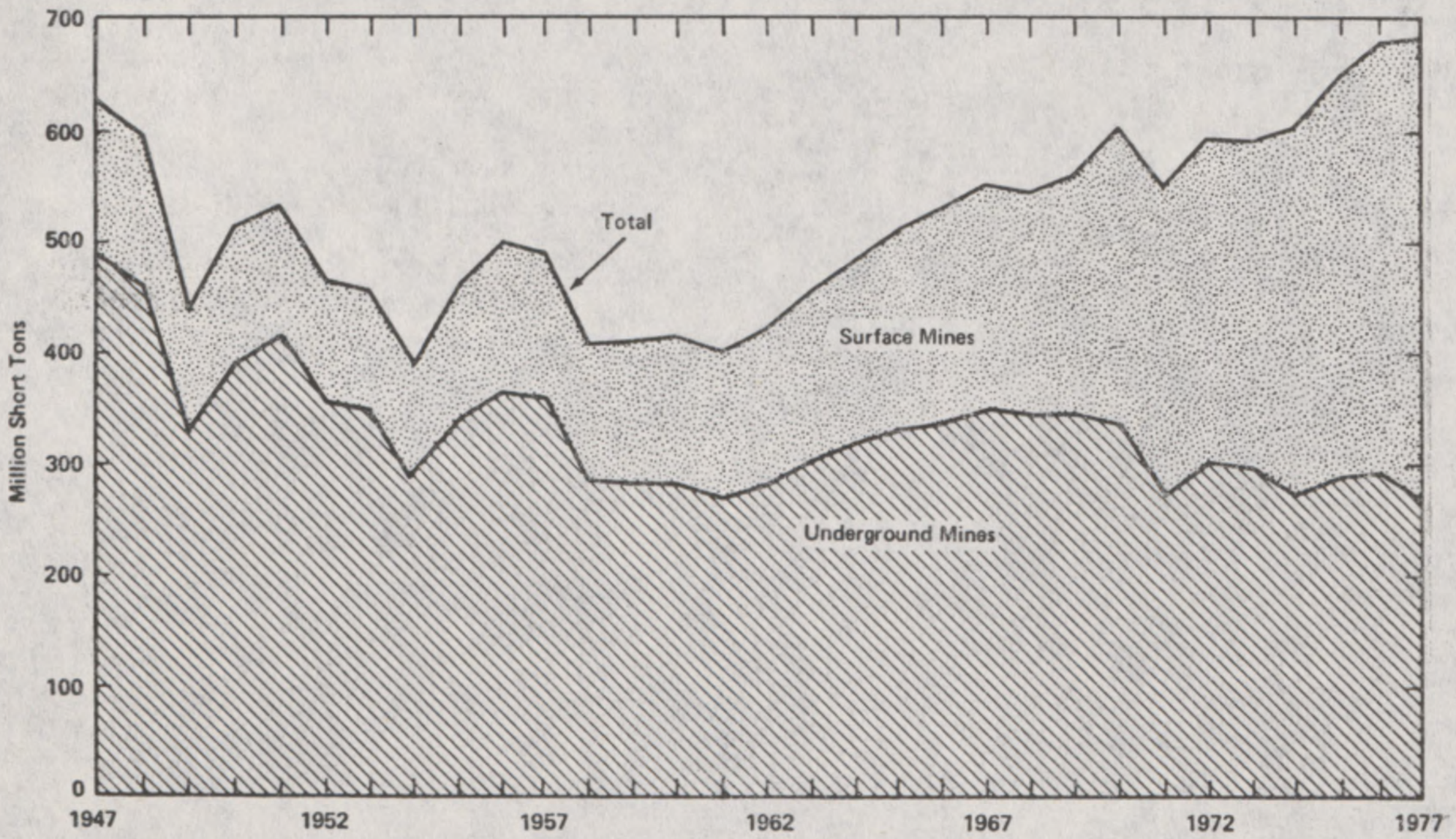
HISTORY

The bituminous coal industry is just now recovering from a slump that has lasted since the mid-1940's. During 1947, the industry produced 630.3 million tons from 8700 mines employing almost 426,000 miners at an average value of $4.16 per ton. From that peak, the production declined (see Figure 4–1) somewhat sporadically over the next 14 years until the industry hit a low production point in 1961 of approximately 403 million tons. Although the output of the industry has continued to increase since the 1961 low, the 1947 production figure was not surpassed until 1975, when the industry produced 648.4 million tons.

With the exception of a few aberrations, underground production has continued to decline, and, basically, all of the increases since the 1961 low have been generated by new production from surface mines. At the time of the 1961 nadir, underground mining accounted for approximately 67.7 percent of the total whereas in 1976 the percentage of coal produced by underground mining methods had fallen to about 43.4 percent. Preliminary information for 1977 from the Department of Energy indicates that the output from underground mines has decreased even further to 39.4 percent of the total output for the industry.

FIGURE 4–1

Production of Bituminous Coal and Lignite



Source: Bureau of Mines and Energy Information Administration.

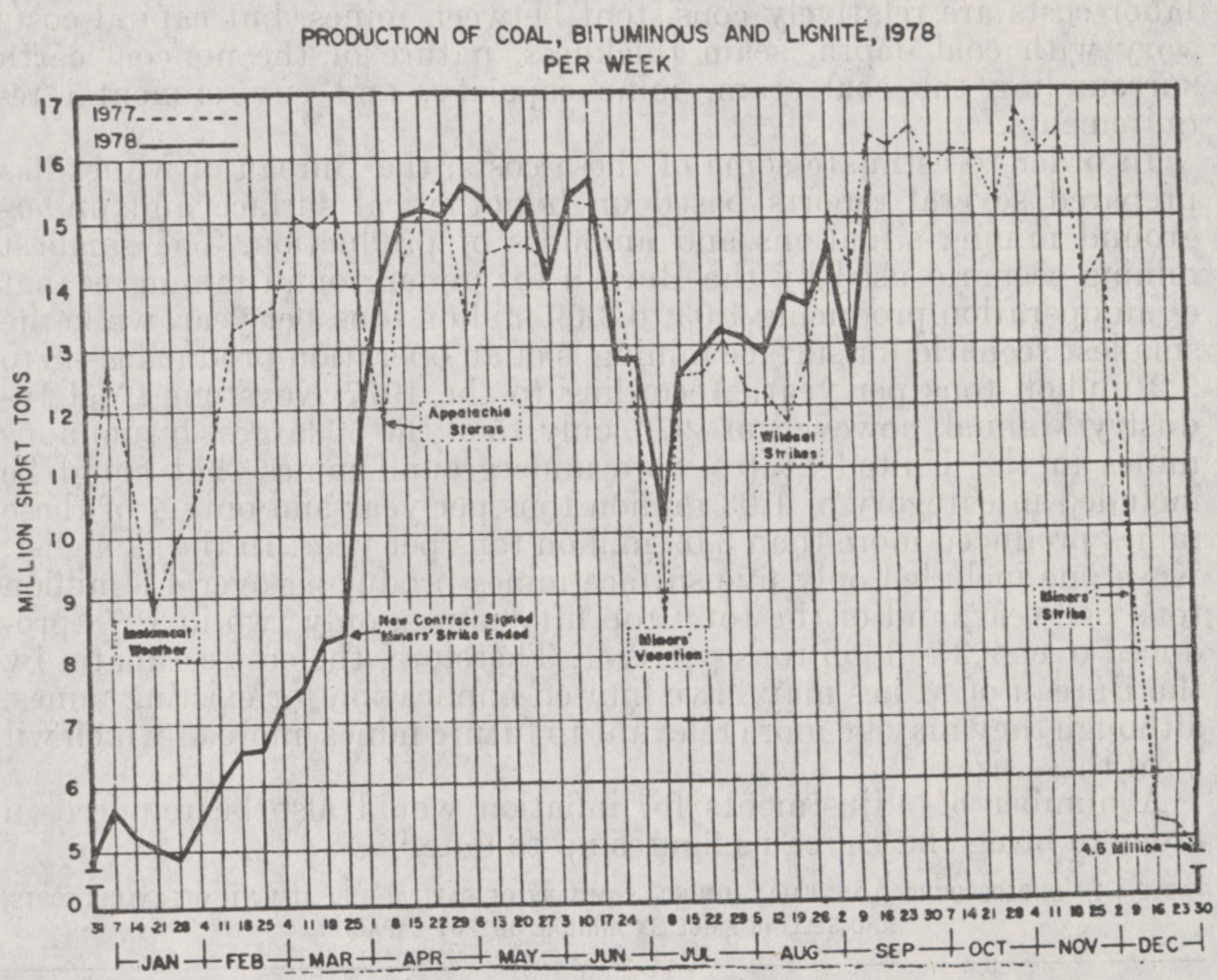
Source: Annual Report to Congress, Energy Information Administration, volume III, Statistics and Trends of Energy Supply, Demand and Price, 1977, p. 76.

---

*Duane Thompson, Analyst, Environment and Natural Resources Division, CRS.

During the first three months of 1978, coal production (or lack of it) in the United States received considerable publicity. December 6, 1977, marked the expiration of the three-year contract between the Bituminous Coal Operators Association and the United Mine Workers of America. Although production of coal during the last month of 1977 was effectively eliminated, consuming industries had stockpiled enough coal during the first eleven months to stave off any shortages in the closing weeks of the year. Production for the week ending December 16, 1977 was approximately 5.3 million tons, down from about 14.5 million tons for the preceding week (Figure 4–2).

FIGURE 4–2.—U.S. production of coal, bituminous and lignite, 1978, per week



Source: "Production of Coal, Bituminous and Lignite," 1978, per week Energy Data Reports, Weekly Coal Report No. 51, Sept. 22, 1978.

Geographically, the greatest percentage of the lost production occurred in the Eastern States, where the UMWA has the greatest membership. Production for the Western States remained relatively constant during the strike, in some instances actually increasing slightly as Western surface mines produced additional tonnage for hardpressed Eastern utilities. The lowest level of production came right at the end of 1977 when the industry produced 4.5 million tons per week. At the beginning of 1978, although there was no hint of a breakthrough between the BCOA and the UMWA, coal production began to increase until, just prior to the signing of the new contract, the industry was producing about 8.5 million tons weekly. After the signing of the new contract on March 26, 1978, production soared to

over 15 million tons weekly and has generally remained at that level since, except when the miners left on vacation first the two weeks in July.

Cumulative 1978 production through September 23d totaled 439 million tons, 66 million tons less than for the comparable period in 1977. National Coal Association is currently estimating total 1978 production at about 650 million tons, some 30 million tons below the 1977 level.

PRODUCTION COSTS

Production costs vary widely between surface and underground mining and vary widely from mine to mine in each category. Hourly labor costs are relatively consistent between mines, but capital costs vary with coal depth, seam thickness, nature of the noncoal earth surrounding the coal seam, mine capacity, and environmental requirements.

In order to estimate some of these costs, the Bureau of Mines has prepared several reports based on hypothetical surface and underground mining situations and amounts of production. The smallest mining scenario used by the Bureau for underground mining is that of an operation producing 1.03 to 3.09 million tons per year, while the smallest scenario for surface mining is of an operation producing 4.8 to 9.2 million tons per year. According to the 1977 Keystone Coal Industry Manual, however, in 1976, only 15 of the 50 largest bituminous mines in the United States were underground mines that could be included in category of 1.03 million tons per year and only 4 of these mines produced more than 3.09 million tons per year. In the same list, Keystone included only five surface mines producing over 4.8 million tons per year, and of the total top fifty mines, only two in 1978 produced over 9.2 million tons per year. Therefore, the cost estimates by the Bureau of Mines may have limited application for existing mines, although they may be more relevant to future mines, more of which wil be at these sizes.

A number of adjustments for inflation would also be required in order to bring the Bureau's figures up-to-date.[1]

TABLE 4-1.—UNDERGROUND (LONGWALL) MINING—SUMMARY OF CAPITAL INVESTMENT, OPERATING COSTS, AND SELLING PRICE BY ANNUAL OUTPUT CAPACITY

	Tons per year	
	1,504,800	3,009,600
Estimated capital investment:		
Initial	$33,835,100.00	$60,952,000.00
Deferred	18,639,400.00	33,282,700.00
Total	52,474,500.00	94,234,700.00
Capital investment per ton of production	34.87	31.31
Operating cost:		
Per year	11,934,400.00	21,609,800.00
Per ton of production	7.93	7.18
Selling price per ton:		
12 percent DCF[1]	11.01	9.99
15 percent DCF[1]	12.06	10.94
20 percent DCF[1]	13.87	12.58

[1] Discounted cash flow.

Source: "Basic Estimated Capital Investment and Operating Costs for Underground Bituminous Coal Mines Developed for Longwall Mining," United States Department of the Interior, Bureau of Mines, Information Circular No. IC-8715. 1976, p. 5.

[1] A subsequent study of surface mining costs has been prepared. See *Economics of Large-Scale Surface Coal Mining Using Simulation Modes*, prepared for the United States Energy Research and Development Administration by Fluor Utah, Inc. and Bonner & Moore Associates, Inc. (sixteen vols., No. FE-1520-101 through FE-1520-116). Copies available from the National Technical Information Service, Springfield, Va.

TABLE 4-2.—CONVENTIONAL UNDERGROUND MINING (72-INCH COALBED)—SUMMARY OF ESTIMATED CAPITAL INVESTMENT, OPERATING COST, AND SELLING PRICE BY ANNUAL OUTPUT CAPACITY

Million tons per year	1.06	2.04	3.18	4.99
Initial capital investment	$23,629,500.00	$36,943,000.00	$54,853,800.00	$79,907,500.00
Deferred capital investment	11,707,000.00	18,615,000.00	26,164,500.00	38,956,000.00
Total	35,336,500.00	55,558,000.00	81,018,300.00	118,863,500.00
Capital investment per ton of production	33.34	27.23	25.48	23.83
Production cost per year	9,938,500.00	17,297,900.00	25,988,100.00	40,304,500.00
Production cost per ton	9.38	8.48	8.18	8.08
Selling price per ton, 15 percent DCF	13.57	12.09	11.63	11.36

Source: "Basic Estimated Capital Investment and Operating Costs for Underground Bituminous Coal Mines," United States Department of the Interior, Bureau of Mines, Information Circular No. IC-8682, 1975, p. 5.

TABLE 4-3.—CONVENTIONAL UNDERGROUND MINING (48-INCH COALBED)—SUMMARY OF CAPITAL INVESTMENT, OPERATING COSTS, AND SELLING PRICE BY ANNUAL OUTPUT CAPACITY

Million tons per year	1.03	2.06	3.09
Estimated initial capital investment	$26,498,500.00	$46,054,400.00	$67,173,300.00
Estimated deferred capital investment	10,939,000.00	18,100,500.00	25,811,000.00
Total	37,437,500.00	64,154,900.00	92,984,300.00
Capital investment per ton of production	36.36	31.16	30.10
Operating cost per year	9,803,600.00	18,110,500.00	26,577,700.00
Operating cost per ton of production	9.52	8.79	8.61
Selling price per ton, 15 percent DCF [1]	14.83	13.56	13.26

[1] Discounted cash flow

Note: This study furnishes cost analyses for 3 hypothetical underground bituminous mines that produce 1.03, 2.06, and 3.09 million tons per year of coal. A summary of the total capital investments, operating costs, and selling prices is given in this table.

Source: "Basic Estimated Capital Investment and Operating Costs for Underground Bituminous Coal Mines," U. S. Department of the Interior, Bureau of Mines, Information Circular No. IC-8689, 1975, p. 5.

TABLE 4-4.—SURFACE MINING—SUMMARY OF CAPITAL INVESTMENT, OPERATING COSTS, AND SELLING PRICE BY ANNUAL OUTPUT CAPACITY

Million tons per year and location (province)	4.8, eastern	6.72, interior	9.2, Northern Great Plains
Estimated initial capital investment	$65,137,900.00	$78,514,600.00	$42,050,100.00
Estimated deferred capital investment	21,832,000.00	30,863,900.00	36,493,400.00
Total	86,969,900.00	109,378,500.00	78,543,500.00
Capital investment per ton of production	18.12	16.28	8.54
Operating cost per year	20,992,000.00	25,696,400.00	24,027,300.00
Operating cost per ton of production	4.37	3.82	2.61
Selling price per ton, 15 percent DCF [1]	6.94	6.03	3.39

[1] Discounted cash flow.

Note: This report furnishes cost analyses for three hypothetical coal strip mines. A summary of the total capital investments, operating costs, and selling prices is given in this table. Included in this table is the cost of reclamation at the various locations.

Source: "Basic Estimated Capital Investment and Operating Costs for Coal Strip Mines," United States Department of the Interior, Bureau of Mines, Information Circular No. IC-8703, 1976, p. 5.

One estimate of increased labor costs, prepared by Joel Price, coal analyst for the investment firm of Dean Witter Reynolds, Inc., reported the first-year cost increase of the labor settlement to be $2.726 per hour based on an assumed productivity of 12.2 tons-per-man-shift.[1] This translates into a first-year cost increase of $1.79 per ton

[1] "The Coal Observer," by Joel Price, CFA, first vice president, Dean Witter Reynolds, Inc., Apri 1978, p. 6.

assuming an eight-hour working day for underground miners. This estimate is consistent with another prepared by Peabody Coal Company which established the per-ton industry average cost increase at approximately $1.89. Peabody indicated, however, that its own cost increase should be somewhat lower than the industry average because of its higher average productivity.[2]

In addition to this wage settlement estimate, Peabody further estimated marginal cost for land reclamation to be about $2.50 per ton for their surface operations and $.30 per ton for the underground operations, and black-lung costs of 25 cents per ton for surface mining and 50 cents per ton for underground mining. In view of the indeterminacy surrounding land reclamation requirements, however, estimates of the effects of the 1977 Surface Mining Control and Reclamation Act must be regarded as preliminary and uncertain.

PRODUCTIVITY

Productivity has significantly decreased from the time portrayed in the song "Sixteen Tons," popularized by Tennessee Ernie Ford. The miners in that song were working under primitive conditions with primitive tools and were still supposedly able to load almost twice as much coal per day as today's underground miners working with modern equipment.

According to the Department of Energy, productivity for all mines, both underground and surface, peaked in 1969 at 19.9 tons per man day. Productivity for underground mining also peaked that year at 15.61 tons per man day. Surface mining productivity, however, continued to increase after 1969 until 1973, when it reached 36.7 tons per man day. Since that time, it too has been declining. In 1977, the rates are estimated to have been 7.8 and 26.9 tons per man day for underground and surface mining respectively.

Productivity seems to be stabilizing now, with some indications that it is rising slightly.

These declines in productivity appear to coincide with the enactment and implementation of the Federal Coal Mine Health and Safety Act of 1969, and operators generally agree that the new safety requirements are one of the major contributors to the productivity decline. Productivity has become one of the most sensitive problem areas in the industry, as many miners consider management's emphasis on it to be a euphemism for disregard for the miner's health and safety. Some industry observers strive to distinguish between productivity and total production in order to indicate that two problems exist which can be treated concurrently.

A more comprehensive discussion of the relationship between productivity and health and safety is included in the labor/management section of this report.

---

[2] Letter from Robert H. Quenon, President of Peabody Coal Company to Hon. Robert S. Strauss, Special Counselor on Inflation, Sept. 1, 1978.

5. Coal Mine Technology*

UNDERGROUND MINING TECHNOLOGY

In the United States, most of the underground coal mines follow a room-and-pillar plan that results in intersecting tunnels 14 to 20 feet wide. The pillars are columns of coal that are left standing to help support the ceiling in a particular area until it is mined. The mining process in an underground mine moves forward until as much coal as possible is removed from the coal seam. Subsequently, as the miners move back toward the main entrance of the mine, they often remove some of the coal from the pillar in order to cave the roof. Two main types of room-and-pillar coal mining are employed in the United States, conventional mining and continuous mining.

Conventional mining is the oldest and most complex of the mechanized deep-mining processes and accounts for about 32 percent of the total coal mined underground.[1] This technique utilizes sparkproof explosive or cylinders of compressed air to shatter the sections of a coal seam after the seam has been cut by a special coal-cutting electric chain saw. Loading machines then move the coal onto a conveyor belt or shuttle cars that carry the coal to either another conveyor belt or rail cars, which transport the coal out of the mine. After removal of the coal, machines drill holes in the roof and long steel expansion bolts are inserted to bind the overlying rock layers together to help support the ceiling. Because there is a sequential nature to this type of mining, modern mines keep the different types of machinery simultaneously in operation in different working areas of the same mine section in order to utilize the equipment most efficiently. Coal recovery with the conventional mining method, as with other room-and-pillar methods, is in general probably no more than 50 to 60 percent, although much higher recovery rates are obtained at some mines.[2]

Continuous mining accounts for over 63 percent of the total coal mined underground in the United States.[3] In one operation, a continuous mining machine tears the coal from the seam with its revolving teeth and loads it for transport out of the mine. The continuous miner (machine) is a great technological improvement over conventional mining because it eliminates the "bottleneck" which occurs with conventional mining when one of the steps in the mining sequence falls behind. In addition, it requires fewer men to produce an equivalent tonnage of coal. Conventional mining, however, will probably be utilized for quite some time because of the flexibility the method offers in responding to adverse seam conditions (poor roof rock, hard coal, and

---

*Barbara Bascle, Senior Reference Assistant, Office of Senior Specialist, CRS.

[1] National Coal Association Coal Facts. Washington, D.C., 1978. p. 16.

[2] Breslin, John J. and Richard J. Anderson. Observations on Current American, British, and West German Underground Coal-Mining Practices, Battelle Energy Program Report. 1976. p. 184.

[3] National Coal Association, p. 16.

high rates of methane gas liberation), and because conventional mining units are more reliable and more readily available. Continuous miners actually operate intermittently, with delays attributed most often to roof control, ventilation, haulage, and maintenance requirements and problems.

A third method of mining, longwall mining, accounts for only 4 percent of the total underground coal mined in the United States; by contrast, it is extensively used in European coal mines.[4]

Longwall mining utilizes a steel plow or rotating cutting drum which moves back and forth across a face that is several hundred feet long to cut the coal, which then falls onto a conveyor. A series of large self-advancing hydraulic jacks that are topped with broad steel beams and set a few feet apart, supports the roof and protects the machine operator. After each pass of the machine along the coal face (350–600 feet long), the support jacks momentarily release their pressure and move forward to resume their support.

The production potential with longwall mining is much greater than with room-and-pillar methods because the entire operation, both mining and haulage, are truly continuous. In addition, rock dusting and ventilation procedures are greatly simplified because only one coal face is being mined, while roof support problems are almost eliminated with the self-support jacks. Coal recovery rates of 95 percent are not uncommon.

However, there are inherent problems with utilizing longwall mining: (1) a soft top or bottom or a top too strong to cave will make the method untenable; (2) a wide variance in seam thickness cannot be tolerated because of the use of roof support jacks with a limited height range; (3) displacement faults, seam pinchouts, or the presence of gas wells will offset advantages of the system; and (4) moving the system from one working area to the next requires at least 30 shifts to accomplish and is a cost disadvantage. The advantages of the longwall system, however, appear to outweigh the disadvantages in seams where longwall mining is an alternative and, in the future, longwall mining is expected to increase its share of the total coal mined in the U.S.

A fourth type of mining, which is somewhat of a combination of longwall and room-and-pillar mining, is shortwall mining. Shortwall mining utilizes a continuous miner to cut and load from the open end of a rectangular pillar of coal, while self-advancing roof supports provide protective cover. Overall recovery of coal with the shortwall method is about 85 percent of the coal seam, an extremely high rate when compared to the room-and-pillar methods, but about 10 percent lower than longwall mining. Shortwall mining offers some advantages over longwall mining; where seam variability is great, shortwall mining can be utilized because the length of the wall of coal to be mined is less (150–200 feet long), and movement of the equipment to a different area is less of a problem than with longwall mining. Additionally, roof support presents fewer problems than in room-and-pillar mining because of the utilization of self-support jacks.

Underground coal mining in the future will probably resemble that of today, even though new machinery will undoubtedly be introduced.

---

[4] Breslin and Richardson, p. 184.

No large degree of innovative substitution is expected in the next 25 years. A major reason for this is the tendency for mine operators to retain their machines in place as long as is possible. New machines are costly, not only to purchase but also to install. A mine design and its every-day operation are often tailored to the type of equipment utilized, and any change in that equipment may require a redesign of the mine system, itself. Mine operators tend to be conservative in their acceptance of new technologies because of the high capital risks involved, and only after substantial proof is offered in favor of new equipment or mining methods do they tend to slowly accept the change.

Much of the ongoing research in coal mining technology is aimed at providing short-term improvements in existing mining systems, with research commonly concentrating on improvement of specific existing machines or their component parts. Current research in underground mining is concentrated on eight categories: (1) coal breakage; (2) roof control; (3) ventilation; (4) haulage; (5) power; (6) machine design; (7) training aids; and (8) integration of systems. Table 5–1 shows specific research under each of these categories and the stage of development to which it has progressed.

TABLE 5–1.—TECHNOLOGY TRENDS IN UNDERGROUND COAL MINING

Item	Research task	Prototype	Limited commercial availability	General acceptance
Coal breakage:				
1. Water jet continuous miner	X	X	X	
2. Improved coal breakage bits	X	X	X	X
Roof control:				
3. Improved fully grouted resin bolts	X	X	X	X
4. Automated resin bolt installer	X	X	X	
5. Forced-pin bolts	X	X	----	
6. Torque indicating bolts	X	X	X	
7. Split-shell bolt	X	X	X	
8. Reduced-noise roof bolters	X	X	X	X
9. Automated mechanical-roof-bolt machine	X	X	X	
10. Concurrent (bolter-conveyor) bolting machines	X	X	X	
11. Roof-truss installer	X	X	X	
12. Longwall shields	X	X	X	X
13. Improved hydraulic controls for shields	X	X	X	X
14. Headgate control of shield advance	X	X	----	
15. Shield supports for thicker seams	X	X	X	
16. Mobile shields for room-and-pillar mining	X	X	----	
17. Improved cabs and canopies	X	X	X	X
18. Chemical roof stabilization	X	X	X	
19. Bad roof sensors: Microseismic	X	X	X	
20. Bad roof sensors: Thermal	X	X	----	
21. Harmonic mining	X	X	----	X
Ventilation:				
22. Methane drainage: Premining	X	X	X	
23. Methane drainage: Postmining	X	X	X	X
24. Water infusion	X	X	X	
25. Telemetric measurement of air quality	X	X	X	
26. Automatic adjustment of air flow	X	X	----	
27. Improved auxiliary ventilation systems	X	X	X	X
28. Machine-mounted fans and diffusers	X	X	X	X
29. Improved brattice cloth	X	X	X	X
30. Water-flushed bits	X	X	X	X
31. Reliable fire-control systems	X	X	X	X
32. Gas and dust ignition quenchers	X	X	X	
Haulage:				
33. Improved cornering systems for conveyors	X	X	X	X
34. Rapid installation of conveyors	X	X	X	X
35. Hydraulic face transportation of coal	X	X	X	
36. Roadbed preparation improvements	X	X	X	X
37. Improved batteries	X	X	X	X
38. Diesel locomotives	X	X	X	X
39. Diesel face equipment	X	X	X	
40. Automated rail haulage	X	X	X	

TABLE 5-1.—TECHNOLOGY TRENDS IN UNDERGROUND COAL MINING—Continued

Item	Research task	Prototype	Limited commercial availability	General acceptance
Power:				
41. Improvements in use of a-c	X	X	X	X
42. Improved permissible boxes	X	X	X	
43. Telemetric measurement of power parameters	X	X	X	
Machine design:				
44. Standardization of controls	X	X	X	X
45. Simplification and rationalization of controls	X	X	X	
46. Improved machine design for maintenance	X	X	X	X
Training:				
47. Training aids and simulators	X	X	X	X
Integration of systems:				
48. Improved conventional mining systems	X	X	X	
49. Remotely controlled continuous miners	X	X	X	
50. Advance conditions sensors	X	X		
51. Pillar augers	X	X	X	X
52. Road headers	X	X	X	X
53. Tunnel boring machines	X	X	X	
54. Single-entry longwall	X	X	X	X
55. Longer faces	X	X	X	
56. Gas well plugging	X	X	X	X
57. Roof failurei nducers	X	X		
58. Remote-control of longwall shearers	X	X	X	
59. Thick seam technology	X	X	X	X

Note: Adapted from Hittman Associates, Inc., "Underground Coal Mining: An Assessment of Technology." EPRI (Electric Power Research Institute) Report EPRI AF-219, 1976, p. 8-5 and 8-6.

The mix of underground mining methods in the United States in the next 20 years or so will probably still consist mainly of the room-and-pillar method (70 to 80 percent), with continous mining accounting for 50–60 percent of all underground mining and conventional mining 20–30 percent of the total.[6] Shortwall mining may increase to account for about 10 percent of the total underground coal mined, whereas longwall mining will also likely increase to about 10 percent. However, longwall mining may become more important and reach 25 percent of the total underground production if it is adapted for use in the thick-seam Western coals, where its potential for use in the United States is viewed to be the greatest.

SURFACE MINING TECHNOLOGY

Approximately one-half of U.S. coal production comes from surface mines, where the coal seams lie fairly close to the earth's surface. In general, the overburden that must be removed averages about 100 feet in the East and about 35 feet in the West, while the seam thickness averages about 4 feet in the East and 35 feet in the West, but seams as thick as 100 feet are also common in the West.[7]

The major methods of surface mining utilized in the United States are: (1) contour mining; (2) auger mining; and (3) area mining. Both contour and area surface mining utilize numerous techniques and equipment, depending on the geology and climate of the area to be mined.

Contour mining is practiced in areas where the terrain is mountainous or rolling and the slope is steep. Contour mining techniques are numerous, but basically, the method consists of removing the overburden above the coal bed to expose the coal. The coal is then

[6] Hittman Associates, Inc., "Underground Coal Mining an Assessment of Technology. EPRI Report AF-219." 1976. pp. 8-1 through 8-6.

[7] U.S. Bureau of Mines, "Strippable Reserves of Bituminous Coal and Lignite in the United States." Information Circular 8531. Washington, D.C., U.S. Govt. Print. Off. 1971. pp. 28-121.

removed and the procedure moves along and into the hillside until the ratio of the overburden to strippable coal (stripping ratio) becomes so great that it is uneconomical to mine.

Auger mining is usually associated with contour strip mining, and is commonly utilized to recover additional tonnages after the stripping ratio has become too great to be economical. Augers extract the coal by boring horizontally into the seam; some augers are as large as seven feet in diameter and can drill in excess of 200 feet into the hillside.

Area mining techniques are utilized mainly in relatively flat terrain. Basically with this type of surface mining, a trench or "box cut" is made through the overburden to expose a portion of the deposit. The coal is then removed from this first cut, which may extend as far as the limits of either the deposit or the property. Succeeding parallel cuts are made, with the spoil being deposited in the cut just previously excavated.

The machines used in surface mining range in size from ordinary construction bulldozers and front-end loaders to huge power shovels and draglines that are the largest moving land machines in the world. The smaller, more mobile equipment is generally used in the Eastern (Appalachian) strip mines where more versatile equipment is needed to traverse the rugged terrain. The gigantic equipment (some power shovels have bucket capacities large enough to fill about 4 train cars) is utilized mainly in the Western and Midwestern coalfields where strippable coal seams are fairly continuous for miles. These large pieces of equipment are so specialized and laborious to erect that a specific piece of equipment may be used in the same vicinity for decades.

Surface mining technology development has concentrated on new equipment and methods that are both more efficient and environmentally sound. Mining equipment research currently underway includes development of (1) a portable belt-conveyor haulage system to eliminate congestion in the pit; (2) a crosspit conveyor to increase the output of a dragline; (3) forward-rotating bucket conveyor to dig and load coal; (4) foam-filled tires for excavation machinery; and (5) a shovel configuration to provide better digging capability.

The longwall mining method is also being studied as an alternative to strip mining. The longwall miner would be utilized under the relatively shallow overburden found in the Western coalfields. This method would allow the coal to be mined without disturbing the overlying vegetation while recovering most of the coal resource, and at the same time help control subsidence and eliminate runoff problems. The surface longwall method would be similar to the deep underground longwall, and would utilize the self-advancing jacks to support the roof, which caves after the longwall advances.

6. Anthracite

The future of arthracite production looks bleak. Its landmark year was 1917 when production reached 100 million tons (Table 6–1).

Table 6–1

Anthracite production, 1900–1976

Year:	*Production (million tons)*
1900	57. 3
1910	84. 5
1920	89. 6
1930	69. 4
1940	51. 5
1950	44. 1
1960	18. 8
1970	9. 7
1971	8. 7
1972	7. 1
1973	6. 8
1974	6. 6
1975	6. 2
1976	6. 2

Source: Anthracite Task Force Report, Overview Section, p. 7, Department of Energy, Nov. 18, 1977.

From that time, however, production trends for hard coal have been steadily downward. As recently as 1947, the anthracite industry was producing approximately 57 million tons of coal with consumption amounting to about 48 million tons during the same period. By 1976, however, production of anthracite had fallen to 6.2 million tons.

Although much of the decrease in anthracite production can be attributed to exogenous factors including inroads by competing fuels, many of the difficulties experienced by the industry are physical, not economic constraints. Furthermore, these production limitations come at a time when, more than ever before, success in the coal mining industry is more contingent upon operators being able to guarantee large volumes of coal. Currently, the entire anthracite industry is producing only enough coal to fuel one intermediate-size utility boiler.

Because of its extremely high level of fixed carbon (95%), boilers using anthracite either have to be specially constructed or be modified in order to provide the fuel with the adequate combustion time. These special modifications increase the cost of installation and discourage conversion to anthracite by many potential users.

In addition to the problem of competing fuels, the Anthracite Task Force Report, prepared for the Department of Energy, classified other industry problems according to the following breakdown:[1]

1. Environmental, specifically air quality, legislation;
2. Lack of modernization of mining and preparation technology;
3. Sale of sub-standard coal; and
4. Poor quality control.

---

[1] Anthracite Task Force Report, coordinated by the Department of Energy, Nov. 18, 1977, Final Report of the Production Subgroup, p. 4.

The production-related problems of the anthracite industry are caused primarily because the resource is situated in beds that are folded, faulted, and associated with aquifers that cause continual flooding. The steeply pitching beds of coal make mining difficult, not amenable to modernized mining machinery, and costly since the greatest percentage of anthracite must be produced largely with antiquated and labor-intensive methods. Once produced, anthracite still faces additional transportation problems. Production of the fuel is concentrated in an area that has experienced, over the past few years, the demise of six railroads serving the industry. These railroads have since been consolidated into Conrail, a quasi-governmental corporation that has not proved particularly helpful to the anthracite industry.

In order to combat some of the difficulties of the anthracite industry, the Task Force recommended the following actions:

1. The establishment of an anthracite office with the Department of Energy, dedicated to the specific problems of the industry;[2]

2. The enactment of a Congressional amendment to the Best Available Control Technology (BACT) provisions of the Clean Air Act Amendments to provide an exemption for the use of anthracite coal;

3. Force conversion, wherever possible, of existing Federal and State funded public buildings to anthracite fired heating equipment;

4. The establishment of a Federal anthracite stockpile program, and

5. Amend[ing] the Federal Underground Coal Loan Guarantee Program to allow loan guarantees for both new and existing anthracite production facilities, regardless of the type of operation.

The Task Force considered anthracite coal a significant energy resource, relatively close to potential consumers in the Northeastern United States, and desirable because of its low-sulfur/high-heat characteristics.

Other, although more remote, potential for anthracite coal development also exists in the three-State area of Rhode Island, Massachusetts, and Connecticut.

Productivity figures for the anthracite industry are not encouraging. Currently, the industry is producing slightly over seven tons-per-man-day, a figure which has improved somewhat over the 6.9 tons-per-man-day produced in 1972.

---

[2] An anthracite office has subsequently been established in the Department of Energy under the Director of Coal Supply, Deputy Assistant Secretary of Utility and Industrial Applications.

7. Labor in the Coal Industry*

Labor/management relations in the coal industry have fluctuated almost as widely as coal production from one decade to another, and the past decade has been no exception.

The emergence of coal as one of the great energy sources of modern civilization helped usher in coal-mining unionism at a relatively early date in American labor history. Fluctuations in the industry's fortunes thereafter were mirrored in the ebbs and flows of coal union power down until the 1930's. At that point the conjunction of powerful union leadership, favorable labor legislation, economic recovery from the great depression, and then great wartime demand for coal helped make the United Mine Workers of America the nation's most powerful labor organization for several decades.

The substitution of new sources of energy for coal, along with wholesale substitution of machine for human power in the industry, combined to erode the union's power by the 1960's. Political crises in the mid-East, along with a growing awareness of the relative abundance of coal in the U.S., especially when compared to other fuels, have more recently provided a new foundation for the restoration of some of the industry's traditional importance; but a large part of the recent expansion has been in a area, new western strip mines, where labor unions have not achieved substantial organization.

Union and management institutions, however, continue to play a vital role in determining the conditions of labor in the coal industry today. Powerful, highly centralized union leadership which persisted for many decades has been more recently succeeded by a less unified, more open pattern of union government, and this has brought with it less stability in the industry's labor relations. A relatively new, younger work force, better educated and more assertive, now mans the nation's coal mines. This younger work force brings with it new values, new demands and aspirations, as well as greater potentialities. In addition, greater national sensitivity to environmental and occupational safety factors has led to new regulatory legislation with farreaching implications for the health and safety of the industry's work force, as well as its productivity.

A high incidence of strikes, an influx of inexperienced workers and the impact of the new regulatory legislation have tended to hold back some of the potential expansion of the coal-industry. Some effective restructuring of its labor institutions seems essential, if that industry is to achieve the expanded role assigned to it in the nation's energy program. Any such restructuring would rationally take into account, and, indeed, use to advantage the new, young, better educated work force. This restructuring will also require improved labor-management relations in the industry. It could beneficially include more and better training of coal mining management. It is useful to examine basic trends in employment, wages, productivity and working conditions in coal mining, and the way in which union-management relationships can influence those elements.

---

*Prepared by E. M. Kassalow, Senior Specialist in Labor, CRS;

EMPLOYMENT IN THE COAL INDUSTRY

While the last few years have been a period of high demand and employment expansion in the U.S. coal industry, a view with longer perspective suggests the volatile nature of the industry, especially as regards employment. Just in the post war decades, employment in bituminous coal mining has fluctuated from 425,000 in 1947 down to 130,000 in 1966 and up again to nearly 215,000 by 1977. Even such industries as automobile manufacturing and basic steel which are prone to cyclical ups and downs have not approached the volatility of coal mining. (See Table 7–1). The only industry (in this table) whose experience parallels coal somewhat is railroads, which indeed has not even enjoyed the coal industry's employment upturn of recent years.

TABLE 7–1.—EMPLOYMENT IN SELECTED INDUSTRIES, 1947–77

[In thousands]

Year	Industry						
	All manufacturing	Bituminous coal	Contract construction	Class I railroads	Motor vehicles and parts	Basic steel	Retail trade
1947	15,545	426	1,982	1,352	768	656	6,595
1958	15,595	193	2,778	841	607	601	7,902
1968	19,781	126	3,306	583	874	636	10,488
1977	19,558	214	3,845	497	891	544	13,892

Source: U.S. Bureau of Labor Statistics.

The volatility of employment in the bituminous coal industry when compared to most other industries is even better grasped from Table 7–2, which takes employment in 1947 as a base year for various industries.

TABLE 7–2.—INDEXES OF EMPLOYMENT, SELECTED INDUSTRIES 1947–77

[1947 equals 100]

Year	Industry						
	All manufacturing	Bituminous coal	Contract construction	Class I railroads	Motor vehicles and parts	Basic steel	Retail trade
1947	100	100	100	100	100	100	100
1958	100	45	140	62	79	92	121
1968	127	30	167	43	114	97	159
1977	126	50	194	37	116	83	210

Source: U.S. Bureau of Labor Statistics.

It is useful to keep this experience in mind, for although employment in the bituminous coal industry has been moving upward in the seventies, this industry has experienced great peaks and valleys in the past. It has proven to be peculiarly sensitive to social and economic and even political forces outside the industry and its immediate market. This past experience without a doubt continues to influence the present conduct and outlook of the key human, institutional forces in the industry, employers and unions.

For a closer evaluation of the employment situation in the bituminous industry it is necessary to disaggregate the data in several differ-

ent ways. To begin with, it should be noted surface mining employment gains have tended to exceed those in underground mines since 1960. The labor force mix in the industry has also undergone significant change in the past two decades. Within the industry the number of non-production workers, engineers, technicians, clerks, managers, etc., has grown much more rapidly than has the production (and maintenance) blue collar force. In 1960 production workers constituted 88% of the work force in coal, but by 1977 that figure had declined to 82%. Indeed, between 1976 and 1977 the number of production workers in the industry declined 3,500, while white collar employment rose 6,700.

It is anticipated that the non-production work force, including engineers and technicians, will continue to grow more rapidly than the production worker component in the future, although some significant increase in production workers is also expected. If one can assume that the new labor force mix with more professionals and technicals will prove to be effective, it could be a positive element in the industry's future productivity performance, but just how long it may take to fully assimilate these workers is difficult to judge. Estimating the relationship between productivity and the higher occupational skill ranking of today's coal work force is also complicated by the fact that an important part of the added professional and technical group has been employed to help comply with new safety and environment regulations. At best these new regulations may have a favorable long run influence on the industry's productivity performance. In the short run, however, this added labor tends to depress the usual productivity measures.

SPECIAL MANPOWER TRAINING PROGRAMS TO ANTICIPATE AND BREAK BOTTLENECKS

Along with the need for more professionals and technicians, it is also anticipated that there will be a growing demand for skilled maintenance employees, especially in underground mines. While there has been only a limited number of successful cooperative training programs between mine operators and vocational schools or junior colleges, one recent survey of the industry's manpower needs in the future urged an extension of similar cooperative programs to many more mining areas.[1]

The industry's growing demand for more high-level manpower than it has used in the past underscores the need for more extensive training of personnel for complex equipment such as is used in some dragline operations, as well as more training programs for foremen throughout the industry. It may be useful to explore whether any special "incentive" programs could be designed to encourage the coal mining industry to train systematically more of its own managers, foremen, maintenance and related personnel in the coming years. Mining engineers are another group whose supply does not seem to be keeping pace with the coal industry's growing needs.[2] In some areas these occupations could become bottlenecks holding back expansion of operations.

---

[1] Kramer Associates, Inc., "Determination of Labor Management Requirements to Meet the Goals of Project Independence," Washington, D.C., 1975, p. 60.

[2] "Manpower for Coal Mining, Supply-Demand Training," prepared by Bernard S. Friedman, for the Division of Materials and Exploratory Research Energy and Development Administration Fossil Energy, TID-27669, Washington, D.C., September 1977, pp. 42-58.

With so many new, young workers entering the industry, there is also recognition of the need for training programs at the entry level, both in basic skills and in safety. The 1974 UMW-Bituminous Coal Operators Association agreement made provision for a Joint Industry Training Committee to help with this need. Its implementation left something to be desired in the ensuing three years; but the new 1978 agreement continued this provision as well as one requiring an orientation program for new employees.[3]

Just recently the U.S. Department of Labor and the Department of Energy agreed to a new training program with ten mining companies in the Illinois Basin, the UMW and the Wabash community college. Under this program some 350 workers will be trained for new, entry slots in the mines, mostly in deep mining, although some provision is made for training strip mining entrants as well. The program will be financed by a three million dollar grant out of CETA funds. (Safety Training is to be part of the program.) This, of course, is only one program in one area, but it is noteworthy that interested federal agencies are increasingly favorable to making resources for training to the parties in the industry.

THE FUTURE GROWTH OF COAL EMPLOYMENT, AN "EASTERN TILT?"

There is, of course, widespread belief that the coal industry and coal employment are likely to continue to grow in the immediate future—the great, worldwide pressure on energy supplies seems to assure this. It also now appears that in spite of the spectacular growth in western strip mining in the past decade, the future expansion of the industry may have more of an "eastern tilt" than has been true of the past decade.[4] Changes in federal air pollution laws along with other environmental problems associated with western strip mining seem to encourage such an "eastern" trend, i.e. a greater dependence on underground mines in the older eastern Appalachian areas (Pennsylvania, West Virginia, Ohio, eastern Kentucky, Virginia, Tennessee and Alabama) and the Illinois Basin (Illinois, Indiana and Western Ohio).

A recent Georgetown Coal Policy report concluded that environmental and other constraints are likely to mean "only modest increases in tonnage production from the Northern Plains," but "notable increases will be possible in parts of the Illinois Basin and in Appalachia," especially in deep mining.[5] In sum it has been estimated that 85 percent of new coal mining employment will occur in the East. This figure seems high and other forecasts hold most expansion of coal production in the *immediate future* will continue to be concentrated in the West, though even these projections anticipate that after 1985 production expansion will be greater in the older producing areas.[6] In any event all these projections agree that *employment* expansion will be several times greater in the older areas. (The greater labor intensity of production in those areas contributes to this.) There is a caveat to this, namely, the possibility that fears of future interruptions in pro-

---

[3] Article XVI of the Mar. 14, 1978 agreement between the UMW and the BCOA.

[4] See the summary of the Georgetown University Center for Strategic Studies National Coal Policy Project "Where We Agree" (issued Feb. 9, 1978), in *The National Journal*, Mar. 25, 1978.

[5] Francis X. Murray, Editor, "Where We Agree: Report of the National Coal Policy Project," Boulder, Colo., Westview Press, 2 vols., 1978, vol. 2, p. 66.

[6] General Accounting Office, "U.S. Coal Development—Promises, Uncertainties," Report to the Congress by the Comptroller General of the United States, Washington, D.C., Sept. 22, 1977, p. 4.15.

duction (wildcat strikes and the like) might conceivably deter some of the expansion in the "older" coal producing areas. The added costs of strengthening Eastern (especially Appalachian) community infrastructures to support new coal employment could also be a limiting factor in any expansion.[7]

It need scarcely be emphasized that the geographical concentration of any new coal employment can have far reaching implications for manpower policy, union-management relations, productivity in the industry, etc. Some of these are explored in subsequent sections.

EARNINGS OF COAL MINERS OUTSTRIP MOST OTHER INDUSTRIES

An examination of wage movements since 1947 reveals that although the bituminous coal industry may have lagged in employment growth, its workers have registered substantially larger wage gains than has been the case for all manufacturing employees and for those in retail trade, even though these sectors have outstripped coal in employment growth. (See Table 7–3).

TABLE 7–3.—AVERAGE HOURLY EARNINGS, SELECTED INDUSTRIES 1947–77

Industry	1947	1958	1968	1977
All manufacturing	1.22	2.19	3.19	5.24
Bituminous coal	1.58	2.93	3.86	8.46
Contract construction	1.50	2.93	4.79	8.04
Class I railroads	1.19	2.44	3.44	7.39
Motor vehicles and parts	1.47	2.55	3.90	7.90
Basic steel	1.45	2.88	3.76	8.45
Retail trade	.84	1.42	2.16	3.83

Source: U.S. Bureau of Labor Statistics.

Although bituminous coal started at a much higher dollars and cents level, workers in the industry registered a 435 percent increase in average hourly earnings between 1947 and 1977, while manufacturing and retail trade increased 330 and 356 percent respectively. This gain, however, is in line with that of construction and auto workers over the same period, and actually trails behind the percentage gain in basic steel and railroads. When one disaggregates this wage change material, it is significant that between 1947 and 1968 when the bituminous coal industry was largely in the doldrums earnings advanced only 147 percent compared to 162 percent in manufacturing and 157 percent in retail trade. Bituminous coal earnings have made their greatest gains in recent years against a background of growing employment demand, and these earnings are likely to continue on a strong upward path, given the prospect of continuing employment growth.

UNION, MANAGEMENT AND LABOR RELATIONS IN THE COAL INDUSTRY

The recent coal strike focused enormous attention upon labor relations in the industry as well as on the United Mine Workers. The somewhat fragmented character of union leadership, divisions on the management side, the slippage in the UMW's organizing reach over the industry (the union is now estimated to "control" a little over 50 percent of the output), the growing importance of the much less

---

National Journal, op. cit., pp. 461–463.

unionized sub-bituminous western strip mines, the spread of wildcat strikes,[8] these and other forces were seen by many observers as creating a very unstable pattern of labor relations.

In assessing future coal needs and possibilities it is essential to take a realistic view of all these elements. The UMW has only recently emerged from an extended period of concentrated, top down leadership control. It may have been inevitable that once this control was relaxed, a certain lessening of centralized leadership would take place, especially in view of the fact that the successors to the previous period of tight control have tended to accept many democratic practices in the union's government.

The process of human change in the coal industry was doubtless also accelerated by the almost explosive rate of change in the "demographics" of the industry's work force. It has been estimated that the median age of coal miners was 46 as recently as 1966, that it dropped to 34 by 1974 and to 30 or 31 by 1977.[9] While it is difficult to evaluate definitively, in a number of industries across the country unions and management have expressed some "concern" about the "young worker." Younger, better educated workers, when compared to those of one or two or three decades back, often seem more likely to question authority, be less patient with fixed routinized work, have a keener appreciation of leisure, etc. On the management side of coal labor relations, it is reported that the degree of professionalization in personnel positions leaves much to be desired, especially in many of the older properties.

It is plausible to conjecture that the impact of demographic change is focused as sharply in the coal industry as in almost any other economic sector. It is also likely that the almost headlong decline in the average age of coal miners may contribute to some gap between leaders and union workers. Given the great respect for seniority in most union settings, it is almost inevitable that some union leaders tend to be older than followers. Where the age of "followers" is changing so swiftly, as in coal mining, the value gap between leaders and followers might conceivably be particularly aggravated.

The new quality of labor relations in the coal industry has also been manifest in its day-to-day labor problems. The earlier, Lewis-led top-down control of negotiations on the union side tended to neglect the lower levels of negotiations. Added to this was the largely unsuccessful effort to impove local grievance procedures in the 1974 UMW-BCOA collective agreement.[10] All of this was particularly troublesome in the light of the newer, more assertive mining work force in place by the early seventies, at the very time demand for coal was rising. The result was a great glut of grievances, growing impatience among miners, and a rash of wildcat strikes as they sought to bypass sometimes ineffective local machinery. Between 1970 and 1976 the U.S. Bureau of Labor Statistics reported an average of 947 stoppages per year in the bituminous coal industry. This compares with 184 stoppages per year between 1960 and 1969, and 314 per year between 1950 and 1959. Even

---

[8] See The National Journal, Mar. 25, 1978, The Wall Street Journal, May 25, 1978, and Fortune, Apr. 24, 1978 for pessimistic evaluation of the UMW.

[9] Estimate from U.S. Bureau of Labor Statistics not yet published study, "Technological Change and its Labor Implications in the Coal Mining Industry," 1978 (typed), p. 47.

[10] The weakness of the grievance machinery was dealt with at some length in a Wall Street Journal Mar. 4, 1977 article.

in the previous period of high strike activity, 1943–1952, the number of strikes only averaged around 500 per year, but the shutdowns affected many more people and far more working time was lost. The sense of instability of supply engendered by many small strikes in the industry may lead some consumers of coal to shift to other fuels, or to non-union sources of coal where available.[11]

More recently, the BCOA and the union seem to have made significant new efforts to come to grips with this problem. Extensive delays in grievance settlement as well as excessive utilization of the final arbitration step in the machinery had become widespread. Under the new agreement, the grievance machinery has been streamlined, tight time limits have been set for each of the four steps of this machinery, and authority to settle a grievance at the first step of the machinery has been passed to grievants and foremen at the work site (without their results setting any general precedents).[12] Training programs for management and union representatives who are involved in the grievance process have also been extended in the industry. While it is still rather early to make any firm judgment, the BCOA reports a dramatic drop in the number of wildcat strikes in recent months. Both sides continue to recognize the pressing need for what can almost be described as a modernization of the bargaining structure at many local mining sites.[13]

In estimating the possibility of strikes and any interference with future production one must also take into account the UMW procedures for contract ratification. In part as a reaction to the previous pattern of highly centralized, leadership controlled contract negotiations, the new administration which defeated the previous one of President Boyle, supported a constitutional provision requiring that labor management agreements be submitted for membership approval. As the 1978 experience demonstrates (the rank and file rejected the first new contract proposals which the leaders presented), this provision while enhancing democratic membership control over policy, can have the effect of creating a greater uncertainty in labor-management relations, at least until the practice has been assimilated by the union's officers and the rank and file. (This practice of submitting national agreements to rank and file approval has been followed for some years by several other unions, and is not now looked upon as anything very unusual or disruptive in most instances.)

Current estimates of the so-called fragmentation and "decline" of the UMW may rely too heavily on a vision of the union as it operated under John L. Lewis in the decades beginning with the early thirties until the fifties. In contrast to the recent strike, for example, when Lewis called the UMW out in the thirties or forties, almost the entire industry went down, and a sense of crisis developed almost immediately. The absence of unionism from a large part of the Western

---

[11] "Collective Bargaining in the Bituminous Coal Industry," Report 514, U.S. Bureau of Labor Statistics. Washington, D.C., 1977, esp. Table 1, p. 5. An older study of strikes in the coal industry suggested that production losses due to strikes were often offset by production increases elsewhere in the industry. See C. L. Christenson, "The impact of Labor Disputes Upon Coal Consumption," American Economic Review, Vol. XLIII, No. 4, Part 1, September 1945. Tighter markets for all energy supplies may now make this substituting possibility somewhat less likely today, but the substantial coal inventory build-up before the 1977–78 strike was a form of offset.

[12] These changes are described in the speech by Joseph P. Brennan, President, BCOA to the Mining Symposium, 1978, Michigan Technological University, Houghton, Mich., Aug. 25, 1978 (mimeographed)

[13] In addition to the speech of Brennan, already cited, the United Mine Workers have also spoken out that "Solving [the workers'] . . . Problems—Strikes Are Not the Answer." *United Mine Workers' Journal*, July 1978, "Wildcat Strikes Are Not the Answer." The union argues that some operators even welcome wildcat strikes to reduce excessive inventories.

strip coal mines as well as parts of the East have changed this situation today. It was only after the strike had been on for a few months that the kind of crisis took shape that Lewis and the UMW had been able to "create" in a much shorter time when it struck in the thirties or forties.

On the other hand, if comparisons are carried back to an earlier era, the recent strikes and the relatively long period which ensued before it produced a severe crisis in the country, are not so exceptional. In the 1920's when the UMW had only unionized a part of the industry Lewis led strikes also had some of the agonizing, drawn out quality of the recent 1977–1978 conflict. (The impact of the recent strike, when compared to those in the thirties, may have been even more delayed than that of some earlier conflicts as a result of more sophisticated inventory building by coal producers and users in the present day.) Some strikes in the decade of the 1920's ran three, four and even five months in duration. Frequently it took as much as three months before a sense of crisis moved the Federal Government to any intervention.[14] But such a sense did finally come in most instances and this may be suggestive about the drawn out impact of possible future strikes in loosely unionized coal markets.

THE UNITED MINE WORKERS AND WESTERN STRIP MINES

As it undergoes the transition from its form of the John L. Lewis era, the UMW may continue to be subjected to some internal conflict, and under these circumstances it might not succeed in large scale organizing of the large, nonunionized Western strip mines in the very near future. This would be a necessary prelude for the union's achieving the kind of wider labor market control exercised by John L. Lewis and the UMW from the mid-thirties to the 'fifties. A number of differences between some of the new western mining communities and those in the better organized east would seem to present some difficulties to new organizing. The work force in the new strip mines does not have the same coal-linked community background that is typical of workers in the older bituminous areas. The basic occupations in these new strip mines differ substantially from those in the underground bituminous mines. (It should be kept in mind that most of the coal produced in the western sub-bituminous strip mines is not ordinarily directly competitive with "Eastern" bituminous coal, and, Western coal has its own growing Western markets).

The special structure of many UMW negotiated fringe benefits, especially for health, hospitalization and pensions, which have traditionally been financed by royalty payments linked to each ton of output, may also make membership less appealing to Western surface coal miners. It is true that pension benefits for active miners are now fixed and guaranteed, so to speak, by collective agreement, and the royalty payments are primarily an enabling device, not unlike cents-per-hour payments used to finance similar benefits under other collective agreements; but the royalty payments do have the additional function of financing payments to those who retired under earlier, pre-1974 arrangements, as well as for the widows of some miners (including, in both cases, retirees and widows whose original fiscal ties may have been with mines which are by now shutdown). The

---

[14] These strikes are described in the recent work by Melvyn Dubofsky and Warren Van Tine, "John L. Lewis, A Biography," New York, Quadrangle in New York Times Book Co., 1977, pt. II.

system of tonnage payments on an industry-wide basis also helps insure the portability of miners' pension rights if they move or are compelled to move (as a result of shutdowns) from one mine to another, something which is much more likely in the relatively dense coal communities of the East than in the West.

In some of the newer surface mines of Wyoming or Montana, the average of the miners may be even lower than elsewhere, and they may have less interest in health and pension benefits. The high output per miner of many of these strip mines makes it unlikely such miners would be interested in tonnage linked contributions to welfare funds. They may have little incentive to allocate several dollars per hour of their compensation to health and retirement, as is currently the case under the UMW bituminous agreement. (Wages of workers in the new, large non-unionized sub-bituminous western strip mines do not compare unfavorably with those of UMW members although it is difficult to get precise data on this matter). Finally, there aren't the large groups of already retired miners in these new communities, groups which are a powerful, supportive force favoring substantial payments into such welfare funds.

While the existence of older, union based "fringe" benefit systems in the Eastern and mid-Western mines have represented something of an obstacle to effective cooperation with the miners in the West in the past, this burden should not be exaggerated. The UMW has already shown flexibility in approaching the question of retirement benefits in western strip-mining. In a separate collective bargaining agreement which it has signed with some western strip mine operators (covering sub-bituminous mines), the union has agreed to a cents per hour contribution formula in place of the usual tonnage-royalty formula in effect in the UMW unionized, bituminous coal mines.[15] The extension of UMW organization to more (sub-bituminous) strip mines in the West would not, then, face any great obstacle on this score since they would, presumably, come under this separate Western agreement.

The burden of the older pension system continues, of course, to be a heavy one on the older bituminous coal bargaining relationship—(i.e., the parties under the Bituminous Coal Operators Association and the UMW Agreement). Responsibility for thousands of miners already retired, or for the widows of miners who have died, poses a heavy, if diminishing over time, fiscal load on national bituminous coal bargaining. To some extent it limits the degree of flexibility of both parties in that bargaining relationship.

So far as hospital and health benefits are concerned, the recent UMW-Bituminous Coal Operators' Association agreement of March of 1978 eliminated, for working miners, the previous dependence on the union-built health system. It substitutes, instead, a system of stipulated health and hospitalization benefits underwritten by insurance companies, for working miners.[16]

The phasing down of the largely union-run hospital and health system has some serious implications for the UMW, especially in certain Eastern mining communities. The union health centers have been a source of integration between the coal union and the wider community. It is impossible to forecast the possible effect of this change in the union's position in the surrounding community. More-

---

[15] See Article XVIII, Section (d), p. 20 of the Western Surface Wage Agreement of 1975.
[16] These benefits are described in Article XX, Section (10) of the 1976 UMW–BCOA agreement.

over, some in the health field have deplored the ending of the community health system, including *preventive* care, which was set up as a result of the UMW's efforts. It is recognized, however, that the UMW health system had been encountering some severe cost and administrative problems.[17]

The substitution of a system based on insurance companies for the union health system does, however, free the union up in some respects. It may now be in a position to develop a general health bargaining policy which can fit other geographical areas, including the West. There seems to have been no serious possibility of extending union-community health centers to most of the newer western mining areas.

The UMW does have a small foothold of organization in some of these sub-bituminous Western strip mines, but these mines, as we have already observed, are under a separate collective agreement, which has a different expiration date from the bituminous agreement, and they continued to work during the recent strike. The UMW has also organized a number of the older, strip mines in Missouri, Arizona, and elsewhere in the West, but most of these come under the regular, national bituminous agreement. The International Union of Operating Engineers, AFL-CIO, has also organized around a dozen of these Western strip mines. A few other unions also have some minimal organization in the industry. None of these other unions halted operations during the strike. Overall, one recent estimate indicates that the different UMW agreements cover around one-third of all coal produced in the West,[18] though much less than that of the sub-bituminous mines.

Even if no rapid change in UMW organization of the Western surface-mining area does occur, it is useful to have a clear view of some of the underlying forces in assessing any future labor-management prospects in western strip mining. Mining tends to be a union-prone operation most anywhere, but whether the still unorganized strip mines, which have an occupational structure quite different from underground mining, will be an exception to the usual unionization pattern to be found in mining or in most high skilled and high paid manual work in difficult to say. It is also useful to keep in mind that the coal industry has been subject to great fluctuations in the past. It may be hard to envisage a period in the near future when demand for western strip coal will decline; but should this occur for any reason, the need for closer cooperation between all miners to preserve their high levels of compensation might come quickly to the surface. Moreover, forms of cooperation between different unions operating with the same employer or with different employers in the same industry have been increasing in recent years in the United States, so that even the presence of plural unionism in the mines might not be an insuperable obstacle to joint bargaining. (We allude here to so-called coalition bargaining by several different unions).

In concluding any assessment of the UMW and how it may fare in the future, it is helpful to return to the employment outlook, since employment has been a critical force influencing the union's fortunes in the past. It has already been noted that the largest part of the

---

[17] See Barbara Berney, "The Rise and Fall of the UMW Fund," *Southern Exposure*, Vol. 6, Summer 1978, and Curtis Seltzer, "Health Care by the Ton," *Health/PAC Bulletin*, No. 79, November-December, 1977.

[18] This estimate was suggested by The Wall Street Journal, May 25, 1978.

industry's *employment* expansion in the future is likely to take place in the "older" Appalachian and Illinois Basin areas (as well as in the so-called Central area which also lies east of the Rocky Mountains.) These are areas where existing unions (most notably the UMW, but the Progressive Mine Workers of America also have organized a fair number of establishments in the Illinois Basin area, and the Southern Labor Union has some agreements in Kentucky and a few in Tennessee) have long been well entrenched. They are likely to make further membership gains in new or enlarged operations in these areas, although there has been some significant growth in non-union coal mining even in these older areas.

So far as employment in the industry is concerned, the UMW already represents over seventy percent of the production work force, even if it covers only a little over half of the current production. The militant response of union members in the recent strike clearly suggests that in judging future trends it would be unwise to assume that internal union conflicts will seriously minimize the union's ability to have a profound impact on coal operations. According to one journal of business opinion,[19] the bitterness and prolongation of the recent strike may have been due, in part, to the faulty judgment on the part of some mining managers that the weakness of the union left it in a poor position to resist some of the industry's very forceful demands for controls over wildcat strikes, new plans to improve productivity, etc.

In general, however, it does appear that BCOA has a sense that a common fate links their possible future prosperity with that of the UMW. They have pointed with concern to the shrinking UMW "segment of the bituminous coal industry," and attribute this to labor instability, including wildcat strikes and falling productivity.[20] Most recently the President of BCOA has struck an optimistic note about the parties' relationship, citing the decline of strikes, the improvement of grievance processing, the advance of voluntarily negotiated, local bonus-productivity plans and other postive developments.[21]

WORKING CONDITIONS AND PRODUCTIVITY: WHAT CAN BE DONE?

The productivity record in U.S. coal mines has been disappointing in the past seven or eight years. While output per miner in U.S. coal mines still appears to be well ahead of other countries, it has declined steadily since 1969–70. (See Table 7–4.) The periods 1960–67 on the one hand and then 1967–77 on the other illustrate vividly the changing productivity experience of the industry. In the earlier period output per hour for coal mines rose 5.8 percent, annually, while it fell at a −3.8 percent annual rate in the 1967–77 period. By 1977 output per man hour had fallen to about 70 percent of the 1968 level, although the productivity decline appeared to be tapering off in the last year or two.[22] It is conventional to measure productivity in terms of output

---

[19] Business Week, Mar. 6, 1978, pp. 94–95.

[20] See the statement of the BCOA, "Will the United Mine Workers of America Play a Major Role in Coal's Future," 1977, presented to the UMW by the BCOA during the 1977–78 negotiations. The UMW-BCOA national agreement is estimated to have covered 68.2 percent of total coal production in 1972, 60.9 percent in 1974, 55.6 percent in 1976 and 51.5 percent in 1977, pp. 3–5 of this same BCOA pamphlet.

[21] See the speech by BCOA President Brennan, already referred to above in Fn. 2.

[22] U.S. Bureau of Labor Statistics, "Technological Change and Its Labor Implications on the Coal Mining Industry," 1978 (typed), p. 44.

per man hour, but output is, of course, a joint product of capital, labor, science and technology, raw material availability, etc. This productivity decline has not been confined to underground mines, although the decline has been somewhat smaller in strip mining.

TABLE 7-4—PRODUCTIVITY IN U.S. COAL MINING, SELECTED INDICATORS

Year	Index of output per hour of production workers (1967=100)	Output per worker day in tons			
		Underground	Strip	Auger	Combined
1940		4.86	15.63	----------	5.19
1950		5.75	15.66	----------	6.77
1955		8.29	21.22	22.22	9.84
1960	66.8	----------			
1961	74.0	11.41	25.00	30.61	13.87
1965	93.1	----------			
1966	98.0	----------			
1967	100.0	----------			
1968	103.2	----------			
1969	101.8	----------			
1970	97.0	13.76	35.96	34.26	18.84
1971	91.0	----------			
1972	84.2	----------			
1973	83.9	----------			
1974	82.6	----------			
1975	74.9	9.54	[1] 26.69	----------	14.74
1976	73.4	[1] 8.50	[1] 26.00	----------	13.50
1977	72.5	----------			

[1] 1976 figures are estimates. Strip and auger output combined in 1975 and 1976.

Sources: U.S. Bureau of Labor Statistics for column 2, and General Accounting Office, "U.S. Coal Development, Promises Uncertainties, Report to the Comptroller General, Sept. 22, 1977, Washington, D.C., 1977, pp. 4.5 and 4.25, for other columns.

A series of factors are cited to explain the decline in productivity in recent years. These include: the lack of trained manpower (and the relatively large expansion in the hiring of untrained, young workers); labor-management difficulties which have led to an unusually high number of strikes; new federal and local environmental restraints which have delayed the opening of new mines and the expansion of existing properties; an increase in personnel devoted to new exploration and reclamation work; new health and safety-protective requirements which have led to the hiring of new personnel not directly linked to the production process, and in some companies lack of available capital.

To put this productivity decline into proper balance it is useful to recall that the past decade has been a period of slowdown in productivity growth for the U.S. economy generally. (It is estimated output per man-hour in the private economy advanced 3.2% annually from 1947 to 1967, and only 1.6% from 1967 to 1977.) This general slowdown has been due to some of the same reasons for the decline in coal mining productivity—viz the influx into the economy of an unusually large number of new, inexperienced workers, the impact of new safety and environmental regulations, the lack of available capital, etc.[23]

Some of these developments such as new safety and environmental laws have, perhaps, "hit" the coal industry even more sharply than the

[23] These conclusions on productivity in the U.S. economy were commonly and independently set forth in the statements by Jerome Mark, Edward Denison, Solomon Fabricant, John Kendrick and Michael Evans in the hearings of the Joint Economic Committee's Special Study on Economic Change, June 8 and 13, 1978 (to be published later this year).

economy as a whole, since coal has been subject to its "own" special legislative action. In both instances, i.e., the general economy and the coal industry, existing productivity conceptions (and measures) may be biased and exaggerate the downward influence of such legislation. Conventional measures of output per-man hour usually make no allowance for improvements in the air we breathe or the water we drink. Even improvements in workers' health or reductions in occupational loss of life will take time before they have an upward impact on conventional productivity measures. But such improvements in the quality of life are, after all, critical in any comprehensive measure of the general welfare. (While it is difficult to judge on the basis of only a few years, mine fatalities, compared to numbers of hours worked, appear to be down substantially in recent years compared to 1969 or 1970).[24] The 49 miners killed between January and June 1978 are, nevertheless, grim testimony to the ground still to be covered in safety improvement.

It is generally true that dramatic breakthroughs in productivity improvement for an entire industry are not easy to come by. Large scale improvements in human skill, advances in technology or increases in capital flows are not easy to call into existence. Even when new advances occur they are only part of a large already existing (one is tempted to say immutable) stock of skills and technology, so that spectacular breakthroughs in productivity for an entire industry (or an economy) are not common. Moreover, so far as labor skills are concerned, the coal mining industry will be up against the hard fact that it will still be recruiting substantial blocs of new workers to meet expansion goals. Large numbers of these new workers will be young and inexperienced, and this cohort tends to be relatively less productive in its first few years. Hopefully, improved skill and safety training for new entrants may offset some of these disadvantages.

There are, however, some important new opportunities for the improvement of working conditions and labor productivity in coal mining. The recent (March, 1978) bituminous coal agreement stated that both parties "recognize that the need exists to improve labor relations and productivity in the nation's coal industry . . ." With "that in mind," they agreed to establish a "Joint UMWA-Industry Development Committee" whose objectives include looking into labor relations and the problems of low productivity in the industry.[25] This Committee is already meeting regularly and the employers' side has noted encouraging progress. The BCOA also cites the success of several companies in installing new, voluntarily and jointly agreed to local "bonus plans for increased production and safety . . ." [26]

While the new Development Committee holds out the possibility of labor relations improvement in the industry, the extension of this approach down the line to local unions and local managements is also highly desirable. There are a variety of ways in which labor-management communications and cooperation can be enhanced at the local site. We refer, for example, to the work of joint safety committees, joint training efforts, labor-management cooperation to improve production, etc.

---

[24] General Accounting Office, op. cit., p. 4.36.
[25] National Bituminous Coal Wage Agreement of 1978, "Article II, Industry Development."
[26] Speech of Joseph P. Brennan, cited in Fn. 13 above.

Our report has already referred to joint efforts to improve the handling of grievances by unions and operators. This, too, could lead to general improvement in labor relations and, hopefully, some reduction in wildcat strikes, many of which have frequently grown out of frustration born of the delays and breakdowns in processing grievances.[27] Better grievance handling by the bargaining parties can lead to improved worker and management morale which, in turn, can advance productivity.

What appears to be a larger, developing joint industry-union sense of the common problems confronting the industry may also offer some possible basis for a more effective attack on some of the run-down community institutions in parts of the Appalachian coal areas. Many of the schools, roads and miners' houses are still sub-standard in parts of Appalachia. With the probability of generally sustained employment at relatively good wages for some years ahead in the coal industry, there exists a firm foundation from which to take effective action against these conditions, provided broad social support can also be mobilized in the effort. In the past workers and the UMW have complained that some coal operators have not cooperated in such an effort, and often, for example, would not make land available for new housing. Improvements in these "community" and related institutions are part of the promise of a better life for coal miners and their families, and, in the long run, should help employee morale and productivity. (For a discussion of some of the factors working to improve this situation, see the section on socio-economic factors.)

The possibility of improved relations and some greater common understanding between management and union of the problems the coal industry faces may also provide an opening for other programs to directly improve working conditions and productivity in the industry at the local work site. Where sufficient consensus has emerged in American industrial life, labor and management have, in a number of interesting cases, been able to structure joint programs to reorganize and improve working conditions and productivity. While much of this work is still new and "experimental," there are some striking cases of success.[28] Without becoming euphoric about these "experiments," they may suggest some important possibilities in the coal industry.

The 1973–1976 experience of the cooperative project carried on at the Rushton (Pennsylvania) Mining Co., with the participation of the United Mineworkers of America union there, is illustrative of some possibilities. At Rushton, with the assistance of several "outside" experts, to begin with one of the mine's work faces was reorganized to permit the workers to assume control of day to day production of coal (nine men without any boss). The crew members (volunteers from among all the miners) were given special training to prepare them for more varied tasks and responsibilities. The foreman for each of the three shifts was to have responsibility only for the health and safety of the crew, and he would no longer exercise direct, managerial control over the work. (Formerly foremen had the dual responsibility of production and miners' safety). The regular grievance machinery in operation at the mine was by-passed, and a special joint (labor-

---

[27] Wall Street Journal, Mar. 4, 1977.

[28] See, for example, the reports of the National Center for Productivity and Quality of Working Life: "Recent Initiatives in Labor-Management Cooperation," Washington, D.C., 1976.

management) committee was established to handle any grievance arising in the experimental section. The usual administration of wages was eased and all workers were to receive the maximum day rate, regardless of the work performed.[29]

In the first year of the experiment the most striking results were a substantial drop in "reported accidents and time-lost accidents," as well as a reduction in reported violations of the Federal Coal Mine Health and Safety Act of 1969 at the "experimental" work face, when compared to other faces in operation. After the "experiment" was extended to a "second face," the safety record continued to be superior and the two experimental mine face work groups registered substantial productivity gains when compared to two other "regular" mine face work groups. Just as striking were the "new" perceptions of the miners who participated in the experimental section. They saw themselves "as making more decisions concerning how the work is divided," they felt their supervisors were "making fewer decisions affecting how they should perform their work," they "no longer felt tired when they got home from work." and "they felt themselves respected by management as never before." [30]

For the men who were participating, the experiment was a substantial success. The logic of this (and other) autonomous work experiments was to extend it to other groups in the enterprise. Despite the enthusiasm of the men participating (and of top mine management) and the official support of the U.M.W., by a very close vote the local union rejected this proposal, and the experiment officially came to an end in August 1975. It is generally agreed that a variety of forces, largely external to the experiment, led to its ultimate defeat in the local union.

In the interest of deriving some lessons from this experience it is useful to reflect on some aspects of it. This and many other similar individual experiments in other (non-coal) industries generally achieve success, measured in terms of improved job satisfaction and better productivity—thus indicating the potential benefits of such experiments. By the same token, rarely has it been possible to generalize these "micro" experiences into macro (entire industry or even many large companies) successes.

Yet it remains true that the U.S. coal industry, especially in underground operations, with its small team type of production units would seem to be the kind of industry where such autonomous work group techniques might enjoy considerable success—success in improving the quality of work life and success in improving productivity, with the likelihood that such productivity gains could also be translated into higher compensation for employees as well as higher profits for mine owners. If any significant advance is to be made on a wide front, however, it must be approached with great caution.

Clearly, against a background of difficult, adversary relationships such as those which have characterized the long labor-management history of this industry, any broad experimental programs must involve the highest possible union visibility in them. At Rushton, once the experiment was underway, the union as such does not seem to have

---

[29] This description of the Rushton "experiment" as well as the following paragraphs are taken from the following reports: Eric L. Trist, Gerald I. Susman and Grant R. Brown, "An Experiment in Autonomous Working in an American Underground Coal Mine," *Human Relations*, vol. 30, No. 3, 1977. Ted Mills, "Altering the Social Structure in Coal Mining: A Case Study," *Monthly Labor Review*, October 1976, and National Center for Productivity and Quality of Working Life, *Recent Initiatives in Labor-Management Cooperation*, February 1976, pp. 51–58.

[30] Trist, op. cit., pp. 223–224.

played a very active role in the process, and the workers in the experiment tended to become somewhat isolated in their own new world. To the maximum extent possible, any new efforts of this sort in the coal industry should be cast as an integral part of the union-management relationship, and not as work experiments. The role of outside figures while useful, and often essential, in any such work reorganization, should be minimized to the maximum extent possible.

Finally, there has been a tendency on the part of many proponents of work reorganization and work-humanization programs to make some exaggerated claims on their behalf, and these should be avoided. Moreover, there are many individual instances where there already exists effective informal cooperation between workers and local unions, on the one hand, and local management on the other, and there is no need for formal work reorganization programs. Even more important, work reorganization is no substitute for the other significant changes in labor relations already underway in the industry. These include: the institution of new training programs for grievance representatives and the streamlining of the machinery they use to handle day to day disputes; the prospect of more and better training programs to help raise the skill level of the work force; the completion of a large part of the inevitable demographic adjustment which the industry's manpower has undergone. Added to these is the growing adjustment of the UMW membership and of many coal operators to a new, post John L. Lewis era of coal industry labor relations. These related dvelopments may help make possible improved union-management relationships in the future. Perhaps the most promising among the new trends is the appearance of some growing cooperation, especially at the national level, between labor and management, with regard to some of the industrial problems they commonly face. Encouragement by government and by all those who share this concern for the industry's future development can strengthen this common effort and help extend it down to the local worksite.

8. Coal Demand*

HISTORY

The pattern of coal consumption has changed significantly since 1945, as shown in Table 8–1. At the end of World War II, the two biggest markets were railroads and manufacturing industries (primarily chemical industries where coal was used as a feedstock). Home heating was the third largest market, coking plants for the steel industry was fourth, and electric utilities was fifth.

TABLE 8–1.—COAL CONSUMPTION BY CONSUMER CLASS

[Millions of tons per year]

Year	Electric utilities	Railroads	Steel industries	Other industries	Retail dealers	Total consumption [1]	Exports
1945	72	128	110	131	119	560	28
1950	88	63	115	104	84	454	25
1955	141	17	115	98	53	423	51
1960	174	3	88	85	30	380	37
1965	243	(2)	102	95	19	459	50
1970	320	----------	101	83	12	517	71
1975	403	----------	84	59	7	556	66
1976	447	----------	83	59	7	597	59
1977	480	----------	83	68	7	630	54

[1] May not add due to rounding.
[2] Canvass discontinued.

Sources: U.S. Department of Interior, Department of Energy.

Today, electric utilities are by far the largest market. Coking operations are still major coal consumers, but the railroads have disappeared as a coal market, home heating has almost disappeared, and the chemical industry has switched almost completely from acetylene (made from coal-derived calcium carbide) to ethylene (made from natural gas liquids and petroleum fractions).

The loss of these three markets has changed coal from a broad-spectrum basic raw material into almost a two market product. Those two markets are boiler fuel and steel. Some 90 percent of the boiler fuel market is in electric utilities.

Boiler fuel

Coal use by electric utilities has increased from about 70 million tons in 1945 to almost 500 million tons this year. Yet its share of the utility fuel market has actually decreased (Table 8–2). Since about the late 1930's, oil and gas became economically attractive and available and pushed coal's role back primarily into areas relatively near the coal mines. In the late 1960's, toughening air pollution control requirements accelerated this decline for new plants and led utilities to convert a large number of existing coal-fired capacity to oil. At the same time, nuclear generating capacity entered the picture in a meaningful way as well, thus further eroding the role of coal.

*David Gushee, Specialist in Energy Policy, Congressional Research Service (Subsequently appointed Senior Specialist in Environmental Policy and Chief, Environment and Natural Resources Division).

TABLE 8-2.—ENERGY INPUT TO ELECTRIC SECTOR

[In percent]

Year	Coal	Oil	Gas	Hydropower	Nuclear
1945	52	4	9	35	----------
1950	45	13	13	29	----------
1955	53	8	18	21	----------
1960	52	6	21	20	1
1965	53	7	21	18	1
1970	45	13	24	16	2
1975	43	16	16	16	9
1976	45	16	15	14	10
1977	47	17	14	10	12

Since the oil embargo of 1973–74 and the associated sharp increase in oil prices, this trend away from coal has stopped. The utility industry plans no further new oil- or gas-fired base load facilities (other than those already committed earlier and still under construction) for base load electricity generation. Gas is no longer available in the necessary volumes or is limited under the Energy Supply and Environmental Coordination Act of 1974 (ESECA), the Power Plant and Industrial Fuel Use Act or comparable State regulations (Texas Railroad Commission's Docket 600 for example). Oil now produces more expensive electricity than coal, even when coal must be scrubbed. The economic choice is now between coal and nuclear.

Coal's role as an industrial fuel has also been eclipsed by oil and gas. For 30 years or more, coal has been economic almost exclusively in larger-scale industrial boilers—300 million Btu per hour heat input rate or larger. Thus, coal provides less than 10 percent of industrial boiler fuel. Since the embargo, the higher oil prices and scarcity of gas have led to an increase in the number of new industrial boilers fired by coal and to economic advantages of coal use in units smaller than 300 million Btu per hour capacity in an increasing number of cases. In 1977, for example, there were no new large industrial boilers ordered for oil firing and, of all boilers ordered, more than half the total capacity was for coal or other fuels, compared to a historic ratio of about 20–25 percent.

Passage of the Clean Air Act amendments of 1977, however, is stopping this trend. The amendments require the use of best available control technology on all new units. This will probably mean scrubbers, which are subject to substantial scale economics and are thus relatively more expensive in the smaller industrial sized boiler than they are in the large electric utility boilers. Since the regulations defining best available control technology are not yet finalized, either for coal or for oil, the impact of this requirement on boiler economics is not at all clear but will in all probability shift the trade-off back toward oil or gas. Nonetheless, it is a good bet that these two initiatives will do no more than make up for the increase in coal use cost resulting from the new Clean Air Act and thus continue the trend in evidence prior to the passage of the whole set, rather than accelerating that trend.

Iron and steel

Metallurgical coal is a "premium" grade of coal with relatively demanding requirements in sulfur content, volatility, and the like, so it is more expensive and is effectively a different business than steam coal (the coal used in boilers). As a basic ingredient in steel manufacture, metallurgical coal's fortunes depend on steel's fortunes. This

dependence is not one-for-one, because scrap recycle, which does not consume coal, has been increasing as a percentage of total domestic production.

As a result of the stagnating domestic steel industry and the reduced demand for coal per ton of steel produced, coal consumption in these industries has declined some 20 percent over the past 30 years and is now about 85 million tons per year. Most export coal is metallurgical grade, the export volume fluctuating rather widely over the years in response to international steel production levels and international competition for the "met" coal market. Met coal exports in 1977 were just over 50 million tons.

The international steel market is currently in a slump, with extensive overcapacity in most producing countries. The history of met coal and steel production and trade is summarized in Table 8–3.

TABLE 8–3.—U.S. AND WORLD STEEL PRODUCTION

[In millions of tons]

Year	U.S. production	World production	U.S. imports
1950	97	121	0.1
1955	117	208	2.0
1960	99	297	1.0
1965	131	503	12.0
1970	131	654	15.0
1975	117	712	14.0
1976	128	746	16.0
1977	125	743	22.0

Source: American Iron and Steel Institute.

COAL, OIL, AND GAS PRICES

The history of coal, oil product and natural gas prices is tabulated in Table 8–4. These are average prices; actual prices vary widely around these averages. Further, they are at the mine mouth for coal, the refinery gate for oil products, and the wellhead for natural gas and thus do not include transportation costs nor any costs associated with fuel use.

TABLE 8–4.—HISTORY OF COAL, OIL, AND GAS PRICES

[Cents per million Btu in current dollars]

	Coal	Oil	Gas
1945	14	53	5
1950	21	59	7
1955	20	63	10
1960	21	64	14
1965	20	63	16
1970	28	72	17
1971	31	76	18
1972	34	76	19
1973	38	88	22
1974	70	164	30
1975	85	192	44
1976	86	207	58
1977	91	235	80

Source: National Coal Association, Independent Petroleum Association of America, and American Gas Association.

With respect to fuel use economics, coal is the most expensive fuel to transport and to burn. Its environmental control costs at the point

of use are also highest. As a rule of thumb, capital cost of a coal-fired industrial boiler (exclusive of scrubber) is about four times that of a gas-fired boiler of equivalent capacity (cost of an oil-fired boiler is about 1.5 times that of a gas-fired boiler.)

The combination of these use cost factors means that coal, to be competitive, must have a lower price in Btu equivalents than oil or gas. The general availability and stable price of oil and gas over the postwar period in effect put a lid on coal price. Mining costs had put a floor under coal prices, and transportation costs limited the coal market to areas near the mines.

Since 1973, oil prices have increased more rapidly than coal prices, thus opening new markets for coal. These new markets have consisted of electric power plants longer distances away from their coal sources plus an increased, although still relatively small, share of the industrial boiler market.

Gas, because of its constrained supply, is no longer a major competitor of coal for new boilers and, as a matter of national policy, is being gradually phased out for existing utility boilers and larger industrial boilers.

Many factors are combining to increase coal costs over the next several years at a rate more rapid than inflation. The most significant are higher wage rate increases, coupled with declining worker productivity, charges for black lung benefits, surface mine reclamation requirements, State severance taxes, lease royalty payments, and costs of equipment. Most occupational safety costs have already been internalized, although additional occupational health and fugitive dust control requirements may be added.

Many other factors will add to coal transportation costs and coal use costs. Rail revitalization and expansion are needed to handle the increase expected in coal traffic. Waterway user charges are a possibility. Maintenance costs for roads carrying coal truck traffic may be charged directly to coal traffic or added to taxes.

New environmental control requirements resulting from the Clean Air Act Amendments of 1977 will be adding additional costs to coal-fired equipment. As is discussed more fully in the demand section of this report, these additional new air pollution control costs do not significantly affect coal's cost advantage over oil for electric utilities but they do affect the coal vs. nuclear trade-off. At the industrial scale of operation, however, these added environmental costs are enough to shift the economic advantage back to oil, except for the very largest boilers not too distant from coal supplies.

In the utility industry, coal competes successfully against nuclear power in many instances because of the uncertainties associated with the nuclear licensing process. Should these uncertainties be overcome, and standard plant designs become the norm, it is probable that nuclear power costs will increase at or near the inflation rate. Over time, therefore, nuclear power economics may well improve compared to coal-fired power economics.

In the industrial sector, oil is already a better buy than coal for a majority of installations. Oil prices in real terms have been relatively stable during the past three years and increasing numbers of economists are looking for oil prices to increase at or near the rates of inflation for the foreseeable future. Since coal prices appear destined to

rise at a rate considerably higher than inflation due to the cost push factors described earlier, the industrial boiler operator will perceive an increasing economic advantage for oil compared to coal over time.

DEMAND OUTLOOK

Demand for coal through the remainder of this century will be determined primarily by what happens in electricity generation, industrial boiler fuel mix, and iron and steel production. Additional demand might arise toward the end of the century from coal gasification to make pipeline gas, lower-Btu gas for local fuel uses, or chemical feedstocks. The latter two of these potential markets would represent recapture of markets once held by coal and lost to oil and gas in the last quarter century.

Electricity generation

Electricity demand has been rising at about 7% per year for the past 30 years, up to the early 1970's when, in the aftermath of the oil embargo and the associated recession, it slowed down to less than 2% per year during 1974, surged again to over 6 percent in 1976, fell back to less than 5 percent for 1977 and is currently at less than 3 percent annual rate. The relatively low growth in the past year and a half has occurred at a time of good economic growth and thus represents a potentially permanent real decline in growth rate relative to overall economic growth rate.

Current forecasts of future electricity demand reveal a general consensus that load will not grow as rapidly relative to GNP growth rate as it did in the period from World War II to 1973. They show projected load growth rates of 5–6 percent per year at GNP growth rates of 3.5–4 percent per year.

Two new factors are at work, so forecasters are uncertain about their current predictions. First is the impact of rising electricity prices on current types of users; second is a potential shift in industry to electricity for some functions now served directly by oil or gas. The one impact would reduce electricity growth rates in the near future while the other would increase them over the longer term. So hedging on expansion plans is the order of the day.

Coal now fuels about 47 percent of total electricity generation, up from a low of 43 percent in 1975. Current construction plans call for about 45 percent of new capacity to be added through 1986 to be coal-fired and 45 percent to be nuclear (most of the rest will be oil-fired).[1] Should all the currently-planned coal-fired capacity come on line, coal demand for electricity generation in 1986 would reach about 800 million tons compared to the nearly 500 million tons to be consumed this year.

However, these construction plans are based on an overall demand growth rate for electricity of 5.7 percent per year. As indicated above, this may be high. Further, there is a general consensus that growth rates in the 1990's will probably be lower than in the 1980's (reduced population growth rates plus increased efficiencies of use). Thus, coal use for electricity generation could easily grow more slowly than forecast.

---

[1] "Fossil and Nuclear Fuel for Electric Utility Generation: Requirements and Constraints, 1977–86," National Electric Reliability Council, August 1977.

On the other hand, the nuclear plants being planned are having major difficulties and are taking longer and longer to reach production. This factor could lead to more nuclear plant delays than coal plant delays should electricity demand growth slacken. Such a trend would tend to favor the probability that coal demand will grow about as forecast.

For power plants not yet committed to either coal or nuclear fuel (those that will go on line after 1985 or thereabouts), choosing between the two is not an easy job in most cases. From an economic point of view, nuclear plants have higher initial capital costs and lower fuel costs than coal plants. Near a coal supply, and thus with low coal transportation costs, coal competes effectively, even with stringent environmental control requirements. As coal transportation distances, and thus costs, increase, nuclear economics improve.

Uncertainties in the regulatory process and in public opinion, however, have the effect of increasing the perceived costs of nuclear power, thus leading to selection of coal in a number of instances where the economics for coal are not incontrovertibly better than for nuclear.

Overall, therefore, the largest single factor dictating future increases in coal demand will be the electricity demand growth rate. Coal price, transportation costs, and regulatory problems, should they begin to increase more rapidly than the equivalent factors for nuclear power, would reduce the proportion of coal used in new capacity.

Industrial boiler fuel

As discussed earlier, coal has been a minor boiler fuel for industry for decades. Oil and gas have been plentiful and cheaper. When gas became in short supply and oil became more expensive in the early 1970's, coal became relatively more attractive, but the latest changes in the Clean Air Act (in 1977) have added more cost to coal use than to oil use.

More than 90% of existing industrial boilers cannot physically burn coal. Thus, coal's potential as an industrial fuel depends first on the rate at which new boilers will be needed by industry and secondly on the use economics of coal vs. oil (gas being expected to continue in short supply).

Despite the Nation's recovery from this last recession, industry's investment in new energy using plant capacity has been sluggish compared to previous recoveries. Most forecasts within the boiler-making industry expect only a modest volume of new orders to be placed in the next five or more years, as a result of this constrained industrial investment rate plus improvements in operating efficiences for existing boilers and use efficiencies for the resultant steam. Further, existing boilers have long life expectancies.

With respect to fuel selection, coal can compete economically with oil only in the larger sized industrial units. Environmental requirements accentuate this relationship, as environmental control costs are subject to very important economies of scale. Current coal use legislation (Energy Supply and Environmental Coordination Act and the Power Plant and Industrial Fuel Use Act) do not override fuel use economics except where coal and oil are already close to each other.

The net effect of limited investment in new boilers and of fuel economics leads to the expectation that coal use as an industrial fuel

will increase only a dozen or so million tons per year in the next decade.[2]

The oil and gas user taxes proposed in the National Energy Plan would have increased oil and gas use costs, and thus the proportion of coal-fired new boilers, significantly. The Congressional Budget Office[3] has estimated that the use taxes would have increased coal use by 60 to 80 million tons over what would be used in their absence. Congressional Research Service, in an independent study, reached a similar conclusion.[4]

These two studies show very clearly the sensitivity of industrial fuel choice to fuel use costs and the sensitivity of these costs to fuel prices at the industrial scale of operations. Coal is at an economic disadvantage when compared to oil because of the higher investment and operating costs associated with its use at industry's scale of operation. The oil and gas user taxes would have shifted the equation markedly toward coal by increasing oil fuel price by about 20–30 percent.

Although the user tax did not pass, the Energy Tax Act of 1978 does shift the relative economics of oil and coal in the same direction as the user tax would have. The Act adds a 10 percent "energy percentage" to the business investment tax credit for new coal-fired units and denies the existing 10% credit to new oil or gas fired units. It allows rapid depreciation on new coal-fired units but denies it (allowing only straight-line depreciation) to new oil or gas-fired units.

The impact of these provisions is not clear, but it should approach that of the proposed user tax. In fact, since it acts by reducing the cost of using coal rather than by increasing the cost of using oil or gas, it might even have a greater impact through the indirect effect of improved industrial growth potential.

Elsewhere in this report, the forces affecting on oil and coal prices are discussed, with the conclusion that the forces pushing coal prices up over the next decade appear to be stronger than the forces pushing oil prices up. Thus, in the absence of oil and gas user taxes, the outlook for coal in the industrial sector is not promising.

There are two technological opportunities capable of improving coal use economics. They are fluidized bed combustors and low- and medium-Btu gas from coal. The former promises to provide clean combustion without the expense of scrubbers. However, emission limitations have not yet been set by EPA, and applications to date have been so limited that the technology cannot be labled "available." The latter has been demonstrated, but its environmental and occupational requirements have not been set, its economics have not yet been fully worked out for the range of coals over which it might be applied, and the burner modifications required have not yet been systematized. Thus, some years (estimates range from 5 to 15) will be required before their potential can be usefully estimated.

Opportunities exist for coal use in applications other than boilers, such as cement kilns and brickworks. There has been some movement oward coal, but retrofit is expensive and these markets are not expanding enough to provide a lot of opportunities for new installations.

---

[2] "Replacing Oil and Natural Gas with Coal: Prospects in the Manufacturing Industries," Congressional Budget Office, August 1978, page XIV.

[3] Ibid., p. XV.

[4] Comparison of House and Senate Versions, Oil and Gas Users Tax (H.R. 5263), by David E. Gushee, Congressional Research Service, Apr. 26, 1978.

Coal use for industrial boilers and kilns has fluctuated between 60 and 70 million tons per year during the 1970's. Projections made during the coal conversion legislative debate indicate that this market could increase by perhaps 10-15 million tons over the next 10 years or so as a result of coal's improved use economics deriving from higher oil prices and regulatory requirements and by 50 to 80 million tons more from the investment that credits and associated tax changes. The fluidized bed combustor and coal gasification could, assuming satisfactory demonstration and competitive economics, begin to accelerate relative coal use by about 1990. Even so, total industrial coal market would still be quite small compared to the utilities market through the year 2000.

Iron and steel

Demand for coal for the iron and steel industries has fluctuated between 80 and 100 million tons per year since World War II. It is currently about 85 million tons per year. Coal exports, most of which are metallurgical coals, have also fluctuated widely, between 30 million and 80 million tons per year, and are currently about 50 million tons per year.

Demand for metallurgical coal depends on the health of the iron and steel industries, therefore. Outlook for these industries, both domestically, and internationally, is for little if any growth for the foreseeable future, perhaps through the 1980's and probably at least through the mid-1980's. Starting in about 10 years, world iron and steel capacity is expected to grow at a modest rate—perhaps 2 percent per year.[5]

Meanwhile, competition for coal markets in the world steel industry, is intensifying among the U.S., Canada, Australia, and South Africa, with hints that the Peoples Republic of China is considering entry. Mining costs in the U.S. are rising more rapidly than those in the other producing countries, as a result of recent legislation imposing new surface mining, occupational health and safety, black lung disease funding, leasing cost, and State severance tax requirements.

Even in the absence of production cost increases in the U.S. total production of metallurgical coal in the U.S. (for both export and domestic consumption) is expected to remain for the next decade or more within the range over which it has fluctuated for the past quarter century. Met coal production cannot be expected to grow much even in the decade beyond that, because of the increased international competition and the production cost increases which will probably occur.

Synthetic oil and gas from coal

For the past several years, there has been renewed interest in converting coal, which is so plentiful, into liquid and gaseous fuels, which are not plentiful from domestic sources. The major products under consideration are solvent refined coal (SRC), oil from coal, synthetic natural gas, and medium- and low-Btu gases. The Department of Energy (and its predecessor agency ERDA), many parts of the Congress, and a number of private interests have been involved.

Under the best of circumstances, none of these synthetic fuels could become significant commercial realities until the mid- or late-

---

[5] "World Steel: The Race for Dominance," by Donald B. Thompson, Industry Week, May 15, 1978, pp. 74-80.

1980's, because of technological and regulatory uncertainties plus long lead times. But of more fundamental concern is the economic question; all (except for low and medium-Btu gases in tailored situations) appear unable, given current or foreseeably-applicable technologies, to produce oils or gases at attractive prices. Instead, the proposals currently on the table rely on rolling in the high prices of synthetic fuels with the low prices of price-controlled existing supplies in order to come out with acceptable average fuel costs.

Synfuels supporters grant currently unattractive economics, countering with arguments that 10 or so years from now, with oil prices much higher than current levels (a debatable projection), synfuels will be becoming able to compete economically. But this outlook is also questionable, according to the pessimists, because it does not take into account the impact of the then-higher energy prices on future capital costs for the synfuels plants.

In sum, there is little chance of any significant market for coal for synfuels production for a decade, and a reasonable chance only for a couple demonstration plants by the year 2000. Thus, the coal industry is counting only on a demonstration plant market of perhaps 5–10 million tons per year.

There is more reason for optimism, however, in the low- and medium-Btu gas area. The technologies are well developed and, in fact, in commercial use all over the world. The main problem is that low-Btu gas must be used at the site where it is generated (or at best within a single industrial park), while medium-Btu gas must be used within 15 to 30 miles of the site where it is generated. The reason for this is the cost of transportation—a high gas volume must be moved per unit of energy moved.

Industrial interest in these two gases from coal is increasing, although this increased interest has not yet been reflected in coal sales. Considering the limitations of the technique, estimates of coal use for this purpose are conservative, running perhaps one million tons per year by 1985 and up to a few 10's of millions of tons per year by 2000.[6]

Chemical feedstocks

Medium-Btu gas from coal, in addition to its fuel value, can also be used as a chemical feedstock. Its composition is very similar to that from steam cracking of natural gas and so would fit directly into existing petrochemical facilities.

Currently, the cost of producing synthesis gas from coal is high compared to producing it from natural gas or various oil fractions, because of the lower yields of the desired components and the higher content of impurities in the reactor off-gases. However, as natural gas supplies for this use become more difficult to obtain, and as the prices of oil fractions raise, coal-derived synthesis gas begins to look more attractive. A number of chemical industry experts expect coal to become competitive for this purpose before the year 2000, and perhaps even earlier given some favorable Federal decisions on tax policies and appropriate trends in oil and gas prices and availability.[7]

---

[6] For example, Department of Energy's "Market Oriented Program Planning Study (DoE/ET—0010/1 December 1977) estimates about 10 million tons (page 275).

[7] Alternative Raw Materials for Organic Chemical Feedstocks, prepared for Office of Technology Assessment by American Institute of Chemical Engineers, Aug. 15, 1978.

9. The Regulatory Matrix*

INTRODUCTION

Because coal prices are not controlled at the Federal or State levels, it would be easy to conclude that coal is basically an unregulated industry. But such a conclusion would be misleading.

The coal industry operates within an extensive network of direct regulation. Regulatory requirements impinge on coal operations from exploration through production to post-mining reclamation; they impinge on coal markets from transportation through combustion to residuals disposal. Further, although coal prices themselves are not regulated, oil, gas, uranium, and electricity prices are, thus directly affecting the economic arena within which coal must compete.

Many of these regulations are new or greatly expanded in the last ten years—mine safety, occupational health, air and water pollution control, surface reclamation, environmental impact assessments, and leasing requirements, for example. Some are exceedingly detailed. Some are exceedingly restrictive. Some are in litigation. Some are under administrative review. Some have not yet even been proposed.

There is as yet no good quantification of the full impact of all these regulations on the costs of producing or using coal or on the lead times necessary for scheduling purposes. The situation is too fluid for that. Nonetheless, some observations can be made.

The process of preparing for, requesting, and pursuing the necessary authorizations from local, State, and Federal authorities takes at least a year and can take up to a decade, depending on specific circumstances such as the current Federal coal leasing moratorium. Roughly half of this elapsed time results from processing times required by the various public agencies and is beyond the control of the requesting company. Ultimate authorization is not assured, nor can ultimate regulatory requirements be foreseen with assurance because of ongoing changes in regulatory programs.[1]

The cost of preparing for, requesting, and pursuing the necessary authorizations has risen rapidly over the past several years as the new regulatory programs noted earlier have been phased in. It will continue to rise as currently new legislation is implemented. The process already costs hundreds of thousands of dollars when Federal or State-owned coal is involved.

The cost of complying with the various environmental, health, and safety regulations has added significantly to the costs of mining and burning coal. Not all these requirements have yet been implemented, so not all the costs have yet been identified.

---

*David Gushee, Specialist in Energy Policy, Congressional Research Service (Subsequently appointed Senior Specialist in Environmental Policy and Chief, Environment and Natural Resources Division).

[1] "The Permitting Process for Surface Mining Federal Coal, with Recommendations for Improvement," Mountain Plains Federal Regional Council, July 1977.

The closest thing to a quantification is Peabody Coal's estimates in its letter to Robert Strauss, President Carter's anti-inflation coordinator, that about $2.50 per ton of surface-mined coal has been added for reclamation costs in 1978 over 1977.[2] Peabody points out that its estimates are specific to its operations and, with respect to surface mining and health and safety, are preliminary and therefore not firm. Further, they do not take into account the costs associated with the proposed final regulations issued by the Office of Surface Mining in September 1978.

To the coal industry, this intricate, time-consuming, expensive network of regulations means reduced growth potential, reduced flexibility for response to changing market conditions, and pressures for further concentration into fewer, larger companies within the industry. The regulatory network currently in place and in process of being put in place carries with it necessary new costs, additions to project lead times, and requirements for additional technical, supervisory, and managerial skills.

Evidence presented in litigation, administrative and Congressional hearings, and the press, shows clearly that the several regulatory programs are neither optimally implemented nor optimally coordinated, thus adding potentially avoidable cost and scheduling penalties.

Most additional cost imposed by regulatory requirements is reflected in coal price, both at the mine mouth and at the point of use. Coal is in competition with other fuels in all its markets; increases in the cost of using coal will reduce the incentive for increased coal use and hence for reduced oil and gas use.

The issues are first, how to identify which costs imposed by the way the regulatory process is implemented are necessary and which ones might be avoided without damage to the purposes for which the regulatory requirements are being imposed, and second, how to modify the process without at the same time endangering its integrity.

COAL DEVELOPMENT AND LAND USE POLICY *

The nation's effort to develop its coal resources has already led to significant and difficult to resolve conflicts with other state, local and even national objectives for the use of our finite land resources. Almost certainly, these conflicts will become more intense in the years to come if there is an all out effort to significantly increase coal production by the mid-1980s, as the Carter Administration has proposed.

To most members of the public, the debate surrounding coal development and the land seems focused almost exclusively on the controversy over surface mining and legislation to regulate its practice.[3] This controversy has perhaps overshadowed a number of other important land use issues related to coal development which are also of great importance. Among these issues: Can intensive coal development be undertaken without significant adverse impact on other essential land uses, such as agriculture and forestry? How should "boomtown" conditions arising from increased coal mining,

---

[2] Letter from Robert Quenon, Peabody Coal Co., to Robert Strauss, Executive Office of the President, Sept. 1, 1978.

*Wendell Fletcher, Analyst, Environment and Natural Resources Division; Barbara Bascle, Senior Reference Assistant, Senior Specialist Division; and Duane Thompson, Analyst, Environment and Natural Resources Division.

[3] The surface mining issue is dealt with in greater detail in another section of this report.

and from rapid construction of related facilities (mine-mouth power plants, with associated transmission lines, coal slurry pipelines, coal gasification plants, and so forth) be dealt with? Should land use restrictions be implemented in order to protect life and property from hazardous conditions (such as flooding and land subsidence) that may arise from coal mining operations? And, should the coal resources on the federal government's land holdings—amounting to approximately one third of the nation's land at this time—be intensively developed, or should these lands be used primarily in order to enhance renewable resource values, and protect scenic and recreation values that might otherwise be adversely affected by mining activities?

How these questions are dealt with is not only centrally important to land use policy, but may very well have much to say about whether present coal development scenarios can in fact be implemented. Organized citizen opposition to energy projects of various sorts is an increasingly important factor in determining where, when or even if a given energy project will proceed. The impact of energy development on the land is one concern of these citizen activists. Thus, for example, a coalition of farmers, and environmentalists has been formed to oppose construction of a transmission line across Minnesota farmland. Farmer opposition has been so vehement that guards have been posted along the route. Similarly, need for federal marshalls was predicted by a South Dakota Attorney General in 1975, when it was predicted that a proposed coal slurry pipeline might draw off water from agricultural uses. Although the pipeline has yet to receive clearance from Congress, concern about its impact on farming remains high. Similar examples have occurred in virtually every region of the country. Furthermore, the effectiveness of these protests may increase greatly if present efforts at "coalition building" by geographically isolated citizen groups are successful.

While some of this citizen opposition is generated by concern about the kind of energy development that is proposed—such as nuclear power, or surface mining—many other conflicts have arisen because energy planners have failed to adequately consider the likely impact of their projects on other essential uses of the land such as agriculture, or on settlement patterns. Some of these conflicts might well have been avoided if greater effort had been made to incorporate broader land use considerations in the planning of projects at an early stage.

This lack of attention to other land needs is also apparent in many of the energy development scenarios developed by the federal government in response to the energy "crisis". Thus, for example, the now defunct Federal Energy Administration (FEA), in its Project Independence Report issued in late 1974, estimated that between 35.6 and 38.5 million acres of land could be required to meet energy production needs by 1985—more than double the 1972 level.[4] Even greater land requirements were projected by FEA for implementation of President Ford's proposed but never enacted Energy Independence Act. The agency's draft environmental impact statement estimated that over 45 million acres would be affected: 25 million acres for coal mining, up to 20 million acres for hydroelectric facilities, 7,200 acres for oil shale development, and 823,000 acres for other energy related facilities, such as refineries, storage tanks and power plants.[5] This acreage—

---

[4] U.S. Federal Energy Administration, "Project Independence Report". November 1974, pp. 213-214.
[5] U.S. Federal Energy Administration, "Draft Environmental Impact Statement on the Energy Independence Act of 1975, and Related Tax Proposals." March 1975. pp. 2-77.

which apparently includes land presently devoted to energy uses—is a land area about the size of the State of Missouri, and is about ten million more acres than the total land area classified by the Agriculture Department as urban in 1969.[6] Despite the vast acreages projected to be affected, however, FEA's discussion of these land use projections were limited to about five pages in texts totalling over 700 pages. Given the increasingly intense competition for land that is even now occurring as a result of such factors as population increases, dispersed settlement patterns, and changing projections of future cropland needs, such an assessment is clearly inadequate.[7]

To date, the Carter Administration has apparently not comprehensively assessed the likely land impacts of its energy policy goals—one of which is to nearly double coal production by 1985 (from 690 million tons in 1977 to 1.2 billion tons in 1985). While there are many questions about the feasibility of achieving such a goal even if there were no environmental or land related constraints, any significant increase in coal production is likely to have major land impacts unless these impacts are anticipated and an effort is made to ameliorate them in advance.

In any event, an effort to increase coal production will not only have the potential for conflict with some other land use objectives, but will also be subject to a number of recently enacted laws at the Federal level which will require integration of other land considerations in coal planning. Thus, if future conflict is to be minimized, land use policy issues will have to become a significant aspect of coal planning.

Coal related land needs

To date, there do not appear to be adequate nationwide projections of coal related land needs. Nonetheless, the information that is available suggests a significant increase in land needed for coal production purposes—both land directly committed to coal production (such as surface mined land), and land indirectly committed for related development.

Direct land needs.—Most scenarios for increasing domestic energy supplies anticipate a significant increase in surface mining of largely untapped Western coal reserves, as well as intensified surface and underground mining in Appalachia and the Mid-West. Much of the Western coal development may take place on Federally owned land, or on privately owned land for which the Federal government continues to hold the mineral rights.

Because of complex economic, political and environmental variables, any projections of future coal related land needs are highly conjectural at this time. Nevertheless, past surface mining surveys show a significant increase in land committee to coal production in the 1970's. In January, 1974, for example, the Soil Conservation Service (SCS), an Agriculture Department agency, estimated that a total of 4.4 million acres of land had been surface mined for all purposes. Of the land needing reclamation, only 958,000 acres had been mined for coal.

---

[6] U.S. Department of Agriculture, "Perspectives on Prime Lands," 1975.

[7] For example, the Bureau of the Census's 1977 mid-range population projection was for a U.S. population of 260 million by the year 2000—a significant increase from the estimated population of between 216 and 220 million in 1977). Yet, Americans are increasingly opting for a dispersed settlement pattern. The Agriculture Department has found evidence that a demographic change is taking place in which significant numbers of Americans are migrating to small cities and towns—a trend facilitated by the secondary interstate highway system, dispersion of employment centers and increasing retirement and second home development. Thus, between 1970 and 1975, the population of non-metropolitan areas increased 6.3 percent, while metropolitan areas increased only 3.6 percent. Furthermore, some feel that cropland needs will increase in the coming years in order to meet high export demand for U.S. food.

An update of the survey by SCS in July, 1977, showed a significant increase in coal surface mining. While 5.7 million acres had been surface mined for all purposes, coal surface mining now amounted to 1.66 million acres of the land found to be in need of reclamation—a 58 percent increase in a little over three years. SCS also found that the amount of coal mined land that was legally required to be reclaimed had increased from 337,000 acres in 1974 to 570,080 acres in July, 1977.[8]

The land actually used for surface mining operations is—so far, at least—quite small. A far greater amount of land may be adversely affected by such operations, however. Thus, the Environmental Protection Agency estimated in 1973 that surface mining for all purposes adversely affected 13 million acres at the time, and that by the year 2000, 20 million acres could be adversely affected.[9]

While an assessment of the capacity of reclamation to restore surface mined land to its prior uses is beyond the scope of this section of the report, it is highly probable that the recently passed Surface Mining Control and Reclamation Act (P.L. 95–87) will significantly increase the extent of reclamation, and will stimulate reclamation technology.

Coal related land needs.—In addition to land actually disturbed by coal production, projections of coal land needs should attempt to take into account indirect land needs—such as land for new coal fired power plants (with related transmission lines)—and secondary industrial, residential and commercial development likely to arise from mining activities and coal related facilities.[10]

One factor that could affect land needs is the increasing propensity to construct so called "mine-mouth" power plants, which are located near the coal mine, but may serve a market area hundreds or even thousands of miles distant. Thus, for example, the famous Four Corners power plant in the Southwest serves a market area in California. Similarly, EPA recently denied construction permits for two coal fired power plants proposed to be built in Colstrip, Montana, which would have served the Pacific Northwest. (EPA denied the permits on the basis of their impact on air quality).

The siting of such power plants is a major land use decision, with important consequences for air and water resources, local and regional growth, and agriculture. In addition, mine-mouth power plants may require considerably more land for transmission line rights-of-way than plants located closer to market areas. In 1970, the Federal Power Commission estimated that transmission line rights-of-way covered 4 million acres of land—an area about the size of Connecticut—and that an additional 3 million acres of rights-of-way would be needed by the year 1990.[11] Even more land could be required if there is widespread adoption of the mine-mouth power plant concept.

Although, at the present time, agriculture and certain other pursuits are permitted on and around many rights-of-way in the United States, increasing controversy surrounds continued use of rights-of-way under extra high voltage transmission lines. Research conducted by the Soviet Union asserts that prolonged exposure to "electrical

---

[8] U.S.D.A. Soil Conservation Service, "Status of Land Disturbed by Surface Mining as of January 1, 1974" (March 1974), and an untitled inventory of surface mined land as of July 1, 1977.

[9] Testimony of the Environmental Protection Agency before the Senate Interior and Insular Affairs Committee on surface mining legislation, Mar. 13, 1973.

[10] Secondary development is discussed more thoroughly later in this section.

[11] U.S. Congress, Joint Economic Committee. "Economy, Energy and the Environment." 91st Cong., 1st sess., 1970, p. 116.

pollution" from such transmission lines may have adverse affects on health. The Soviets, accordingly, place stringent limitations on exposure to such "pollution." Research on the problem in this country has not been extensive, but it is possible that agricultural or other uses of rights-of-way will be more restricted in the future, and that, therefore, rights-of-way may be a more preclusive land use in the future.

Coal development and agriculture

The potential for conflict between coal development and agriculture extends far beyond transmission lines.

Part of this conflict stems from the diversion—temporary or not—of agricultural land to coal related purposes. Surface mining at least temporarily removes land from agricultural production. Furthermore, in many instances, reclamation may not be adequate to restore full productivity to land that was formerly high quality farmland. And, new development stimulated by the coal related facilities may direct even more land from agriculture.

But part of the conflict also relates to the quality of agricultural resources. Keen competition for water, increased air pollution, the introduction of an industrial economy in a previously rural area—all of these factors may reduce farm productivity, or even force farmers out of business even if the amount of prime land in production has not been reduced.

Surface mining has already resulted in significant conflicts with agriculture—especially in the water poor Western states, where cattle ranching and irrigation agriculture, high population growth, and energy development must compete for limited water resources, and the in the Midwest, where surface mining has taken place in the midst of some of the nation's most productive farmland.

Thus, the SCS July, 1977, surface mining inventory found that 158,000 acres of Illinois—the nation's third ranking agricultural state in terms of products sold—had been surface mined for coal. Over 79,000 acres of Missouri, the tenth ranked agricultural state, had been surface mined for coal. In sixth ranked Kansas, 42,000 acres had been surface mined, while 14,000 acres in Iowa had been surface mined.

Although the SCS survey does not indicate how much prime agricultural land has been surface mined, the prospects of continued surface mining in highly productive agricultural states is alarming to many. In the future, however, surface mining of prime agricultural lands is likely to be significantly curtailed as a consequence of enactment of the Surface Mining Control and Reclamation Act. This Act has several provisions relating to prime agricultural land, including a stipulation that surface mining on such land should only proceed where there is a technological capacity to restore the mined area to equivalent or higher yields as non-mined prime farmlands in the vicinity.[12]

The growth of surface mining in the West is expected to be dramatic, although problems such as water constraints and political opposition to the "stripping of the West", along with fundamental questions about the energy value of western coal, could dampen this expansion.

One estimate of land impacts of western coal development, made by a panel of the National Academy of Sciences on the reclamation po-

[12] Public Law 95-87.

tential of western lands,[13] estimated that 140 square miles of the West would be disturbed by 1990, and 300 square miles by the 2000. The NAS study received a great deal of attention in the West because of its reference to "national sacrifice areas"—areas which, because of their aridity and fragile ecological processes, could be only minimally reclaimed once stripped. The report did not estimate the amount of land in this category.

Water could be a significant limiting factor in determining the size and scope of western energy development. Whether there is sufficient water available for intensive energy development, as well as for other essential land uses has been the subject of a number of recent studies.[14] The NAS study on reclamation potential concluded that there would be sufficient water available for mining and rehabilitation of most sites, but that "not enough water exists for large scale conversion of coal to other energy forms—e.g. gasification or steam electric power." [15] If this is so, the likelihood of mine-mouth energy constellations in the West may be reduced.

While most studies conclude that sufficient water is physically available for widespread western energy development, there is considerable concern about the impact of such utilization on other land uses.

In addition to its prime farmland provisions, the Surface Mining Control and Reclamation Act also has provisions which would limit surface mining on agricultural lands west of the one hundredth meridian. Section 501(b)(5) of the Act specifies that permits to surface mine should not be issued for western alluvial valley floors that are irrigated or subirrigated. Exceptions will be made for undeveloped rangeland, and for surface mining activities that would not significantly reduce farm production.

Socioeconomic impacts

The prospect of widespread coal development in largely rural areas—particularly construction of mine-mouth power plants and other facilities located near mining sites—brings with it the probability of intensive urbanization in areas that are presently undeveloped for the most part. In many cases, this secondary development may occur so quickly, and with so little advance planning, that "energy boomtowns" may be created. Such "boomtowns" have already arisen in many western States and on a dramatic scale in Alaska.

Boomtown development often occurs in areas that have little experience with rapid growth, and do not have adequate planning mechanisms in place. As a result, there may be severe economic, social and environmental disruptions in the area, as the community suddenly grapples with problems such as housing shortages, traffic jams, inadequate public services, skyrocketing inflation, and too few doctors.

A 1977 General Accounting Office report [16] indicated that energy development in the Rocky Mountain States could result in the doubling, tripling or even quadrupling of the populations of some

---

[13] National Academy of Sciences, "Rehabilitation Potential of Western Coal Lands." A Report to the Energy Policy Project of the Ford Foundation. Ballinger Co., 1974. 198 p.

[14] See U.S. Senate Interior Committee, "Water and Energy Self-Sufficiency" (Serial 93-S1 (92-87) for a compilation of some of these studies.

[15] "The Rehabilitation of Western Coal Lands," op. cit., p. 6.

[16] U.S. General Accounting Office, "Rocky Mountain Energy Resource Development: Status, Potential and Socioeconomic Issues," July 13, 1977.

towns in a few years. GAO felt that many "boomtown" problems can be resolved with adequate advance planning, but there is no doubt that severe impacts are likely if "boomtown" conditions catch a community unawares.

One well publicized example of this is Sweetwater County, Wyoming, which experienced more than a doubling of its population between 1970 and 1974. The county growth rate was so high that severe fiscal, social and environmental problems were acutely experienced. Thus, the county, in 1970, had one doctor per 1,000 population, while in 1974, the ratio stood at one doctor per 3,800 population. Increased rates of suicide, alcoholism, and divorce were also noted, and housing, police services and commercial facilities were strained to capacity or beyond.

The county's population growth rate has now leveled off to a comparatively placid 6.9 percent per year, in contrast to the 19 percent annual growth rate in the 1970–1974 period, and its capacity to cope with growth is apparently far greater. Nonetheless, advanced planning could have relieved some, if not all, of the earlier "growth pains."

Back in the days of the Old West, many a gold boomtown became a ghost town in time as gold veins ran out. Some feel that a similar situation could occur in some "energy boomtowns", when and if the basic energy industry shuts down. Thus, the NAS study cautioned: ". . . when the coal is consumed, perhaps by the end of the century in some places, other means must be found to support the local economy in the affected areas." [17] Some assert that energy development, and related growth could adversely affect other economic activities—such as tourism and agriculture—which could be of greater long range economic benefit to the locality, and thus make it difficult to maintain the viability of these economic activities.

Concern about the on-shore energy impacts of OCS oil and gas development led the Congress, in 1976 to amend the Coastal Zone Management Act of 1972, to establish a coastal energy impact fund. This program is integrally related to the land and water planning efforts now being undertaken by the coastal states under the 1972 Act. Taken in conjunction with each other, the coastal planning and coastal impact fund constitute the most far-reaching effort to date to integrate energy and land use planning.

Legislation which would provide impact assistance to areas impacted by federal energy development—but which would not tie the assistance to land use planning requirements as far reaching as the Coastal Zone Management Act—has been proposed in the 95th Congress (S. 1493). In addition, the Federal Land Policy and Management Act—Public Law 94–579—authorizes states and localities to borrow their share of anticipated mineral leasing receipts from federal lands for any prospective ten year period in order to relieve social and economic impacts. Since the Federal Government now returns half of its mineral leasing receipts to the states this program could be significant. To date, however, the program has not been implemented.

To avoid many of the socio-economic problems associated with extensive regional coal development, some companies have taken the

---

[17] "The Rehabilitation of Western Coal Lands," op. cit.

initiative to help affected communities and, in some cases, mine developers are actually constructing towns for their employees.

A recent experiment in community development is taking place in the Eastern Powder River Basin where ARCO is now constructing its Black Thunder mine. To avoid duplicating many of the community development problems experienced by Gillette, its neighbor in the northern end of Campbell County, ARCO is building the town of Wright, Wyo.

According to the representatives of the Company, ARCO acquired about 800 acres of land approximately 40 miles south of Gillette, Wyo. for the Wright development. The community is designed to serve several coal surface mines planned for the area. The Atlantic Richfield Company is responsible for the master planning of the community, and for putting in the infrastructure. The Company is bringing in builders to construct 1,800 to 2,000 residential structures, including mobile homes, apartment units, and individual "detached" houses. Currently the company is planning to have 800 units completed by the end of 1978. Already installed are a 311 space mobile home park and accommodations for an additional 75 recreational vehicles to be used by construction workers and mine workers who prefer this type of housing.

In the near future, the company is planning to construct a 56,000 square foot shopping mall. The mall includes space for utility company offices, along with a medical treatment clinic and a sheriff's substation for Campbell County. In addition to the shopping mall, an auditorium with 3,200 square feet has been planned for community use, along with a branch facility for the Campbell County Library. Also, a volunteer fire station will be included. A Post Office substation, with its own zip-code already exists.

In addition, the company is planning a 125 acre-site for a park which will be deeded to the community. The community will also receive a site for an elementary school (which is currently being housed in a modular unit) and a community recreation center.

Thirty acres of the development are being reserved as an industrial park which will probably attract industries associated with coal surface mining, e.q., equipment suppliers.

The current estimated cost of the community development is $13 million with a five-year return on the investment anticipated. The company is planning to be out of the business in approximately 5 to 7 years.

According to the company officials, a major problem with this type of development results from the fact that funds generated from property tax revenues are just not available when construction begins. Thus, infrastructure must be privately financed. Furthermore, Wright has not received any type of funding from the State of Wyoming. The representatives expressed the opinion that the Federal Government might be able to help, especially with the housing end of the development, in order to get the community off the ground, or at least until the tax revenues can be channeled into infrastructure.

In the eastern coal-producing region, Island Creek Coal Company is also in the preliminary stages of community planning. Island Creek's approach to the problem will be similar to that of ARCO in the Wright project in that the actual building and sale of the single-family units,

mobile home courts, and apartment complexes will be turned over to private contractors. Island Creek will primarily be responsible for the development of the infrastructure including sewer, water, and power facilities for the community which will be located in Buchanan County, Virginia. The Company also envisions school, fire protection, and shopping facilities in the project.* Additional efforts to alleviate housing shortages in the mining areas are being made by Coalfield Housing Corporation, a non-profit organization jointly supported by ten mining companies and ten UMWA locals in southern West Virginia. Currently, the Corporation is involved in constructing 26 single-family units near Gary, W. Va., that will be within the price range of the miners working in that area, and is planning to start construction on 69 units in the Whitesville, W. Va. area next spring. Presently, the organization is not involving itself with the construction of public service facilities.

Hazards—natural and otherwise

Underground coal mining has long been recognized as a dangerous activity for the miners themselves. Less well recognized are hazards—such as flooding and land subsidence—which may harm life and property in nearby settlements.

Probably the most famous example of a mine related hazard to nearby communities was the Buffalo Creek, West Virginia, dam disaster in 1972. In this disaster, a temporary impoundment structure made up of wastes from coal mining burst under the pressure of heavy rainfall and sent a torrent of water into Buffalo Creek. The ensuing flood killed over 100 people and left 4,000 homeless.

While less dramatic, there is a growing awareness that surface mining may increase flood related damages in general.[18] Water bodies clogged by sediment from surface mining operations may overflow to a greater degree than unclogged water bodies, and may thus cause more extensive damage to nearby development when flooding occurs.

Land subsidence associated with underground mining is also a significant problem. The U.S. Bureau of Mines estimates that about 2 million acres—one fourth of the eight million acres of land underlain by coal mines—are affected by land subsidence.[19] Shifting land from subsidence can cause significant damage to housing and other developments.

It is probable that much mine related damage could be prevented through limitations on mining activities that would pose a significant risk to nearby settlements, or conversely, if limitations were placed on new development in areas that could be subject to land subsidence or increased flooding as a consequence of existing mining activities. Several provisions in P.L. 95–87, the Surface Mining Control and Reclamation Act do pertain to mining related hazards, and may reduce such hazards significantly, Thus, for example, Section 522(A)(3) of the Act would require State regulatory authorities to have the capacity to designate areas unsuitable for surface mining if the mining operations would "affect natural hazard lands in which operations could substantially endanger life and property, such lands to include areas

---

*Source: Public Relations Department, Island Creek Coal Company, personal communication Oct. 1, 1978.

[18] This awareness is reflected in such articles as "More Floods in Appalachia", Washington Post, Oct. 18, 1977, p. A–18, and "Trouble on the Land," a December 1977 article by Colman McCarthy, in Progressive.

[19] Christian Science Monitor, Oct. 25, 1977, p. 3.

subject to frequent flooding and areas of unstable geology." Furthermore, the Act requires the regulatory authority to suspend underground coal mining under urbanized areas or adjacent to industrial facilities or commercial buildings, major impoundments or permanent streams upon a finding by the authority that the mining operations pose a significant hazard to the public.

In addition, the law has a potentially significant provision which could result in greater co-ordination between mine related land use and flood plain or other natural hazard related land use requirements. Section 522(a)(5) requires that determinations of areas unsuitable for surface mining "shall be integrated as closely as possible with present and future land use planning and regulation requirements at the Federal, State, and local levels."

Role of the Federal lands

The Federal Government owns one third of the land in the Nation. This land contains significant coal deposits which many feel could and should make a significant contribution to national coal production goals. However, there are many competing claims to the use of the federal lands. Partially as a consequence of these conflicts, the Congress has enacted an increasing number of laws which provide the basic framework for federal land decision-making.

Before describing some of the basic laws which govern coal development on the federal lands, a few words describing the differences among the major federal land management systems—the National Park System, the National Wildlife Refuge System, the National Forest System and the public domain lands—are in order. Significant variations occur both in the kind and levels of uses that are permitted on units of these different land management systems. Thus, land in the most restrictive system, the 26 million acre National Park System, is administered almost exclusively to safeguard recreational opportunities, wildlife habitat or natural and scenic values. Other uses of parkland that could interfere with the protection of such values are ordinarily prohibited or greatly limited. Thus, for example, Congress has usually banned mining and mineral leasing activities when establishing new units of the National Park System. Congressional intent to limit mining in National Parks received further expression in the 1976 Mining in the Parks Act (P.L. 94–429) which governs mining activities on those parks where such activities had not previously been prohibited.

Similarly, units of the 31 million acre National Wildlife Refuge System are administered primarily to safeguard wildlife habitat, and incompatible uses are not generally permitted. While limited oil, and gas leasing has been authorized on some wildlife refuges when found to be compatible with the purposes for which the refuge was established, surface mining is generally held to be incompatible. The National Wildlife Refuge Administration Act (16 U.S.C. 668dd–668jj) specifies that the mining and mineral leasing acts shall continue to apply to wildlife refuge system lands to the same extent that they applied prior to the law's enactment in 1966, except where the land has been subsequently withdrawn under other authority of law.

The vast majority of the federal lands, however—the 187 million acre National Forests administered by the U.S.D.A. Forest Service, and the 450 million acres of public lands administered by the U.S.D.I.'s

Bureau of Land Management (BLM) are managed in accordance with a multiple use philosophy, designed to permit a variety of economic uses of the land, in addition to providing aesthetic, recreational, wildlife and scenic values. As a general rule, the mining and mineral leasing laws apply to these lands; however, there are numerous statutory or administrative prohibitions, modifications, or other limitations that may curtail the appropriation of a given tract of BLM or Forest Service land under the mining and mineral leasing acts. Thus, it is difficult to generalize about the extent to which the mining and mineral leasing acts apply on the public lands and National Forests.

The above distinctions among the federal land systems are, of course, fundamental federal land policy determinations by the Congress (or, in some instances, the Executive). By determining that a given parcel of federal land should be included in a given system, the Congress provides the basic parameters for use of these lands. Beyond such basic decisions, Congress has enacted a number of laws in recent years that pertain to the management of land within the federal land system. Some of these laws are briefly discussed below.

(1) *The Wilderness Act of 1964* (*Public Law 83–577*). This Act established the National Wilderness Preservation System, consisting of Congressionally designated wilderness areas on federal lands. Although only Congress may designate a wilderness area, the Wilderness Act and some subsequent laws have called for Executive branch study and recommendation on the "suitability or non-suitability" of various federal lands for possible wilderness designation. Originally, only land in the National Forest, National Park and National Wildlife Refuge Systems was eligible for formal inclusion in the Wilderness System. However, in 1976, Congress enacted the Federal Land Policy and Management Act, described below, which called for a review of BLM roadless areas for possible wilderness designation by Congress in the future. To date, Congress has formally designated about 16.6 million acres of wilderness—of which 14.8 million acres is National Forest Wilderness.

As a general rule, most resource uses that would interfere with the preservation of wilderness are prohibited or limited on to designated wilderness areas. However, the Wilderness Act indicates that, on National Forest wilderness areas, the mining and mineral leasing laws shall continue to apply to the same extent as they did prior to the Act's passage until December 31, 1983.

Prior to the designation of wilderness areas by the Congress, potential wilderness areas may be managed in such a way as to safeguard wilderness values. At the present time, both the Forest Service and BLM are undertaking wilderness review studies. In the case of the Forest Service, a second Roadless Area Review and Evaluation—acronymed RARE II—is being conducted in order to identify wilderness values on 1920 roadless areas totalling 65.7 million acres. The Forest Service has recently introduced a draft environmental impact statement as part of RARE II which discusses a number of different wilderness alternatives ranging from no new wilderness to addition of all RARE II areas to the Wilderness system. Legislation on the subject is likely in the 96th Congress. BLM's wilderness review, which is just beginning, and could encompass up to 145 million acres, is discussed in the next section.

(2) *Federal Land Policy and Management Act (Public Law 94–579).*—This 1976 law provides the basic statutory framework for management of public lands under the jurisdiction of the Bureau of Land Management. Some of its provisions also apply to other federal land management systems. Many of the law's provisions are directly relevant to mining and mineral leasing activities, including requirements pertaining to land use planning, withdrawal procedures, and wilderness review. These provisions are highlighted below:

Land use planning: Section 201 of Public Law 94–579 calls for the preparation of a continuing inventory of public land and resources on all public land. Section 202 requires the preparation of land use plans for all BLM land. When completed, these plans are expecte to served as a basis for determining uses and levels of uses of public land resources, in accordance with multiple-use, sustained-yield principles.

Withdrawals: A Withdrawal is an order by the Congress or the Secretary of Interior which restricts the use and disposition of a given tract of federal land in order to hold the land for a given public purpose. Because withdrawals frequently involve restrictions on mining and oil and gas activities, they have prompted considerable concern among these industries. Section 204 of Public Law 94–579 sets up a procedure for Congressional review and possible veto of withdrawals by the Secretary of Interior involving 5,000 acres or more. Three year "emergency" withdrawals and withdrawals of less than 5,000 acres are not subject, to this veto process. Section 204 also requires the Interior Department to conduct a review of certain existing withdrawals within 15 years.

Wilderness review: Section 603 of Public Law 94–579 calls for a review of roadless acres of 5,000 acres or more on BLM lands in order to determine their suitability or non-suitability in two stages. In the first stage, to be completed by July 1, 1980, BLM is to make recommendations to the President on formally identified natural or primitive areas on BLM lands that had been designated prior to enactment of Public Law 94–579—about 307,000 acres. The second stage, to be completed by 1991, will cover the remaining land. The law indicates that during the "study" period and until Congress determines otherwise, mining and mineral leasing may continue in the "manner and degree" such activities were being conducted prior to Public Law 94–579's enactment.

(3) *Federal Coal Leasing Amendments Act of 1976* (Public Law 94–377).—This law requires that "comprehensive" land use plans be prepared prior to the leasing of coal resources on Federal lands, and also requires that a lease sale be compatible with the plans. Where the Federal Government owns the mineral rights, but the surface is not federally owned, the lease sale may be held if the coal lands are included in a comprehensive land use plan prepared by the State, or are included in an Interior Department "land use" analysis."

(4) *The Mining in the Parks Act (Public Law 94–429).* Prior to enactment of this law, private mining claims could be established in six national park units. This law prohibits new mining claims in park system units, but permits continuation of existing claims subject to

Park Systems regulation. The Act states that surface disturbances on valid claims in Death Valley National Monument, Mount McKinley National Park, and Organ Pipe Cactus National Monument are to be limited to existing operations for a four year period, pending completion of a Park Service assessment. Other provisions pertain to assessment of costs involved in possible federal purchase of claims, expeditious handling of claimholder suits, and so forth.

(5) *Surface Mining Control and Reclamation Act* (*Public Law 95–87*). This Act, in addition to providing guidelines for state surface mining programs, also has requirements that apply to federal lands. Among them: promulgation of a federal land surface mining program within one year of enactment; review of federal lands as to suitability for surface mining; prohibition of surface mining in National Parks, Wildlife Refuges, National Trails, Wilderness, or Wild and Scenic Rivers Systems; prohibition of surface mining on the Custer National Forest (but surface mining on other National Forests may continue if consistent with certain guidelines in the Act); and authorization for co-operative agreements between a state and the Federal Government for state regulation of surface mining on federal lands, subject to ultimate federal authority to disapprove plans and declare federal lands unsuitable for surface mining.

(6) *The National Forest Management Act of 1976* (*94–583*).—This Act is concerned primarily with planning and management of renewable resources on the National Forests. However, increased reliance on planning to achieve multiple use objectives and coordinated resource use could affect mining and mineral leasing activities—especially if such activities would adversely affect renewable resources.

(7) *The Alaska Native Claims Settlement Act of 1971* (*Public Law 92–203*).—This law pertains only to Alaska. In order to meet the requirements of this Act, most federal land in Alaska (over 90 percent of the State) has been placed off-limits to mining and mineral leasing activities for the time being. Land has been withdrawn for possible selection by Alaskan Natives (P.L. 92–203 authorized these natives to select 44 million acres of federal land in Alaska); to safeguard the "national interest" in 80 million acres of land pending a Congressional decision on how much Alaskan public domain to add to more restrictive federal land management categories (the so-called "D–2" withdrawal); and to safeguard the "public interest" in the BLM lands pending their classification (the so-called "D–1" withdrawals). The status of federal land in Alaska is extremely complex, and the ultimate availability of these lands for mining and mineral leasing activities will depend upon a number of factors. One of the most important of these factors will be the way in which the Congress resolves the "D–2" issue. "D–2" legislation (H.R. 39) was passed overwhelmingly by the House in the 95th Congress. However, the Senate did not consider a much different "D–2" bill reported by its Energy and Natural Resources Committee before adjourning in October, 1978, *sine die*. Although the "D–2" withdrawal expires December 18, 1978, the Interior Department is expected to utilize its other withdrawal authority to continue safeguarding these lands. The "D–2" issue is almost certain to be a major issue in the 96th Congress.

All of the laws discussed above affect land use on the federal lands, and, thus, at least indirectly, affect mining activities in one way or another. In addition, there are a number of bills introduced in the

95th Congress that would affect federal land management, and, at least indirectly, mining activities. Among them:

Revision of the 1872 Mining Act: Several bills, including H.R. 5831, H.R. 9292, S. 1248 and S. 2210, have been introduced which would revise the mining act in one way or another. They range from bills which would modify the existing location/patent system, to bills which would substitute a leasing/royalty system.

BLM Quadrennial authorization: This legislation (H.R. 10767 and S. 2297) has grown out of a provision in the Federal Land Policy and Management Act, calling for submittal by BLM of four year authorization requests to the Congress. By setting relatively long range budget priorities, Congress could affect BLM's planning programs.

Energy impact aid: A number of bills, including H.R. 19787, S. 2913, S. 2914, and S. 1493, have geen introduced which would provide federal financial and other assistance to localities impacted by energy development on federal lands.

Alaska national interest lands legislation: This legislation ("D–2") including H.R. 39, S. 1500, S. 1782, S. 2465, and S. 2944, has already been discusssed.

Surface Rights and Federal Mineral Holdings

The Federal Government has retained the mineral rights to about 63 million acres of original public domain land the surface rights to which have been conveyed to private landowners. Because of the potential for conflict such bifurcation can cause, Congress has enacted special provisions pertaining to land use planning and consent of the surface owner in the event that the Federal Government intends to lease its mineral rights to these lands.

The Federal Coal Leasing Amendments Act of 1976—Public Law 94–377—requires that "comprehensive" land use plans be prepared prior to the leasing of coal resources on Federal lands, and laso requires that the lease sales be compatable with the plans. Where there is a non-Federal interest in the surface of the land (that is, where the Federal Government owns the mineral rights, but the surface is not federally owned), the lease sale may be held if the coal lands are included in a comprehensive land use plan prepared by the state, or are included in a "land use analysis" prepared by the Secretary of Interior.

In the preparation of the land use plans, the relevant Federal agency (in the case of Federal land) or the State, (in the case of lands where, there is a non-federal interest on the surface) is to consult with state and local agencies, and is to provide an opportunity for a public hearing on the proposed plan if such a hearing is requested by any person having an interest which is, or may be, adversely affected by the adoption of such plans.

Prior to issuing a lease, the Secretary of Interior (the chief Federal administrator of the act) is to consider the effect the lease might have on an impacted community or area, including its impact on the environment, on agriculture, on other aspects of the economy, and on public services.

In addition, the Surface Mining Control and Reclamation Act requires the Secretary of Interior to obtain written consent from the surface owner prior to leasing any federal coal deposits in such areas for surface mining.

35–270—78——6

FEDERAL COAL LEASING*

The history of Federal coal leasing policy through late 1977 has been summarized in a Committee Print, "Federal Coal Leasing Policies and Regulations," published by the Senate Committee on Energy and Natural Resources as Publication No. 95–77. The background section of that document is reprinted here.

A brief description of recent events follows.

BACKGROUND

A consequence of the perceived need for increased production of domestic energy resources that has developed in the 1970's is the renewed interest in the issue of coal leasing policy. The heavy emphasis that has been placed on increased coal use as a substitute for oil, especially in utility and industrial applications, has led to a critical reexamination of the existing policies that make coal on Federal lands available to the mining industry. To place the current discussion on coal leasing in perspective, therefore, it may be useful to consider the background of the issue.

Concern over the disposition of Federal coal lands is not a recent development. As early as 1907, the Secretary of the Interior reported that serious frauds were being perpetrated in the acquisition of coal lands and recommended that the coal land laws be amended.[1] Prior to 1864, coal lands were disposed of under settlement laws, but legislation was passed in 1964 and 1865 to establish limitation on the amount of coal lands that could be acquired by any one party.[2] The passage of the Coal Lands Act of 1873 extended the provisions of the two earlier laws and reemphasized the objective of discouraging the formation of any coal monopolies in the Western States, especially by the railroads. They found the Western coal lands, with their potential for producing boiler fuel, particularly valuable when they extended their lines farther into the frontier. Basically, the law provided two procedures for the acquisition of coal lands:

1. Awarding lands upon the payment of either $10 or $15 per acre depending on the distance from the railroad, or
2. Providing for a preference right-of-entry for persons who had already opened or improved coal mines on the public lands, with the maximum acreage being 640 acres.

Various sections of the 1873 act also provided for the legal right-of-entry on coal lands under certain circumstances. The act covered not only the coal lands in the Western States, but also the public domain lands in Arkansas, Florida, Louisiana, Mississippi, and parts of Oklahoma. Coverage under the act was extended to Alaska by amendments in 1900 and 1904, but the act had little or no practical application there.[3] In 1906, President Theodore Roosevelt requested that the Secretary of the Interior withdraw lands with known workable coal deposits from all forms of entry and patent. Under this action, 66 million acres of land in Colorado, North Dakota, Montana, Oregon, Washington, Utah, Wyoming, and the territories of New Mexico and Alaska were withdrawn. By 1908, however, 38 million of these acres had been restored to public domain status, Congress provided in 1910 that unreserved lands of the United States, excluding Alaska, that had already withdrawn or classified as coal lands, or valuable for coal, could be entered by actual settlers under the homestead laws or under the Desert-Land Act in order to obtain or to pass title, although the United States reserved the rights to the coal in such lands.[4]

The action, however, that was crucial to the determination of split ownership in the West was contained in the Stock Raising Homestead Act of December 29, 1916.

"It reserved all the coal and other minerals to the United States. Under Section 9 of the act it is provided that one who has acquired the right from the United States to prospect or mine the coal or other minerals may reenter and occupy so much of the surface of the land as reasonably required to remove the coal. In

---

*Duane Thompson, Analyst, Environment and Natural Resources Division, Congressional Research Service.

[1] Public Land Law Review Commission, "Nonfuel Mineral Resources of the Public Lands." Vol. I: Legal Study, December 1970.

[2] *Final Environmental Impact Statement*, Proposed Federal Coal Leasing Program, U.S. Department of the Interior, 1974, pp. 1–29 to 1–32.

[3] Ibid.

[4] Ibid.

exercising the right, the person may (1) obtain written consent or waiver of the surface owner, (2) pay the damages to crops or other improvements to the owner under an agreement, or (3) in lieu of either of above upon execution of a good and sufficient bond to the United States for the use and benefit of the owner of the land, secure payment of crop damage or tangible improvements of the owner.[5]"

If the mineral developer opted for the last mechanism for entry to the land, the law required that the bond be in the amount of at least $1,000 or an amount mutually acceptable to the surface owner and mineral operator or as determined by a court of competent jurisdictions. According to the final environmental impact statement on the proposed Federal coal leasing program prepared by the Department of the Interior, this particular law has been the major instrument for land patents for the retention of mineral rights by the United States. Although the previous legislation provided for the Secretary to allow the surface of the land to be patented, the actual authority to dispose of the minerals subjacent to the surface was not provided until 1917.

THE MINERAL LEASING ACT OF 1920

Basically, the 1920 Mineral Leasing Act provided the Secretary of the Interior with the authority (1) to divide coal lands into leasing units, (2) to issue permits to prospect unclaimed and undeveloped areas of coal lands and coal deposits, and (3) to issue limited licenses or permits to prospects for, to mine, and to take for use coal from public lands. The prospecting permit provided for in the 1920 Minerals Leasing Act required the payment of a nominal annual rental of 25 cents per acre for the area being explored along with a $10 filing fee. The permit was good for 2 years and could be renewed for another 2 years if the permittee, despite reasonable efforts on his part, had been unable to locate coal on the prescribed area within the initial term of the prospecting permit. If the holder or the permit, however, could prove the existence of coal in commercial quantities within the life of the permit, he could then apply for a preference rights lease entitling him to the exclusive right to extract coal from the permitted area. This mechanism was used extensively by legitimate coal companies to obtain coal on the public domain and by a small number of mine developers and "market makers" to speculate with large areas of Federal coal lands. Congressional concern over these speculative abuses led to the passage of the Federal Coal Leasing Amendments Act of 1975.

FEDERAL COAL LEASING AMENDMENTS ACT OF 1975 [6]

On August 4, 1976, Congress enacted, over President Ford's veto, the Federal Coal Leasing Amendments Act of 1975 (see appendix). This act made several significant changes in the Department of the Interior's coal leasing program. The purposes of the bill included:

(1) An end to speculative holding of coal reserves

The act addressed the problem of speculation by requiring the termination of any lease which is not producing in commercial quantities at the end of 10 years. In addition, each lease was made subject to diligent development and continuous operation requirements. As with the old law, the requirement of continued operation may be suspended with the payment of an advanced royalty.

(2) Reduction in the concentration of holdings

Concentration of holdings was limited by the act through tightening the definition of control and placing a national limit of 100,000 acres which can be controlled by any corporate entity or its affiliates. A limit of 46,080 acres per state was retained. In addition, a provision of the act which requires that 50 percent of all new leasing must take place using a deferred bonus bidding system was intended to permit smaller ccrporations to compete for Federal coal. The act also required that a "reasonable number" of leases be reserved and offered to public entities which produce energy.

(3) Fair return to the public

Several provisions were designed to insure a fair return to the public. First, all leases are awarded on the basis of competitive bidding only. Second, a bid is not

---

[5] Ibid.
[6] Information contained in a memorandum dated Sept. 28, 1977, to the chairman and members of the Subcommittee on Energy Production and Supply from Thomas Laughlin, Professional Staff Member.

acceptable unless it is at least as high as the fair market value as determined by the Secretary. Third, a minimum royalty of 12.5 percent of the value of the coal is placed on all new leases except those for underground mines. Fourth, readjustment of the terms of the lease is to occur every 10 years, after the expiration of the original 20-year primary term, rather than every 20 as in the old law. Fifth, preference right leasing is eliminated.

(4) Environmental protection, planning and public participation

The act prohibits the leasing of any coal lands unless they have been included in a comprehensive land use plan prepared by the Secretary, or the Secretary of Agriculture. The land use planning process required consultation with State and local officials, an opportunity for a public hearing, and an assessment of the amount of coal in the land, together with an estimate of the amount recoverable by surface and deep mining methods. Prior to leasing any tract, the Secretary must hold a hearing, separate from the land use plan hearing, on the lease in the impacted area and consider the effects which issuance of the lease might have on the environment, community services, and conomic impacts on the area.

(5) Amelioration of social and economic impacts

Prior to enactment of the Federal Coal Leasing Amendments Act, 38.5 percent of all money received from sales, bonuses, royalties, and rentals of Federal leases was returned to the States. The act increased this amount to 50 percent. The additional 12.5 percent is to be spent as the State legislature determined, but priority is given to areas socially or economically impacted by mineral development. This portion of the Mineral Lands Leasing Act of 1920 was amended later in the 94th Congress with passage of the Federal Land Policy and Management Act of 1976, Public Law 54–579. While the amount returned to the States remained 50 percent of the total, the direction to give priority to impacted areas in expending these funds is made applicable to the entire amount. The FLPMA also authorized the Secretary of the Interior to make loans to States and their subdivisions to relieve social and economic impacts. The amount of these loans is limited to anticipated revenues returned to the States.

(6) Increased information

The Office of Technology Assessment was directed by the act to conduct a study of the current coal leasing situation. This study was to be completed by August 4, 1977. However, OTA estimates that it will require an additional year to be completed. The act also directed the Secretary of the Interior to undertake a comprehensive exploratory program to reveal the existence and location of viable coal deposits on the public lands and to provide a basis for formulating land use plans, developing accurate maps of resources, and upgrading information on the value of the public resources. In addition, the Secretary was directed to submit a yearly summary of Federal lands leasing and production together with his suggestions for improvements in the program.

(7) Maximum economic recovery of the resources

To prevent waste of coal resources, the act requires the Secretary to form leasing tracts which "permit the mining of all coal which can be economically extracted." The Secretary is prohibited from approving any mining plan which he finds does not achieve the maximum economic recovery of the coal within the tract.

To further maximize economic recovery, the concept of "logical mining unit" was adopted. The act authorizes the Secretary to approve, or by regulation require, the consolidation of Federal coal leases with other Federal coal leases, State leases, or with private holdings in order to form a logical mining unit. All coal within such a unit must be mined within 40 years.

Coal Leasing Activities of the Interior Department

Although the basic law for the disposal of Federal coal lands was established in 1920, actual leasing activity languished until about 1960 (fig. 1). Extensive leasing on the public lands did not occur until the beginning of the 1960's.[7] From

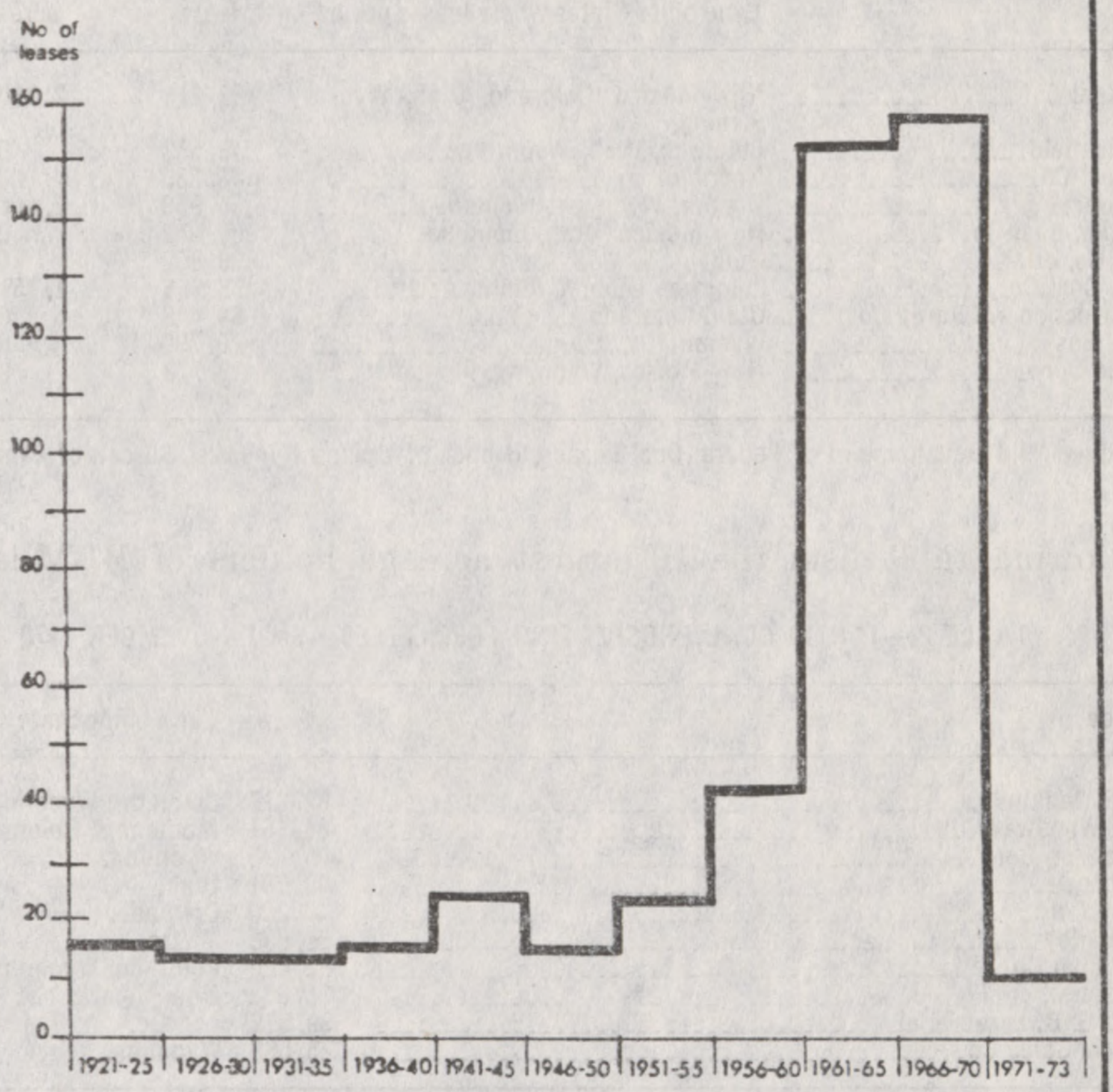
---

[7] Council on Economic Priorities. "Leased and Lost a Study of Public and Indian Coal Leasing in the West," vol. 5, No. 2, 1974, p. 6.

the enactment of the Minerals Leasing Act of 1920 until 1950, with the exception of the war years of 1941 through 1945, the number of leases awarded did not exceed 20 per year, and did not exceed 40 per year until 1960. From 1961 until 1965, however, the number of coal leases on the public lands rose sharply to slightly over 150 per year; it was almost 160 annually during the years from 1965 until 1970. Only when the leasing moratorium was established in the beginning of the 1970's did the number of leases drop back to pre-1950 levels. The total number of leases awarded between 1965 to 1970 alone is approximately equal to the total number of leases awarded from 1920 until 1960. The size of the leases increased almost as fast as the number during that 5-year period.

Figure 3.

PUBLIC & INDIAN LEASING ACTIVITY



From 1971 to 1973 there was an unofficial moratorium on public coal leases. In 1973, the Department of Interior made the moratorium official.

Council on Economic Priorities

The average coal lease issued between 1966 and 1970 contained 2,173 acreas, an area 400 percent greater than the average size of a lease issued in the 1940–49 period. The combination of a much larger number of leases coupled with the trend toward larger leases resulted in an even greater increase in the actual tonnage of Federal coal under lease.

By using an extremely conservative approach to calculate the actual coal reserves under lease, the Bureau of Land Management, (BLM), estimated that the total tonnage of recoverable coal under lease at the time of the moratorium in 1971 was approximately 8.6 billion tons. The actual figure is probably much higher because the Bureau applied a 50-percent recovery factor for coal-in-place. The Department has since raised that figure to 17.3 billion tons.[8]

Along with the increases in coal leases have been increases in the number of coal prospecting permits which have been issued by the Department of the Interior,

---

[8] U.S. Geological Survey, Department of the Interior Reserve Data System Report No. 2A, Dec. 31, 1976.

pursuant to the Minerals Leasing Act of 1920. These permits, which are issued for an initial term of 2 years with renewal rights for an additional 2 years, as of November, 1970 encompassed a total of 761,000 acres. By March 1971, the number of applications for coal prospecting permits totalled 300, a record number. Unfortunately for the overall leasing activity, the individuals and businesses holding prospecting permits and applying for permits often did not have the equipment or the inclination to mine the coal in the event that preference rights leases were issued on top of the prospecting permits. Even though the top 10 holders of actual leases were coal mining companies (table 1) the list of the top 10 permittees reveals that only 2 of the permittees were coal-producing companies (table 2).

TABLE 1.—HOLDINGS OF FEDERAL COAL LEASES

Lease	Land office States where leases occur	Total acres directly leased	Productive acres	Percent productive acres
1. Peabody Coal Co	New Mexico, Colorado, Utah, Wyoming.	63, 218	2, 360	3. 7
2. Atlantic Richfield	Colorado, Utah, Wyoming	43, 502	0	0
3. Garland Coal Co	New Mexico	40, 239	4, 000	9. 9
4. Pacific Power & Light	Oregon, Wyoming, Montana	39, 958	2, 000	5. 0
5. Consolidation Coal Co	New Mexico, Utah, Montana	39, 882	0	0
6. Resources Co. et al	Utah	39, 352	0	0
7. Kemmerer Coal Co	Colorado, Utah, Wyoming	38, 705	1, 751	4. 5
8. Utah Construction & Mining Co	Utah, Colorado	34, 448	0	0
9. Richard D. Bass	Wyoming	20, 700	0	0
10. Kerr McGee Corp	New Mexico, Wyoming, Montana	19, 778	0	0

Source: Holdings and Development of Federal Coal Leases, Branch of Upland Minerals, Bureau of Land Management, April 1971.

The following table lists the 10 largest acreage holders of BLM-issued coal leases:

TABLE 2.—TOP 10 COAL PROSPECTING PERMITTEES AS OF NOVEMBER 1970

Permittee	Acres	Land office State
1. Page and E. Jenkins	87, 017	Colorado, Wyoming.
2. Thomas C. Woodward	84, 761	Montana, Colorado, Wyoming.
3. Coal Conversion Corp	46, 795	Wyoming.
4. Cayman Corp	43, 691	Utah.
5. Kerr McGee Corp	40, 250	Colorado.
6. Robert V. Bailey	38, 003	Do.
7. Kemmerer Coal Co	36, 420	Colorado, Wyoming.
8. Robert Cutherall et al	35, 938	New Mexico.
9. Sharon and E. B. Larue et al	30, 832	Do.
10. Rosebud Coal Sales Co	25, 566	Wyoming.

Just prior to the passage of the Federal Coal Leasing Amendments Act of 1975, many companies, who referred to themselves as "marketmakers" were concerned that the then pending legislation would make it extremely difficult for them to procure and to maintain rights to Federal coal unless they intended to enter the mining and marketing industry, that of speculators who obtain legal rights to reserves in place but have no intention of actually mining the coal themselves.[9] It was not the intent of Congress in passing the 1920 Mineral Leasing Act to permit such speculation, but that body did not fully anticipate the abuses that were to develop four decades later.

In an effort to discourage this type of activity, the Congress included in the Federal Coal Leasing Amendments Act of 1975 provisions for the diligent development of coal leases and completely eliminated the issuance of preference rights leases based on prospecting permits. Prior to the passage of the act, however, the Department of the Interior recognized that there were inconsistencies in its leasing program and that it had strongly favored the mining industry and speculators. The Department of the Interior reversed its policy by placing a moratorium on coal leasing early in 1971 "because large amounts of coal were already

[9] Secretary of the Interior Thomas Kleppe, January 26, 1976, Denver, Colo. in Oversight—Federal Coal Leasing program, hearing before the Subcommittee on Minerals. Materials and Fuels of the committee on Interior and Insular Affairs, U.S. Senate, Ninety-fourth Congress, Second Session, on The Department of the Interior's New Coal Leasing Policy, February 16, 1976, p. 4.

under lease, little coal was being produced, and there was widespread concern that the Department's leasing processes were not environmentally adequate."

In February, 1973, however, the moratorium was modified in order to permit the leasing or coal lands in instances where the leases needed the reserves in order to continue production at existing mining operations. This limited leasing was allowed only when the environment could be protected and when the provisions of the National Environmental Policy Act had been met.[10]

At the time of the January 1976 oversight hearings by the Committee on Interior and Insular Affairs, only 10 such leases had been awarded, all of which were for the extension of existing operations. Secretary Kleppe, in his January 26, 1976 statement, identified six elements of the Interior Department's coal leasing policy designed to reverse the discrepancies of the past.[11] The first was the creation of the Northern Great Plains resource program, a cooperative effort of the Departments of Interior, Agriculture, the Environmental Protection Agency, and the States of Montana, Wyoming, Nebraska, North Dakota, and South Dakota. The final product of the resource program was an exhaustive study of all of the elements worthy of consideration of energy mineral development in the Northern Great Plains. In addition to transportation components of coal development, questions relating to environmental and socioeconomic impact were also addressed. Geographic areas not directly in the area of the coal development but which would be affected by increased rail transportation were also included.

The second element of the new coal leasing policy was the Energy Minerals Activity Recommendations System (EMARS). The system, originally conceived as the Energy Minerals Allocation Recommendation System, was designed to provide an overall framework within which coal leasing policy could be pursued on an "as-needed" basis. The Department hoped to reverse its earlier pro-industry policy of accepting nominations for coal leasing tracts and to take the initiative by allowing coal to be leased only as it was needed. Furthermore, the system was supposed to provide an opportunity for other affected agencies (both Federal and State), industry, environmental groups, and the public to have an input into the leasing process.

As described in the Draft Environmental Impact Statement (EIS), EMARS was basically a three-part system: (1) allocation, (2) tract selection, and (3) leasing.[12] During the allocation process Federal agencies released inventories Federal coal resources to projections of coal-derived energy needs. Total national energy needs were disaggregated into regional demands for coal derived Btu's. In the tract selection phase, Federal coal leasing targets were then established in each region or area, flowing from the total national projections for coal based energy needs. The leasing phase was to begin with a detailed preplanning of the coordinated mining and rehabilitation factors required for reclamation and subsequent surface resource management. This phase would conclude with (A) presale evaluations, (B) lease sales, (C) postsale evaluation procedures, and (D) lease issuance.

The third element of the coal leasing policy revisions was that of updating the rules and regulations governing the coal leasing activity. Although the Department probably never intended for lessees to hold Federal leases for extended periods of time without developing them, the Department was handicapped by lack of definitions attached to some of the crucial regulations in the Code of Federal Regulations, titles 30 and 43. Two of the problems which the Department addressed were the inadequacy of the definitions attached to the terms "logical mining unit" and "diligent development." These definitional changes were intended to alleviate the problem of lessees obtaining Federal coal leases and holding the leases without developing them.

Element number four, described by the Department of the Interior, was the Coal Programmatic Environmental Impact Statement.

> The first statement, which was released in September of 1975 . . . is intended to be a general analysis of the environmental impact of major leasing alternatives. It will not, however, satisfy the requirements for future site-specific or regional environmental analyses as individual coal-related actions are proposed.[13]

A fifth element in the development of this program has been the process for consultation with the governors of the Western States and their staffs. Several meetings have been held with the governors or their representatives. We intend

---

[10] Ibid.
[11] Ibid.
[12] Footnote contained in *Natural Resources Defense Council* v. *Hughes*, U.S. District Court for the District of Columbia, Sept. 27, 1977, p. 5.
[13] Kleppe, op. cit. p. 5.

to continue close consultation with the Western Governors' Regional Energy Policy Office on all aspects of Federal coal development in the west.

Finally, the development of a national energy policy announced by the President in February 1974 and the exhaustive study entitled "Project Independence Blueprint" gave us a truer picture of the Nation's future energy needs and the role coal must play in meeting these goals.

Many observers of that Federal coal leasing policy felt that the actions both taken and announced during this period by the Department of the Interior with respect to changes in the leasing regulations were intended to avoid having the change made legislatively by Congress. This speculation was based on the apparent similarities of the suggested changes by the Department to the provisions of the then-pending Federal Coal Leasing Amendments Act. These changes in the regulations, in addition to the program elements announced previously, were announced by the Secretary and included the following:

1. The adoption of a totally competitive leasing system, under which no new coal prospecting permits will be granted.
2. The development of final regulations governing conditions under which mining operations and postmining reclamation must take place.
3. The continuation of the short-term criteria, under which leases can be granted for continuation of existing mining operations or where needed to fulfill short-term production needs until the new leasing is fully implemented. Such leases will be granted only when NEPA provisions have been met and where environmental conditions warrant.
4. The promulgation of diligent development standards to assure development or relinquishment of Federal coal resources in a timely manner.
5. The establishment of firm "commercial quantities" criteria with which existing preference right lease applications can be granted or denied.
6. The lifting of the moratorium on Federal coal leasing so that, as the need arises, we will be able to offer leases for sale.

Despite these similarities, the Department preferred that any changes in coal leasing activity be made at the Department level because of the greater flexibility of departmental regulation over legislation. The Department was unable to convince Congress, however, which passed the Federal Coal Leasing Amendments Act of 1975 over the veto of then-President Gerald Ford. The key provisions of the legislation, which have already been outlined, addressed many of the problems which the Department sought to correct with its proposed changes.

Following the passage of the Federal Coal Leasing Amendments Act of 1975, which was passed on August 4, 1976, the Bureau of Land Management published proposed changes in the Energy Minerals Activity Recommendation System EMARS in the Federal Register.[14] According to the Department, the passage of the Amendments Act had two major effects on their coal leasing activity. First, it eliminated the Secretary's power to issue coal leases noncompetitively; second, it established a comprehensive set of procedures for the issuance of competitive coal leases by the Department. After completion of an extensive review of the competitive leasing system proposed by the Department (EMARS), however, the Department concluded that the system could be salvaged after some modification. The Department, in its Federal Register entry, listed the similarities of the Amendments Act with the earlier proposed changes by the Department.

(1) The Department must lease coal through a competitive bidding system which prohibits lease issuance unless the Department receives fair market value for the coal resources;

(2) The Department may not lease coal unless it is compatible with a comprehensive land-use plan prepared with public involvement;

(3) The Department must consider the effects of lease issuance on impacted communities and other affected areas; and

(4) All leases must be issued on terms that will insure the diligent development of the coal resources and prevent speculative holding of Federal coal leases.

In addition to the common elements of both the legislation and the Department proposals, the entry listed the provisions of the legislation which were not compatible with the following proposed departmental changes:

(1) Half of all leases issued each year must be offered on a deferred bidding system;

(2) A "reasonable" number of leases must be "reserved" to public bodies;

(3) Coal leases may be issued to governmental bodies on lands set aside for naval or military purposes with the approval of the Secretary of Defense;

---

[14] Federal Register (Vol. 41m, No. 209—Thursday, Oct. 28, 1976, pp. 47258-47263).

(4) Federal surface managing agencies may veto coal development on lands they manage;

(5) No lease may be issued (or readjusted or renewed) unless the Attorney General has been given the opportunity to comment on the antitrust implications of the action;

(6) Leases which authorize surface mining must have a royalty rate of not less than 12½ percent;

(7) Leases must be minded to achieve the maximum economic recovery of the coal; and

(8) The public must be given an opportuntiy to comment on the fair-market value of lands to be leased.

One of the key elements of the Coal Leasing Amendments Act of 1975, which was not included in the Department proposals and which is still to be resolved by the Department, is No. 2, which calls for the reservation of a specified number of coal leases to be awarded to public bodies or "set-asides." Section 2 of the Federal Coal Leasing Amendments Act requires the Department to "reserve" a reasonable number of these tracts to be offered to public bodies including Federal agencies, rural electric cooperatives or nonprofit corporations for use in implementing a definite plan to produce energy for their use or for sale to their members and customers. Because the EMARS regulations had no corresponding section for "set-asides," the Department was required to include the concept in its regulation changes published in the Federal Register. Specific regulations for satisfying this requirement under the law have yet to be devised, and no estimate of lead time necessary to resolve the problem has been made public.

RECENT COURT DECISIONS AFFECTING FEDERAL COAL LEASING POLICY

Shortly after the Final Environmental Impact Statement on the Federal coal leasing program was released by the Bureau of Land Management (Department of the Interior), a suit was filed in the U.S. District Court for the District of Columbia by the Natural Resources Defense Council against Mr. Royston Hughes, then Assistant Secretary of the Interior (see Appendix). The plaintiffs wanted the Department to include other options in their latest consideration such as discontinuing coal leasing altogether on the premise that enough Federal coal was already under lease to provide for sufficient coal production for several decades.

Many of those critical of the Interior Department's leasing action were concerned that the privileges extended by the Department to leasees enabling them to obtain short-term leases in order to continue production and to meet coal contracts were being abused. It was also claimed that some operators were using the mechanism to procure additional but unnecessary leases.

On September 27, 1977, Judge Pratt of the U.S. District Court ruled in favor of the plaintiffs. The Department of the Interior has since announced its intention to ask the Justice Department to appeal the decision of the court (see Appendix).[15]

The order issued by the court included the following points:

(1) Within 60 days of the entry of this order, the Federal defendants shall issue an official press release, publish a notice in the Federal Register, and take all other steps it believes appropriate (including sending an announcement to all those who have previously commented on the draft or final Federal Coal Leasing Programmatic EIS) to achieve widest possible dissemination of its announcement that it will reevaluate its coal leasing program and policy and that it will accept comments on the Final EIS issued in September 1975 for 60 days after public of the announcement in the Federal Register.

(2) Thereafter, defendants shall prepare and public a draft supplement to the Final EIS, seeking to correct the defects found by this court to exist, and responding to the significant issues raised in comments previously received on the Draft and Final EIS's. Publication of this draft supplement should be announced by appropriate notice in the Federal Register and elsewhere, as indicated above, and circulated to all interested Federal, State, and local governmental agencies and interested members of the general public. Comments shall be expressly invited thereon, with comment received until at least 45 days after the notice of release of the draft supplement is published in the Federal Register.

---

[15] Department of the Interior News Release, Sept. 30, 1977—According to Secretary Andrus, the Department "had anticipated that the Court might disapprove of the existing programmatic EIS for the leasing program, and [was] therefore well underway in developing a new leasing program for which we would prepare a sound and legally adequate impace statement."

(3) Thereafter, defendants shall prepare a new Final EIS, which combines and integrates the material in the draft supplement with the Final EIS previously released, which fully responds to the comments received on the draft supplement, and which otherwise fully complies with NEPA.

(4) After the new Final EIS has been made available to the public and is on file with the Council on Environmental Quality for at least 30 days, the Secretary of the Interior shall personally reevaluate Federal coal leasing policy, based on the information contained in the new Final EIS, and shall make a new decision as to whether a new leasing program shall be instituted and, if so, what kind of program it should be.

Another relatively recent action by the Department of the Interior was the recent memorandum [16] by the Solicitor (*Krulitz* decision) regarding the prior rights of mining claims on the Department's authority to issue prospecting permits for coal and phosphate on Federal lands (see Appendix). In general, the decision states that mining claims hold precedence over prospecting permits issued for the two minerals listed above. According to the Department, a prospecting permit for coal cannot be issued for land subject to a claim. If a prospecting permit for coal purports to cover land subject to a mining claim, it is invalid as to that land. Consequently, in demonstrating a discovery of coal in commercial quantities in land subject to a prospecting permit, the permittee must exclude coal in land covered by a mining claim.

Because a total of almost 6 million claims have been filed on Federal lands, the impact of such a decision could be significant to those who would plan to or who have already committed capital to the development of coal reserves on the public domain. The problem could be potentially serious in view of the fact that large amounts of coal land necessary for the formation of a logical mining unit (LMU) could be tied up by a mining claim for a small ore body on a relatively small tract. Further complicating the matter is the extremely complex structure of overlapping claims that has evolved over the years since the passage of the General Mining Law of 1872. Revision of the 1872 Mining Law is currently a topic of legislation in the 95th Congress.

Because of all of the current problems associated with the Federal coal leasing programs, Interior Department officials cannot predict when coal leasing activity will be resumed. In an address to the recent American Mining Congress convention in San Francisco, Interior Secretary Cecil Andrus acknowledged that the leasing procedures for Federal lands must be shortened and that too much Federal land has been withdrawn from development, but the Department has not yet announced specific proposals for improving leasing policies. It is possible, therefore, that a resumption of coal leasing activities may not occur until the 1980's.

Recent developments

Since the publication of this Congressional Research Service Committee Print there have been several developments relating to Federal coal leasing. In addition to appealing the September 27th decision of the District Court, the Department of the Interior also negotiated an out-of-court settlement with the plaintiffs which provided for short-term coal leasing satisfying the following requirements:

1. By-pass leases. This standard permits the Secretary to issue leases where Federal coal may be otherwise lost if it is not mined by an existing mine because subsequent costs (either economic or environmental) would be much higher. Up to five years of reserves may be included in a lease issued under this provision.

2. Employment leases. This standard permits the Secretary to issue leases in order to maintain production and employment in existing mines which are running short of reserves needed to maintain past production or where additional reserves are needed to meet existing contracts. Up to eight years of reserves may be included in a lease under this provision.

---

[16] Department of the Interior. Solicitor's Opinion M-36893, August 2, 1977 on "The effect of mining claims on secretarial authority to issue prospecting permits for coal and phosphate."

3. Hardship leases. Seven particular lease applications are specified in the proposed agreement as being not subject to the injunction regardless of any other particular standard. The basis for these leases varies, but each has some special circumstance or hardship which justifies proceeding with them in advance of the completion of the coal program environmental impact statement.

4. Preference right leases. The Secretary may process but not issue the 20 preference right lease applications having the least environmental impact. All activities including completion of the commercial quantities test and NEPA compliance are permitted under this provision.

Finally, the Department may proceed with an environmental impact statement on a proposed hardship lease for Edison Development Corporation involving the production of 5,000,000 tons of coal annually.

By mutual agreement, with the plaintiff, the Department of the Interior intends to issue approximately 30 short-term leases over the next 12 to 18 months based on the criteria in the four lease categories outlined above.

The original decision of the District Court is still under appeal by the Utah Power and Light Company, which felt that the Department should pursue the matter legally. This case will probably not be heard until the Fall of 1979. In the meantime, Interior is in the process of complying with the original court order and has prepared a new programmic environmental impact statement, review copies of which have already been distributed for comment. Barring any delays, the final statement should be completed by April, 1979, at which time, the Department can proceed with lease application processing, some months before the appeal by Utah Power and Light is heard.

According to the Department, new long-term leasing should be resumed sometime in 1980.

SURFACE MINING*

The essence of the Surface Mining Control and Reclamation Act of 1977 (Public Law 95–87) is in Title V, which provides for the control of the environmental impacts of surface coal mining. Its provisions require that surface mining operations must: (1) restore the land to a condition capable of (at least) supporting prior uses; (2) restore the approximate original contour of the area being mined; (3) replace topsoil after mining; (4) on prime agricultural land, replace the separate soil horizons to insure agricultural productivity at least as high as it was prior to mining; (5) minimize disturbances to the quality and quantity of water in surface and groundwater systems at all times—with adverse affects on alluvial valley floors prohibited; and (6) on steep slope mining, prohibit dumping spoil materials (soil and rock materials removed to expose the coal) on downslopes.

Other key provisions established a reclamation fund (by imposing a tax on coal) to restore abandoned lands.

The law further requires that no surface coal mining can be conducted unless the mine operator has obtained either a State or Federal

---

*Duane Thompson and Dr. Malcolm Simmons, analysts in mining, and water resources/quality, respectively, in the Environment and Natural Resources Division, Congressional Research Service.

permit; and that at least a $10,000 performance bond be posted by the operator to ensure reclamation of the land in accordance with an approved plan. A new Office of Surface Mining in the Interior Department administers the program in cooperation with the States.

On December 13, 1977, the Office of Surface Mining Reclamation and Enforcement issued its final interim regulations pursuant to the Surface Mining Law, Public Law 95–87. Shortly thereafter, the National Coal Association, along with other coal mine operators, filed approximately 11 suits against the OSM stating that the regulations go beyond the intent of the Law and have generated an undue hardship for mine operators, especially small mine operators. On another issue, the Office of Surface Mining is considering changes in the regulations establishing the requirements for sedimentation ponds.

Judge John Flannery of the U.S. Court of Appeals for the District of Columbia handed down a decision on August 24, 1978, upholding the interim regulatory program adopted by the Office of Surface Mining (OSM) on December 13, 1977. The regulations had been challenged by the National Coal Association along with Peabody and Consolidation Coal Companies. In a May 3, 1978 preliminary opinion, the Judge denied the plaintiff's request for relief from the regulations.

Included in the regulations that were upheld were the following: (1) warrantless searches of operations; (2) regulations on blasting, toxic materials, head of hollow fill methods of contour surface mining, terracing of reclaimed areas, and the restoration of mined areas to a condition capable of supporting premined land use; (3) surface mining relations proposed for Indian lands; and (4) provisions of the regulations that provided for the immediate shutdown of mines where a public health or safety hazard existed or significant imminent environmental harm could occur.

On September 18, 1978, the Office of Surface Mining published its proposed rules for the permanent regulatory program. Concerned individuals and organizations will have 60 days to comment on the proposed regulations. Public Hearings on the regulations will be held during October at the regional offices of OSM and in Washington, D.C.

Any newly created Federal office must overcome numerous obstacles even under the best of conditions. The new Office of Surface Mining created by Public Law 95–87, however, has had an exceptionally turbulent infancy. OSM had a late start because its budget was included in an appropriations bill for fiscal year 1978, that was vetoed because of the other programs contained in the legislation. This development created a delay in hiring, training, and inspections under the interim regulatory program. Currently, the Agency is running about six months behind schedule. This delay has had chaotic effects for the surface mining industry.

The underlying debate over the regulation of surface mining is whether or not the Agency created by the legislation has gone beyond the intent of Congress in drafting and implementing regulations for an industry that must already comply with the relatively strict provisions of the law itself. Many within the industry and some members of Congress who favored initially the regulation of surface operators now feel that OSM is overzealous in its approach to regulation, which is reflected in the sheer bulk of the detailed requirements. Currently, many of the individuals representing State government agencies are

complaining that OSM is taking an indifferent attitude toward the hardships that it is creating not only for operators, but also for some of the State governments.

In the first instance, many small mine operators, both surface and underground, have expressed a concern that they may be forced to discontinue mining because of stringent bonding requirements and because they simply do not have the manpower for the extensive planning that must precede mine development. Comments filed with the Agency on the draft permanent regulations by the National Independent Coal Operator's Association stated that many small underground operators in the production range of 100,000 tons or less could incur bonding premiums of $30,000 to $40,000 annually.[1]

In the second instance, some of the State legislatures are concerned that the six-months delay in the drafting of the permanent regulations by the Agency may make it difficult for them to prepare their own regulatory programs that will comply with the minimum Federal requirements, and that be promulgated before OSM is required by law to install its own Federal regulatory program within the States. It has been suggested that Congressional action be taken to postpone the deadlines for State programs.

Because of the stringency of the regulations and the confusion that is currently reigning in the surface mining industry, the permanent regulatory program will surely be challenged in the courts by the industry and may be challenged by some of the States that have interpreted the complexity of the regulations as an attempt on the part of OSM to avoid relinquishing the regulation of the industry to the individual State agencies.

The complexity of the issues and the nature of the values at stake are captured in the excerpts which follow, taken from the Committee Print "State Surface Mining Laws: A Survey, A Comparision with the Proposed Federal Legislation, and Background Information," Prepared by the Environment and Natural Resources Policy Division, Congressional Research Service, Library of Congress for the Senate Committee on Energy and Natural Resources.*

Legislative History of the Surface Mining Control and Reclamation Act

The Surface Mining Control and Reclamation Act has received major attention from the last three Congresses. During the 93rd Congress, First Session, extensive hearings were held in both the House of Representatives and the Senate. Using the information offered by representatives of the coal mining industry, environmental groups, and various Federal, state, and local government agencies, the Congress drafted compromise legislation in the form of S. 425. This piece of legislation was pocket vetoed by the President at the close of the 93d Congress.

On February 6, 1975, the President transmitted to Congress, a letter which proposed 27 suggested changes in the legislation, 8 of which were considered critical by the administration. The objections offered by the administration and the reaction of the Congress to the suggestions included the following:

[Selected from "Conference Report—Surface Mining Control and Reclamation Act of 1975"]

CRITICAL CHANGES

1. *Citizen suits. Administration Recommendation:* "S. 425 would allow citizen suits against any person for a 'violation of the provisions of this Act'. * * * Citizen suits are retained in the Administration bill, but are modified * * * to provide for

---

[1] OSM's Proposed Bonding Requirements May Endanger Small Coal Operators", Coal Daily, Aug. 24, 1978, p. 1.

* Prepared by Duane Thompson and David Lindahl, Analysts, Environment and Natural Resources Division.

suits against (1) the regulatory agency to enforce the act, and (2) mine operators where violations of regulations or permits are alleged."

Conference Report—Section 520: Modifies language to meet Administration objection.

2. *Stream siltation. Administration Recommendation:* "S. 425 would prohibit increased stream siltation—a requirement which would be extremely difficult or impossible to meet and thus could preclude mining activities. In the Administration's bill, this prohibition is modified to require the maximum practicable limitation on siltation.

Conference Report—Section 515(b)(11)(B): Clarifies language so as to avoid interpretation feared by Administration.

3. *Hydrologic disturbances. Administration Recommendation:* "S. 425 would establish absolute requirements to preserve the hydrologic integrity of alluvial valley floors—and prevent offsite hydrologic disturbances. * * * In the Administration's bill, this provision is modified to require that any such disturbances be prevented to the maximum extent practicable so that there will be a balance between environmental protection and the need for coal production."

Conference Report—Section 515(b)(10)(F): Modifies language to avoid "absolute requirements" objected to by Administration.

4. *Ambiguous terms. Administration Recommendation:* "In the case of S. 425, there is great potential for court interpretations of ambiguous provisions which could lead to unnecessary or unanticipated adverse production impact. The Administration's bill provides explicit authority for the Secretary to define ambiguous terms so as to clarify the regulatory process and minimize delays due to litigation."

Conference Report: Does not adopt Administration recommendation.

5. *Abandoned land reclamation fund. Administration Recommendation:* "S. 425 would establish a tax if 25¢ per ton for underground mined coal and 35¢ per ton for surface mined coal to create a fund for reclaiming previously mined lands that have been abandoned without being reclaimed, and for other purposes. * * * The Administration bill would set the tax at 10¢ per ton for all coal * * * which would be ample."

"Under S. 425 funds accrued from the tax on coal could be used by the Federal government (1) for financing construction of roads, utilities, and public buildings on reclaimed mined lands, and (2) for distribution to States to finance roads, utilities and public buildings in any area where coal mining activity is expanding. * * * The Administration bill does not provide authority for funding facilities."

Conference Report—Section 401 (d): Reduces reclamation fee on underground mined coal to 15¢ per ton. Does not restrict the scope of the program.

6. *Impoundments. Administration Recommendation:* "S. 425 could prohibit or unduly restrict the use of most new or existing impoundments, even though constructed to adequate safety standards. In the Administration's bill, the provisions on location of impoundments have been modified to permit their use where safety standards are met.

Conference Report—Section 515(b)(13): Provides that Corps of Engineers will set location standards for impoundments, and thus eliminates language objected to by Administration.

7. *National forests. Administration Recommendation:* "S. 425 would prohibit mining in the national forests—a prohibition which is inconsistent with multiple use principles and which could unnecessarily lock up 7 billion tons of coal reserves. * * * In the Administration bill, this provision is modified to permit the Agriculture Secretary to waive the restriction in specific areas when multiple resource analysis indicates that such mining would be in the public interest."

Conference Report—Section 522(e)(2): Does not adopt Administration recommendations.

8. *Special unemployment provisions. Administration Recommendation:* "The unemployment provision of S. 425 (1) would cause unfair discrimination among classes of unemployed persons. (2) would be difficult to administer, and (3) would set unacceptable percedents including unlimited benefit terms, and weak labor force attachment requirements. This provision of S. 425 is inconsistent with Public Law 93–567 and Public Law 93–572 which were signed into law on December 31, 1974, and which significantly broaden and lengthen general unemployment assistance. The Administration's bill does not include a special unemployment provision."

Conference Report: Administration recommendation.

"OTHER IMPORTANT CHANGES"

1. *Antidegradation. Administration Recommendation:* "S. 425 contains a provision which, if literally interpreted by the courts, could lead to a non-degradation standard similar to that experienced with the Clean Air Act. * * * Changes are included in the Administration bill to overcome this problem.'

Conference Report—Section 102(a): Adopts Administration recommendation.

2. *Reclamation fund. Administration Recommendation:* "S. 425 would authorize the use of funds to assist private landowners in reclaiming their lands mined in past years. Such a program would result in windfall gains to the private landowners who would maintain title to their lands while having them reclaimed at Federal expense. The Administration bill deletes this provision."

Conference Report—Sectoion 404: Does not adopt Administration recommendation.

3. *Interim program timing. Administration Recommendation:* "Under S. 425, mining operations could be forced to close down simply because the regulatory authority had not completed action on a mining permit, through no fault of the operator. The Administration bill modifies the timing requirements of the interim program to minimize unnecessary delays and production losses."

Conference Report—Sections 504 and 506: Includes provisions designed to eliminate prossibility of shutdown.

4. *Federal Preemption Administration Recommendation:* "The Federal interim program role provided in S. 425 could (1) lead to unnecessary Federal preemption, displacement or duplication of State regulatory activities, and (2) discourage States from assuming an active permanent regulatory role. * * * In the Administration bill, this requirement is revised to limit the Federal enforcement role during the interim program to situations where a violation creates an imminent danger to public health and safety or significant environmental harm."

Conference Report—Section 502: Does not adopt Administration recommendation.

5. *Surface owner consent. Administration Recommendation:* "The requirement in S. 425 for surface owner's consent would substantially modify existing law by transferring to the surface owner coal rights that presently reside with the Federal government. S. 425 would give the surface owner the right to "veto" the mining of Federally owned coal or possibly enable him to realize a substantial windfall. In addition, S. 425 leaves unclear the rights of prospectors under existing law. The Administration is opposed to any provision which could (1) result in a lock up of coal reserves through surface owner veto or (2) lead to windfalls. In the Administration's bill surface owner and prospector rights would continue as provided in existing law."

Conference Report—Section 714: Does not adopt Administration recommendation.

6. *Federal lands. Administration Recommendation:* "S. 425 would set an undesirable precedent by providing for State control over mining of Federally owned coal on Federal lands. In the Administration's bill, Federal regulations governing such activities would not be preempted by State regulations."

Conference Report—Section 523: Does not adopt Administration recommendation.

7. *Research centers. Administration Recommendation:* "S. 425 would provide additional funding authorization for mining research centers through a formula grant program for existing schools of mining. This provision establishes an upnecessary new spending program. duplicates existing authorities for conduct of research, and could fragment existing research efforts already supported by the Federal government. The provision is deleted in the Administration bill."

Conference Report—Title III: Does not adopt Administration recommendation.

8. *Prohibition on mining in alluvial valley floors. Administration Recommendation:* "S. 425 would extend the prohibition on surface mining involving alluvial valley floors to areas that have the potential for farming or ranching. This is an unnecessary prohibition which could close some existing mines and which would lock up significant coal reserves. In the Administration's bill reclamation of such areas would be required, making the prohibition unnecessary."

Conference Report—Section 510(b)(5): Modifies this provision to make it more precise.

9. *Potential moratorium on issuing mining permits. Administration Recommendation:* "S. 425 provides for (1) a ban on the mining of lands under study for designation as unsuitable for coal mining, and (2) an automatic ban when-

ever such a study is requested by anyone. The Administration's bill modifies these provisions to insure expeditious consideration of proposals for designating lands unsuitable for surface coal mining and to insure that the requirement for review of Federal lands will not trigger such a ban."

Conference Report—Section 522: Modifies this provision to require expeditious administrative action on designations so as to avoid any moratorium.

10. *Hydrologic data. Administration Recommendation:* "Under S. 425, an applicant would have to provide hydrologic data even where the data are already available—a potentially serious and unnecessary workload for small miners. The Administration's bill authorizes the regulatory authority to waive the requirement, in whole or in part, when the data are already available.

Conference Report—Section 507(b)(11): Does not adopt Administration recommendation.

11. *Variances Administration Recommendations:* "S. 425 would not give the regulatory authority adequate flexibility to grant variances from the lengthy and detailed performance specifications. The Administration bill would allow limited variances—with strict environmental safeguards—to achieve specific post-mining land uses and to accommodate equipment shortages during the interim program."

Conference Report—Section 515(c): Does not adopt Administration recommendation.

12. *Permit fee. Administration Recommendation:* "The requirement in S. 425 for payment of the mining fee before operations begin could impose a large 'front end' cost which could unnecessarily prevent some mine opening or force some operators out of business. In the Administration's bill, the regulatory authority would have the authority to extend the fee over several years."

Conference Report—Section 507(a): Adopts Administration recommendation.

13. *Preferential contracting. Administration Recommendation:* "S. 425 would require that special preference be given to reclamation contracts to operators who lose their jobs because of the bill. Such hiring should be based solely on an operators reclamation capability. The provision does not appear in the Administration's bill."

Conference Report—Adopts Administration Recommendations.

14. *Any class of buyer. Administration Recommendations:* "S. 425 would require that lessees of Federal coal not refuse to sell coal to any class of buyer. This could interfere unnecessarily with both planned and existing coal mining operations, particularly in integrated facilities. This provision is not included in the Administration's bill."

Conference Report—Section 523(e): Modifies language to accommodate Administration concern.

15. *Contract authority. Administration Recommendation:* "S. 425 would provide contract authority rather than authorizing appropriations for Federal costs in administering the legislation. This is unnecessary and inconsistent with the thrust of the Congressional Budget Reform and Impoundment Control Act. In the Administration's bill, such costs would be financed through appropriations."

Conference Report—Section 712(a): Does not adopt Administration recommendation.

16. *Indian lands. Administration Recommendation:* "S. 425 could be construed to require the Secretary of the Interior to regulate coal mining on non-Federal Indian lands. In the Administration bill, the definition of Indian lands is modified to eliminate this possibility."

Conference Report—Section 701(9): Adopts Administration recommendation.

17. *Interest charge. Administration Recommendations:* "S. 425 would not provide a reasonable level of interest charged on unpaid penalties. The Administration's bill provides for an interest charge based on Treasury rates so as to assure a sufficient incentive for prompt payment of penalties."

Conference Report—Section 518(a): Adopts Administration recommendation.

18. *Prohibition on mining within 500 feet of an active mine.* "This prohibition in S. 425 would unnecessarily restrict recovery of substantial coal resources even when mining of the areas would be the best possible use of the areas involved. Under the Administration's bill, mining would be allowed in such areas as long as it can be done safely."

Conference Report—Section 515(b)(12): Does not adopt Administration recommendation.

19. *Haul roads. Recommendation:* "Requirements of S. 425 could preclude some mine operators from moving their coal to market by preventing the connection of haul roads to public roads. The Administration's bill would modify this provision."

Conference Report—Section 522(e)(4): Adopts Administration recommendation.*
At the beginning of the 94th Congress, the House and Senate took the Administration's suggested changes under advisement and incorporated many of them into its Joint Conference bill, H.R. 25. Despite the efforts of the Congress to compromise on this matter (Congress accepted six of the eight critical changes and ten of the seventeen important changes suggested by the Administration), the President vetoed H.R. 25 on May 20, 1975. The veto was very nearly overridden in the House on June 10, 1975, but failed by a margin of three votes.

In his veto message, President Ford indicated that he could not sign the bill for the following reasons:

1. As many as 36,000 people would lose jobs when unemployment already is too high.
2. Consumers would pay higher costs—particularly for electric bills—when consumer costs are already too high.
3. The Nation would be more dependent on foreign oil—when we are already overly dependent and dangerously vulnerable.
4. Coal production would be unnecessarily reduced—when this vital domestic energy resource is needed more than ever.

The President said that the Department of the Interior and the Federal Energy Agency had estimated that:

". . . if this bill were to become law, a production loss of 40 to 162 million tons would result in 1977. This would mean that six to twenty-four percent of expected 1977 coal production would be lost. Actually, production losses resulted from H.R. 25 could run considerably higher because of ambiguities in the bill and uncertainties over many of its provisions."

Later in his veto message, the President admitted that the legislation he had sent to Congress would have resulted in coal production losses that would have been tolerable if Congress had enacted the "comprehensive energy package" that he had proposed. To many, this latter statement was an indication that the surface mining bill was not judged on its own merits by the President, but instead was rejected because it was an element of a much larger energy policy which was less desirable to the Administration.

In a news conference on May 19, 1975, the day before the President vetoed the bill, FEA Administrator Frank Zarb, in responding to a question of whether or not the lack of a total energy policy by Congress was the reason that the President would veto surface the mining bill answered:

"If a national energy program was in place, and if we were already underway in reducing our consumption levels of oil, and if we were already underway in putting those measures into place to get additional production between now and 1980, then perhaps this bill might have been examined differently."

In order to give the administration an opportunity to substantiate its production loss estimates, the Subcommittee on Energy and the Environment and the Subcommittee on Mines and Mining of the House Interior Committee (along with members of the Senate Interior Committee who had been invited to participate in the proceedings) in joint action held justification hearings on June 3, 1975. The administration was represented by Mr. Frank Zarb (Administrator, Federal Energy Administration), Mr. John Hill (Deputy Administrator, Federal Energy Administration), Mr. Eric Zausner (Acting Deputy Administrator, Federal Energy Administration), Dr. Thomas Falkie (Director, United States Bureau of Mines), Mr. Raymond Peck (Office of General Counsel, Department fo Commerce), and Mr. Rogers C. B. Morton (Secretary of Commerce).

Other individuals representing the Bureau of Mines, the Federal Energy Administration, and the Department of the Interior were also present at the proceedings.

At the proceedings, the Administration representatives repeated their assertions that the bill offered by Congress would result in lost coal production and associated employment within the industry. To justify their estimates, the witnesses used figures from a paper published by Dr. William Miernyk, Professor of Economics and Director of the Regional Research Institute at West Virginia University,[1] in conjunction with coal production loss estimates prepared by the Bureau of Mines staff. This line of reasoning was refuted during the hearings, however, when one of the Committee members informed the witnesses that the study prepared by Dr. Miernyk did not predict any impact on employment within the industry but did illustrate the interrelationship of the coal industry to other sectors of the economy

---

*Source: Surface Mining Control and Reclamation Act of 1975, Conference Report to Accompany H.R. 25, 94th Congress, 1st Session, Report No. 94-101, May 2, 1975.

[1] William H. Miernyk, *Environmental Management and Regional Economic Development*, Regional Research Institute, West Virginia University, Morgantown, W. Va., Nov. 6, 1971.

in Appalachia. Later, the author informed the Subcommittees and the press that the information in his study had been misused by the Administration. Furthermore, Senate members participating in the hearings pointed out that the testimony being offered was inconsistent with earlier statements made by Administration officials.

Senator Lee Metcalf emphasized that in February of 1975, Interior Secretary Rogers Morton has assured the House Interior Committee that the implementation of the legislation would actually increase the number of jobs within the industry since the amount of production that would be lost from the surface mines would have to be replaced by production from underground mining which is more labor intensive.[2] A crucial element to the proceedings, however, was a list which was to be supplied by the Administration to the Committees that would have identified some of the actual mines that would have been shut down by the implementation of the surface mining bill. This list was never supplied. Supporters of the bill felt that the inability of the Administration to provide this list and the actual methodology used to calculate the aggregate production loss figures and associated unemployment damaged the credibility of the case against regulation of surface mining at the Federal level. This was not enough, however, to provide sufficient impetus to override the Presidential veto, although the House vote was only three votes short of the total needed for an overrride.

Later in the 94th Congress, two bills, amended to meet the objections of the Administration, were introduced. The first, H.R. 9725, as introduced, was virtually identical to the vetoed H.R. 25.

Technical changes which would have delayed the implementation of the provisions were made in order to account for the passage of the time from the consideration of H.R. 25 and the implementation of H.R. 9725.

The Committee did, however, add language to allow mining in alluvial valley floors by operators who had produced coal in commercial quantities during the year preceding the enactment of the Act or who had obtained specific authority to mine in alluvial valley floors from the appropriate State agency.

H.R. 9725 was reported to the House Rules Committee on March 12, 1976. The bill failed, however, to receive a rule in the Committee. Although a petition was circulated to take the bill directly to the floor of the House, the petition failed to receive the required number of signatures and died in the Rules Committee

In a final effort in the 94th Congress to pass legislation, H.R. 13950 was introduced. This bill was also virtually identical to earlier legislation, but it underwent some changes in the House Interior Committee before being reported. In order to make the legislation more acceptable to the Administration, changes were made in the bill to phase in its provisions more gradually in order to give the small and intermediate-sized operators time to comply with its provisions. Under H.R. 13950, the implementation of the bill would have been phased in over a period of three years. According to the Subcommittee report on the bill:

"H.R. 13950 retains the basic framework and concepts of the previous bills. The time periods for compliance have been extended, however, and this modification should mitigate the administrative burdens attendant to a new regulatory scheme. As the bill is now drafted, after enactment of the legislation coal surface mines would begin to become subject to a system of reclamation standards and administrative procedures that are phased in over a period of 26 to (possibly) 38 months. In many cases, the standards and procedures will be compatible with current state laws. Where they are not, states are given over 2 years to amend their laws to conform with the minimum national standards required by the new law."

In spite of the Committee's efforts to report a bill acceptable to the Administration, Mr. Kent Frizzell, Acting Secretary of the Interior, indicated in the following letter, dated June 22, 1976, to the Honorable James Haley, Chairman of the House Committee on Interior and Insular Affairs, that the Administration was still opposed to the legislation which it considered to be essentially unchanged from H.R. 25.

---

[2] Allen F. Agnew, *The U.S. Bureau of Mines*, prepared by the Senior Specialist Division of the Congressional Research Service for the Senate Committee on Interior and Insular Affairs, September 1976, p. 152

UNITED STATES DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SECRETARY,
Washington, D.C., June 22, 1976.

Hon. JAMES A. HALEY,
Chairman, Committee on Interior and Insular Affairs,
House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: Your Committee has before it H.R. 13950, the "Surface Mining Control and Reclamation Act of 1976," which is based largely on previous legislation considered by the Congress. Its antecedents include H.R. 25, which was vetoed by the President on May 20, 1976, and a similar bill, H.R. 9725, which was subsequently reported by your Committee but denied a rule for action by the House.

We have carefully reviewed H.R. 13950 and conclude that it is unacceptable for essentially the same reasons as the earlier measures.

Unemployment in this country remains at unacceptably high levels, but H.R. 13950 could foreclose substantial employment in the coal industry and the communities dependent on it. H.R. 13950 would add significantly to the costs of mining coal and, to the extent that it would cause a decline in coal production, it would require use of scarce higher priced fuel alternatives to meet projected energy demands of the Nation. The need for foreign petroleum would increase in the face of a situation which today finds this Nation more dependent on foreign sources than when the President vetoed H.R. 25 over a year ago. We simply cannot afford unbalanced, inflexible legislation which would stifle our efforts to double coal production by 1985.

I recognize that H.R. 13950 incorporates changes intended to ameliorate some of the unduly burdensome or inflexible provisions of earlier legislation. Some relief would be provided for small mine operators, who would have suffered heavily both with respect to unemployment and production losses under H.R. 25 and H.R. 9725. Unfortunately this bill is only marginally better than earlier legislation in this regard. Although certain procedures have been made more flexible, major difficulties remain in the permitting, enforcement and bonding requirements. The timing of the development and implementation of the Federal and State programs set forth, and the relationship between them, remain unrealistic.

In addition to the direct hinderance imposed on coal production, H.R. 13950 would still lead to long regulatory delays, litigation and uncertainty detrimental to the achievement of either our energy or environmental objectives. Other objectionable features of the previous legislation remain untouched by the latest bill.

In short, I believe that H.R. 13950 does not cure the major defects in legislation vetoed by the President and that the major elements of the analysis underlying his veto would remain valid with regard to H.R. 13950.

Since the President's veto I have implemented a new coal policy which includes comprehensive new surface coal mining regulations for Federal lands. These were developed after considerable discussion to accommodate both our energy and environmental goals.

On non-Federal lands, we note a continued trend of strengthening State regulation. The Administration remains firmly convinced that imposition of a major new all-embracing Federal surface mining program could have a devastating effect on coal production, particularly in the light of our steadily deteriorating energy situation.

I therefore strongly urge that your Committee not report H.R. 13950.

The Office of Management and Budget has advised that there is no obligation to the presentation of this report, and that enactment of H.R. 13950 would not be in accord with the program of the President.

Sincerely yours,

KENT FRIZZELL,
Acting Secretary of the Interior.

Current Legislation

Early in the first session of the 95th Congress, two bills establishing Federal regulation of surface coal mining were introduced. The House version, H.R. 2, is virtually identical to the previously described H.R. 13950 of the 94th Congress. The Senate version, S. 7, does contain some differences. Included in these differences are those relating to the establishment and funding of state mining and mineral resource and research institutes, the levying of a tax on coal for the establishment of an abandoned mines reclamation fund, and the protection of surface owners rights in instances where the surface is under private control and the minerals are owned by the Federal government.

Title III of H.R. 2 provides for the establishment of mining and mineral resource and research institutes. The title would establish a comprehensive framework for the designation of eligible colleges and universities and would authorize funds for the conduct of research pursuant to the provisions of that title. Title III also would require the dissemination of the findings resulting from research by the designated mineral resource institutes. Senate bill S. 7 does not contain similar provisions.

With regards to the establishment of an abandoned mines reclamation fund, H.R. 2 would require that a tax on coal, in the amount of 35¢/ton for surface mined coal and 15¢/ton for underground mined coal, be levied in order to establish the fund. The tax would be levied on all coal regardless of its ownership, either private, state, or Federal. Senate bill S. 7 while establishing the same reclamation fund, would apply the tax only to that coal which is produced from Federal lands.

The House version, H.R. 2, is virtually identical to the previously described H.R. 13950 of the 94th Congress. The Senate version, S. 7, does contain some differences. Included in these differences are those relating to the establishment and funding of state mining and mineral resource and research institutes, the levying of a tax on coal for the establishment of an abandoned mines reclamation fund, and the protection of surface owners rights in instances where the surface is under private control and the minerals are owned by the Federal government.

The most controversial of the differences in the two bills is that dealing with mining on lands where the coal is Federally owned but the surface is privately owned. In H.R. 25 the House and the Senate, determined in joint conference that the best way to protect the rights of farmers and ranchers in the West who choose not to have coal mined from under their lands would be to make it mandatory for the mine operators to obtain their written permission prior to mine development. At the same time, in order to prevent surface owners from receiving windfall profits from the mine operators for permission to mine coal, Congress would establish a system for the evaluation of the surface owner's rights. Under this system. the appraisal would be made by three individuals, the first appointed by the land owner, the second appointed by the Secretary of the Interior, and the third appointed by the first two appointees. This type of arrangement would assure both the surface owner and the mine operator of a fair price for the surface interests attached to the land. This arrangement is retained in the current House version of the surface mining bill. In the Senate version, however, neither the mine operator nor the surface owner are consulted in the decision to mine or not to mine the coal because regardless of the wishes of the surface owner, the development of the coal is prohibited in all cases where the ownership of the coal resources and the surface is different.

Other technical differences exist between the two bills, however, a detailed comparison is beyond the scope of this study.

BACKGROUND AND RECENT DEBATE

Over the course of the debate on the issue of Federal Regulation of coal surface mining, the emphasis shifted at least twice. In the initial debate during the 93d and 94th Congress, opponents of the legislation insisted that to impose further regulations on the industry would force many operators (especially the small ones) out of business, would raise the price of coal produced by the operators capable of remaining in business, would increase the cost of electricity produced by coal-fired generating plants, and would increase America's reliance upon imported energy resources. This carried with it the prospects of increased U.S. trade deficits and compromised United States foreign policy with respect to oil-producing Nations. This argument was bolstered by the actions of the Organization of Arab Petroleum Exporting Countries (OAPEC), in October of 1973, imposing an oil embargo

against the United States which lasted until March, 1974. During the embargo, through the initiatives of the larger Organization of Petroleum Exporting Countries (OPEC) the price of oil to the U.S. quadrupled. In the wake of the embargo and the oil price increases, the price of steam coal in the United States doubled and, in some cases, tripled.

Following these developments, spokesmen for the coal mining industry asserted that any new regulation of the industry, especially any as "stringent" as that proposed for surface mining, could only serve to damage America's goal of energy independence by 1985.

Since that time, the debate over the proposed regulaton of surface mining first shifted from the production losses that could occur if the legislation were enacted to whether or not the production loss estimates made by the former Administration were valid and were made in good faith. The second shift in emphasis occurred after the close of the 94th Congress. At the time, some mining companies conceded that the implementation of the legislation would not have resulted in the large production losses that had been initially forecast. In an article which appeared in the Wall Street Journal on July 28, 1976,[1] shortly after Congress upheld the Presidential veto of the strip mining bill, H.R. 25, several coal company representatives were quoted as saying that they could have lived with the surface mining bill. Mr. John Witt, Land Commissioner for the State of Kentucky said that, in conjunction with his State's own strip mining law, "I can't see where the federal bill would have curtailed our mining and reclamation in any severe way."

A survey was conducted by the Environmental Protection Agency, the U.S. Bureau of Mines, and the Federal Energy Administration in order to determine the actual reclamation cost that would be incurred by mine operators under the provisions of the surface mining bill.[2] Aside from the extreme difficulty that the agencies had in collecting accurate information for the survey, the conclusion was, at that time, the Administration did not know what the real costs of the legislation would be. The results of the survey were also widely thought to be damaging to the credibility of the Administration's assessment of the bill's impact of surface mine operators.

The current industry contention is that the coal-mining states are already sufficiently regulating surface mining at the state level, thereby obviating the need for Federal controls. A large majority of the industry and trade association witnesses at both the coal briefings held by the House Interior Committee on January 10 and 12, 1977 and the hearings conducted by both the House and Senate Interior Committees during February and March testified that the states are already doing an adequate job of regulating strip mining. According to the industry, imposing an additional level of regulation on top of the existing one would subject the industry to hardships at a time when increased production is more crucial than ever.

The purpose of this study was to determine the effectiveness of the State enforcement agencies. To accomplish this, the Senate Committee on Energy and Natural Resources conducted a survey of the various state agencies responsible for policing surface coal-mining activities within their jurisdictions.

The first State to establish regulations for the surface mining of coal was West Virginia in 1939. By 1975, that number had increased to 38 States. Most of these State programs are very recent with 32 having been implemented between 1970 and 1975.[3] Some of the state programs for the regulation of the industry and the reclamation of mined lands are relatively effective while others are little more than token efforts. Similarly, enforcement of the existing laws in some of the states is very strict, while in others it may be non-existent.

In order to determine the similarities and differences in the surface mining laws of the various states, the Resources and Land Investigations program of the United States Geological Survey, under the direction of Mr. Edgar Imhoff prepared a comparison, as shown in Table 1, of the State surface-mined area reclamation programs as of December, 1975.

---

[1] "New Outlook for Coal: Not So Sensational—And Not So Troubled," *The Wall Street Journal*, July 28, 1976, pp. 1 and 23.

[2] Coal Week, May 31, 1976, p. 4.

[3] *A Guide to State Programs for the Reclamation of Surface Mined Areas*, United States Geological Survey Circular 731, Resource and Land Investigations Program (RALI), by Edgar A. Imhoff, et al., 1976.

TABLE 1.—MATRIX OF INFORMATION ON STATE SURFACE MINED-AREA RECLAMATION PROGRAMS, DECEMBER 1975

[For explanation of symbols and terminology, see p. 10 and the "Glossary"]

State	Stage of program development			State law			
	Act(s)	Rules and regulations	Technical guidelines	Title of act(s)	Administering agency (ies)	Mineral or commodity covered	Rules vary by mining method
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Alabama	X	X		Alabama Surface Mining Act of 1969 and Alabama Surface Mining Reclamation Act of 1975.	Department of Industrial Relations and Surface Mining Reclamation Commission.	All minerals except lime, stone, marble, and dolomite (coal covered by 1975 Act).	
Alaska [1]							
Arizona [2]							
Arkansas	X	X	X	The Arkansas Open Cut Land Reclamation Act of 1971.	Department of Pollution Control and Ecology.	All minerals	
California	X			Surface Mining and Reclamation Act of 1975.	Department of Conservation (Policy); local governments (Permits and Plans).	All minerals	
Colorado	X			Colorado Open Mining Land Reclamation Act of 1973.	Department of Natural Resources.	Coal, sand, gravel, quarry aggregate, and construction limestone.	
Connecticut [3]							
Delaware [3]							
Florida	X	X		Ch. 211, II Florida Statutes.	Department of Natural Resources.	All minerals	
Georgia	X	X	X	Georgia Surface Mining Act of 1968, as amended.	Department of Natural Resources.	All minerals	
Hawaii	X			Ch. 181, subtitle 3, Hawaii Statutes	Department of Land and Natural Resources.	All minerals, except sand, rock, gravel, and construction materials.	
Idaho	X			The Idaho Surface Mining Act.	Department of Lands	All minerals	
Illinois	X	X	X	Surface-Mined Land Conservation and Reclamation Act.	Department of Mines and Minerals.	All minerals	
Indiana	X	X	X	Ch. 344, Acts of 1967, Indiana Statutes.	Department of Natural Resources.	Coal, clay, and shale	
Iowa	X	X	X	An Act Relating to Surface Mining as amended.	Department of Soil Conservation.	All minerals	

Kansas	X	X	X	Mined-Land Conservation and Reclamation Act.	State Corporation Commission.	Coal	
Kentucky	X	X	X	Ch. 350, Kentucky Revised Statutes.	Department for Natural Resources and Environmental Protection.	All minerals	For contour mining, limits are placed on cut benches and slope.
Louisiana [3]							
Maine	X	X		(1) Mining and Rehabilitation of Land Act, and and (2) Site Location of Development Act.	Department of Environmental Protection.	All minerals (sand and gravel are covered only by Site Act).	
Maryland	X	X	X	Maryland Strip Mining Law.	Energy and Coastal zone Administration.	Coal	Back-filling rules vary by area, terracing, or block-cut methods of mining
Massachusetts [3]							
Michigan	X			Mine Reclamation Act of 1970, as amended.	Department of Natural Resources.	All minerals except clay, gravel, marl, peat, or or sand.	
Minnesota	X			Mineland Reclamation Act of 1971, as amended.	De artment of Natural Resources.	Metallic minerals	
Mississippi [3]							
Missouri	X			(1) Reclamation of Mining Lands and (2) The Land Reclamation Act.	Department of Natural Resources.	Act (1) coal and barite; Act (2) clay, limestone, sand, and gravel.	
Montana	X	X	X (Partial)	(1) Montana Strip and Underground Mine Reclamation Act, and (2) Open Cut Mining Act, and (3) Montana Hard-Rock Mining Reclamation Act.	Department of State Lands.	Act (1) Coal and uranium; Act (2) bentonite, clay, phosphate rock, scoria, and sand and gravel; Act (3) other minerals.	
Nebraska [3]							
Nevada [3]							
New Hampshire [3]							
New Jersey [3]							
New Mexico	X	X		New Mexico Coal Surfacemining Act.	Bureau of Mines and Mineral Resources.	Coal	
New York	X			New York State Mined Land Reclamation Law.	Department of Environmental Conservation.	All minerals and mined topsoil.	
North Carolina	X			The Mining Act of 1971.	Department of Natural and Economic Resources.	All minerals	
North Dakota	X	X		North Dakota Century Code; Reclamation of Strip-Mined Land.	Public Service Commission.	Coal	
Ohio	X	X		(1) Strip Mine Law, and (2) Surface Mine Law.	Department of Natural Resources.	Act (1) Coal. Act (2) All other minerals.	
Oklahoma	X			Mining Lands Reclamation Act.	Department of Mines	All minerals	

See footnotes at end of table.

TABLE 1.—MATRIX OF INFORMATION ON STATE SURFACE MINED-AREA RECLAMATION PROGRAMS, DECEMBER 1975—Continued

[For explanation of symbols and terminology, see p. 10 and the "Glossary"]

State	Stage of program development			State law			
	Act(s)	Rules and regulations	Technical guidelines	Title of act(s)	Administering agency (ies)	Mineral or commodity covered	Rules vary by mining method
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Oregon	X	X		Oregon Mined Land Reclamation Act, as amended.	Department of Geology and Mineral Industries.	All minerals	
Pennsylvania	X	X		Surface Mining Conservation and Reclamation Act, as amended.	Department of Environmental Resources.	All minerals	
Rhode Island [3]							
South Carolina	X	X		South Carolina Mining Act.	Land Resources Conservation Commission.	All minerals	
outh Dakota	X	X		Surface Mining Land Reclamation Act, as amended.	Department of Agriculture.	All minerals	
Tennessee	X	X	X	The Tennessee Surface Mining Act.	Department of Conservation.	All minerals except dimension stone limestone, and marble.	Contour mining rules apply on slopes>15°; area mining on slopes <15°; quarries are a special case.
Texas	X			Texas Surface Mining and Reclamation Act.	Railroad Commission of Texas.	Coal, lignite and uranium	
Utah	X	X		Mined Land Reclamation Act of 1975.	Department of Natural Resources.	All minerals (including oil-shale and bituminous sands).	
Vermont	X			Vermont's Land Use and Development Law.	District Environmental Commissions and the Environmental Board.	All minerals	
Virginia	X	X	X	(1) 45.1–198, and (2) Title 45.1–180. ch. 16.	Department of Conservation and Economic Development.	Act (1) coal Act (2) ali other minerals.	Quarries are a special case—especially in backfilling.
Washington	X	X		Surface-Mined Land Reclamation Act.	Department of Natural Resources.	All minerals	Quarries are a special case.
West Virginia	X	X	X	Art. 6, ch. 20, Code of West Virginia, as amended.	Department of Natural Resources.	All minerals	Grading and backfilling rules vary by area mining or contour mining.
Wisconsin	X	X		Metallic Mining Reclamation Act.	Department of Natural Resources.	Metallic minerals	
Wyoming	X	X		Wyoming Environmental Quality Act of 1973.	Department of Environmental Quality.	All minerals	Rules vary by soft rock mining or hard rock mining.

Reclamation—Main actions required and standards set

	Control water now and quality (9)	Conserve and replace topsoil (10)	Backfill and grade (11)	Reduce highwall or pitwall (12)	Bury or neutralize toxic wastes (13)	Revegetate for beneficial use (14)	Other rules or remarks (15)
Alabama	X	X	Strike-off top of spoil ridges to width ≥15 ft and cover coal seam with spoil to depth ≥ 10 ft.	Eliminate coal mine highwall except at final cut.	With 2 ft of earth or permanent water body.	Standards for forests, grasses, and legumes. soil additives may be required.	Construct 2 access roads per each mile of coal mine highwall. Depth of lakes ≤6 ft.
Alaska [1]							
Arizona [2]							
Arkansas	X	Standards vary according to original natural conditions.	All grades will be ≤33 percent; blade and grade to approximate original surface conditions.	X	With 3 ft of earth or permanent water body.	X	Construct fire lanes or access in areas of reforestation.
California	X						
Colorado	X		Strike-off top of spoil ridges to width of ≥15 ft. Achieve level or undulating skyline.			X (Exceptions for unsuitable areas.)	
Connecticut [3]							
Delaware [3]							
Florida	X (Lakes shall support fish or recreation.)	X	All grades will be ≤25 percent. Blend peaks, ridges and valleys. Develop uninterrupted drainage.			Plant coverage >80 percent; bare areas ≤¼ acre.	Established lakes must be at least 3 acres in size and 6 ft in depth.
Georgia	X	X	Blend peaks, ridges, and valleys into a rolling topography suitable for plant growth.	X (Except in solid rock.)	With 2 ft of soil supporting vegetation.	Attain high quality permanent cover.	
Hawaii	X	If necessary for end-use objective.	Strike-off peaks and ridges of spoil and fill depressions.			Quick cover grass crop, followed by reforestation, or conversion to farming.	Carrying capacity of pasture lands will be ≥1 cow per 3 acres.
Idaho	X	Replace overburden to extent reasonably available.	Strike-off ridges to width of ≥10 ft and peaks to width of ≥15 ft.			Revegetate to compare to premining conditions.	
Illinois	X	Row crops, 18 in.; Other uses, replace as practicable.	Varies by planned use, i.e.: original grade for row crops; ≤30 percent forest and wildlife; ≤50 percent hay and pasture.	To grade of ≤50 percent.	With 4 ft of water or suitable material.	Replant row crops if soils suitable. Detailed standards for other uses.	Separate permits required for refuse disposal (landfill).

See footnotes at end of table.

TABLE 1.—MATRIX OF INFORMATION ON STATE SURFACE MINED-AREA RECLAMATION PROGRAMS, DECEMBER 1975—Continued

	Control water now and quality (9)	Conserve and replace topsoil (10)	Backfill and grade (11)	Reduce highwall or pitwall (12)	Bury or neutralize toxic wastes (13)	Revegetate for beneficial use (14)	Other rules or remarks (15)
Indiana	X		Grades: row crops ≤8 percent pasture and hay ≤25 percent, forest and range ≤33 percent (slope lengths limited).	To grade of ≤33 percent or create lake in pit.	With 2 ft of soil, overburden, or water.	X	Other standards pertain to lakes, soil texture, and waste disposal.
Iowa	X	In coal mine reclamation, strata more suitable than topsoil may be used.	Grade spoil to ≤25 percent, except where original land was steeper, then, blend with adjacent land.	To grade of ≤33 percent.	With 2 ft of spoil	X (Detailed guidelines available.)	
Kansas	X	As necessary to provide plant growth material.	Rolling topography traversable for planned use. Grade ≤25 percent (slope lengths limited).	To grade of ≤25 percent unless supported, as by a lake.	With 2 ft of spoil or permanent water body.	X	Other standards pertain to removal of boulders and formation of lakes.
Kentucky	Detailed standards		Approximate original contour. Grade bench tables to ≤10 percent.	Auger mining face to ≤45°; other mining, backfill and cover coal to 4 ft.	With 4 ft of overburden	X (Detailed guidelines available, e.g., time of planting.)	Other, detailed standards on: access roads, lakes and sediment control.
Louisiana [3]							
Maine	X	X	X			X	
Maryland	X (pH range 6.8 to 8.5.)	X	Area: approximate contour. Terracing: grade the bench to ≤9 percent and outer slope grade to ≤70 percent.	Eliminate highwall by backfill and cut.	With 2 ft of overburden	Quick cover grass crop, followed by vegetation for end uses.	Specific survival standards for the vegetation established through reclamation.
Massachusetts [3]							
Michigan							
Minnesota							
Mississippi [3]							
Missouri			Act (1) traversable for farming: Act (2) traversable for intended uses and strike-off top of spoil ridges to width of ≤20 ft (forest and pasture).	Act (1), slope of face will be ≤25 percent.	With 4 ft of earth supportive of vegetation.	Appropriate to type of end use declared.	Exceptions allowed in grading on: Act (1), subdivisions and wildlife; Act (2) flood plains.
Montana	Act (1) specific criteria, e.g.—pH range of 6 to 9.	X	Act (1) grade to ≤20 percent.	Slope of face will be ≤20 percent.	Act (1) backfill with 8 ft of over-burden.	Suitable, permanent, diverse and primarily native species.	Effluent standards conform with criteria of State Department of Environmental Sciences.

Nebraska [3]							
Nevada [3]							
New Hampshire [3]							
New Jersey [3]							
New Mexico	X		Topography will be "gently undulating" or, consistent with proprosed end use.		X	To serve selected end use.	
New York	X	X	X	To be safe, stable and compatible with surrounding terrain.	X	X	Mining from State-owned submarine lands is covered by an other act.
North Carolina	X		Minimizing earth slides and consistent with future land use.		X	X (with appropriate local or State agency approval.)	
North Dakota	X	Replace all available plant growth material, up to 5 ft thickness.	Approximate original contour, or serve approved end use.	Slope of face will be ≤35 percent.		X	Remedy any impairment to domestic or livestock water supply.
Ohio	X	X (or other plant-growth materials.)	Approximate original contour, or serve approved end use.	X	X	X	
Oklahoma			Topography will be traversable for approved end use. Slope of box cut overburden will be ≤25°.	Suitable to serve enduse objective.	With 3 ft of overburden.	X (Exemptions; soils, with poor texture, toxicity, and nutrient deficiency.)	
Oregon	X		As appropriate for planned subsequent beneficial use.	As appropriate for planned subsequent beneficial use.		X	Visual screening, if economically practicable; streambank restoration.
Pennsylvania	X	X (12 in of soil, conditions permitting, or all available topsoil.)	Approximate original contour; terrace; or, serve approved end use.	Eliminate highwall	Varies with existing conditions.	X	Clean Streams Law also directly applicable.
Rhode Island [3]							
South Carolina	X		Minimizing slides and consistent with future land use.		X	X (with appropriate local or state agency approval).	Visual screening may be required.
South Dakota	X	X	"Achieve contour most beneficial to the proposed land use."	Slope will be ≤14°	With 8 ft of topsoil or suitable overburden.	To create self-regenerative growth without irrigation.	Noxious weeds must be controlled.
Tennessee	Detailed standards are in effect.	X	Contour: Fill benches prohibited on slopes >28°. Area: Approxmate original land surface.	Eliminate highwall with complete backfill, sloped to bench ≤35°.	With 4 ft of compacted material or permanent water body.	Where approved, permanent growth serving purpose at least as useful as pre-mining.	Standards differ by mineral: coal, phosphate, sand and gravel, clays, shale, and barite.
Texas	X	Use stratum best for plant growth.	Approximate original contour.	X	X	Establish diverse self-regenerative cover suitable for approved end use.	Principles stated on lakes, water rights, and ground water; 4-yr responsibility for vegetation.

See footnotes at end of table.

TABLE 1.—MATRIX OF INFORMATION ON STATE SURFACE MINED-AREA RECLAMATION PROGRAMS, DECEMBER 1975—Continued

	Control water now and quality (9)	Conserve and replace topsoil (10)	Backfill and grade (11)	Reduce highwall or pitwall (12)	Bury or neutralize toxic wastes (13)	Revegetate for beneficial use (14)	Other rules or remarks (15)
Utah	X	X	X (where "practical")		X	X (Priority to nonnoxious native plants.)	Program is implemented through orders that recognize individual site and mine conditions.
Vermont							Application for permit is viewed for conformity with State plan or planning principles.
Virginia	X		"... retain spoil on bench insofar as feasible ..."	"... reduce ... to the maximum extent practicable."	With 4 ft of material suitable for plant growth.	X	Standards for access roads across highwall; special preparation of soils in erosion prone areas.
Washington	X		Conform to surrounding land area.	Grade of wall in unconsolidated, ≤66 percent; wall slope in rock, ≤45°.	With 2 ft of clean fill	X	Requirements of other agencies relate to water rights, flood plains, and fish and wildlife.
West Virginia	Standards set forth in "Drainage Handbook for Surface Mining."	X	Fill benches denied on grades >65 percent; contour mined areas will be suitable for farm nachinery.	X	With 4 ft of material suitable for plant growth.	Detailed standards	Other detailed requirements exist for back fill and for stream crossings.
Wisconsin	X	X	X		X	X	Screening of site required.
Wyoming	X	Use most suitable plant growth materials.	Approximate original contour; terrace; or serve approved end use.	Stabilize; slope; minimize effect on landscape.	X	X	Protect soil stockpile from winds. Delay mining for archeologica or paleontological surveys.

	Requirements for land-use planning				Special provisions				
	Resources information required	Alternative uses will be considered	End use will be declared	Role of local public planning	Minerals protected from nonmining development	Exclusion of areas from consideration for mining	Longe-range or regional mine planning	Substitute lands allowed	Financial or economic analyses required
	16	17	18	19	20	21	22	23	24
Alabama	Hydrology and land use.	X	X	1975 Act is ". . . to preempt local . . . regulation of coal surface mining . . ."					
Alaska [1]									
Arizona [2]									
Arkansas	Soils	Any "productive use."	X					X	
California	Climate, geology, land use, minerals, population, topography, and water resources.	Operator must declare "potential uses."	X	Act on permits and reclamation plans and establish mining policy in general plans.	State may designate areas reserved for mining.				
Colorado	Geology, land use, minerals, topography, and water resources.		X	Review for conformity with local land-use controls.				X	
Connecticut [3]									
Delaware [3]									
Florida	Land use, minerals, soils, topography (USGS), and water resources.	Consider "landowner's desires."	X	Must certify excavation intended vation intended for property improvement.					
Georgia	Land use minerals, population, topography, and water resources.		X				Rules provide for long-range planning updated by annual permits.	X	
Hawaii	Soils, topography and water resources.	Land uses comparable, at least, to premining conditions.							
Idaho	Minerals and water resources.								

See footnotes at end of table.

TABLE 1.—MATRIX OF INFORMATION ON STATE SURFACE MINED-AREA RECLAMATION PROGRAMS, DECEMBER 1975—Continued

	Requirements for land-use planning				Special provisions				
	Resources information required	Alternative uses will be considered	End use will be declared	Role of local public planning	Minerals protected from nonmining development	Exclusion of areas from consideration for mining	Longe-range or regional mine planning	Substitute lands allowed	Financial or economic analyses required
	16	17	18	19	20	21	22	23	24
Illinois	Geology, land use, minerals, soils, topography (USGS), vegetation, water resources, and wildlife.	Agency will "encourage" consideration of multiple land use.	X	County board may recommend land use, and may request hearings.			Rules "encourage" long-range reclamation planning.	X	Land values, tax base, State and regional economy, employment and effect of plan.
Indiana	Geology, land use, minerals, soils, topography, and water resources.	X	X					Prohibited	
Iowa	Mineral, soils, and water resources.								
Kansas	Geology, soils, topography (USGS), and water resources.		X				Rules allow 5-yr plans for "contiguous" mined areas.	X	
Kentucky	Soils, topography (USGS), and water resources.			State permits must comply with local zoning laws.			Rules allow the development of "area plans" for mined areas.		
Louisiana [3]									
Maine	Minerals, soils, topography (USGS), vegetation, and water resources.								
Maryland	Minerals, soils, topography (USGS), and water resources.	X	X (Attention to land-owner's desires.)	Agency takes cognizance of county planning zoning, and grading permits.		Land sloping more than 20° (any 200 ft cross-section) is excluded.	"Encouraged." Annual permit renewals provide update.	Prohibited	
Massachusetts [3]									
Michigan	Environmental planning information may be required.								Act mandates studies of economic effects of regulations.

Minnesota				"Rules . . . shall conform with any State and local land-use planning program."		Agency identifies areas not reclaimable under present technology.		Act mandates consideration of economic effects of regulations.
Mississippi [3]								
Missouri		X	X				X	
Montana	Environmental areas, geology soils, mineral topography (USGS), vegetation, water resources (use plan and monitoring system), and wild ife		X			"Intended mining and reclamation plans" are developed to apply to life of operation.	Prohibited	Reclamation costs requested of applicant.
Nebraska [3]								
Nevada [3]								
New Hamphsire [3]								
New Jersey [3]								
New Mexico	Climate, land use, soils topography, vegetation, water resources, and wildlife.	X	X	Consultation required with soil and water conservation districts.				
New York	Land use, minerals, topography (USGS), and water resources.		X	Local mining laws and land use controls, stricter than the act prevail (but locals must enforce).				
North Carolina	Land use, minerals vegetation, and wildlife.		X					
North Dakota	Geology, land-use preference, minerals, soils, topography, vegetation, and water resources.	X	X			Act conveys authority to delete certain lands from surface mining.	"Extended Mining Plans" cover 10-yr period.	Agency may request estimate of costs of reclamation.
Ohio	Act (1) soils (test borings) and topography, Act (2) soils (test borings or prior operation).	X	X			Act (1) conveys authority to delete certain lands from surface mining.	Act (2) plan covers 10-yr period.	Act (1) applicant provides estimated cost of reclamation.

See footnotes at end of table.

TABLE 1.—MATRIX OF INFORMATION ON STATE SURFACE MINED-AREA RECLAMATION PROGRAMS, DECEMBER 1975—Continued

	Requirements for land-use planning				Special provisions				
	Resources information required	Alternative uses will be considered	End use will be declared	Role of local public planning	Minerals protected from nonmining development	Exclusion of areas from consideration for mining	Longe-range or regional mine planning	Substitute lands allowed	Financial or economic analyses required
	16	17	18	19	20	21	22	23	24
Oklahoma			X						
Oregon			X	Department may approve local governmental permitting or reviewing in lieu of State.					
Pennsylvania	Fisheries, geology, land use, minerals, and water resources.	X	X						Applicant provides detailed estimate of reclamation.
Rhode Island [3]									
South Carolina	Land use, topography (USGS), vegetation, and wildlife.		X	Local soil and water conservation districts review and comment.				X	
South Dakota	Land use, soil, minerals, topography, wildlife, vegetation, and water resources.		X	Incompatibility with local land plans can be basis for rejection of mining request by Agency.					Applicant provides detailed estimate of reclamation costs.
Tennessee	Land use, minerals, soils, topography (USGS), and water resources.		X						
Texas	Hydrologic effects, land capability, land use, minerals, soils, topography, vegetation, water sources, and wildlife.	Determine capacity of land for alternative uses.	X	Notified and comment is recorded.		Agency can declare "areas unsuitable for mining" (6 criteria).	Applicant must anticipate effects of reclamation over life of mine.		Agency conducts economic studies relating to item (22).
Utah	Land use, soils, vegetation, and water resources.	Explore capabilities of land to support a variety of uses.	X	Notified and comments taken under advisement.					

Vermont	Land capability and land use.	X	X	Action must accord with local plans.	X (Land development permits.)			
Virginia	Environmental impact study (implied), land use, minerals, topography (USGS), and water resources.	X	X	Local soil and water conservation districts advise.				
Washington	Land use, minerals, topography and water resources.		X	Applicant must show legality of action with regard to local zoning.				
West Virginia	Land use, minerals, soils, topography, and water resources.	X	X					
Wisconsin	Geology, land use, soils (suitability), topography, and water resources.			Mining, reclamation, and comprehensive plan shall conform to local zoning.	Act mandates a State program discouraging the preclusion of mining.		Agency may require comprehensive long-plan.	Applicant may be required to show costs data.
Wyoming	Geology, land use, soils, topography (USGS), vegetation, water resources (use and rights), and wildlife.		Must be ≥ highest previous use of site (as declared by Agency).	County involvement in administration of act.				Socioeconomic analyses may be needed by Agency to set use.

[1] On State lands, reclamation requirements are established by the State of Alaska—on a case-by-case basis—as part of the terms of leases to mine operators. Most of the mineral deposits of Alaska lie on State or Federal lands (where reclamation requirements are a condition of leasing).

[2] The State of Arizona applies standard reclamation requirements to State lands as a condition of mineral leases. Arizona also contains Federal lands where reclamation requirements are a condition of mineral leases. Some local units of government use land-use controls (e.g., zoning) and activity permits (e.g., minerals proceeding) to encourage reclamation.

[3] Local governmental land-use controls and permit activities may be applicable to mining and reclamation.

According to the Imhoff study, early State reclamation laws addressed only coal mining. Rules were promulgated requiring revegetation and, in some cases, reduction of spoil-pile slopes as a means of converting strip mined land to a land-cover type that would be of economic value and would reduce erosion. Near the close of the 1960's, however, many states expanded the coverage of their laws to include minerals other than coal, such as sand and gravel, clay, stone, etc.

The primary problem alleged with individual states regulating mining for coal or other minerals has been that a uniform set of regulations has been generally lacking. This type of arrangement allows the states to regulate mining activities according to the unique conditions which may exist in the individual states. In the case of coal, however, when one state passes stringent rules for the control of the mining industry and enforces these rules while a neighboring state does not, it creates a condition of unfair competition for mine operatiors n the first state who have higher costs but must compete for the same customers with operators in the second state.

Reclaiming mined land is expensive and the proponents of mining legislation have not denied this. Such additional costs are usually added to the price of coal along with other costs such as labor and amortization of the physical plant and equipment. If mine operators are not required by the State to reclaim mined land, they can pass this saving on to their consumers in the form of lower prices, thereby undercutting mine operators in other states who must reclaim land at additional costs. Therefore, the non-existence of a uniform set of requirements for mine operators simultaneously favors some and impairs the ability of others to compete in the open market for coal customers. This view was expressed in a statement before the Senate Subcommittee on Minerals, Materials, and Fuels of the Committee on Interior and Insular Affairs on March 2, 1977, by Mr. Robert A. Bohm, Associate Professor of Finance at the University of Tennessee who testified that a surface mining reclamation law is needed now "to provide coal mining states minimum standards of reclamation upon which to compete in the coal market."

Many State officials have expressed apprehension about the Federal government regulating an activity within their boundaries, which they claim could be better regulated by State and local officials. Much of this anxiety, however, is apparently based on a misunderstanding of the Federal bills. As they are written, both the House and Senate surface mining bills merely establish a framework within which the individual States may conduct their own reclamation and enforcement programs. Only in instances where a State is unwilling to establish an acceptable program for reclamation would the Federal government become actively involved in the regulation of coal surface mining within that State.

Much of the debate has centered on the adequancy of some of the individual state enforcement programs. Because of a concern regarding the capability of some states to properly enforce existing surface mining laws, the Center for Science in the Public Interest conducted a survey in 1975 to determine whether or not the States being surveyed (Kentucky, West Virginia, and Pennsylvania) were capable of and committed to a program of sound regulation.[4] The States included in the survey are major producers of coal through surface mining. At the time of the survey, the production figures for the three states for surface mining were as follows:

1974 SURFACE MINED PRODUCTION FOR THE 3 STATES SURVEYED

[In thousand tons]

	Total State surface mining production	Percent of State total production	Percent of U.S. total surface mining production
Kentucky	73,700	53.7	22.6
Pennsylvania	38.213	47.5	11.7
West Virginia	20,243	19.8	6.2

According to the CSPI report, over the last few years, in Kentucky there has been a sharp increase in the number of permits issued to operators for the development of surface coal mines in Kentucky. In 1974, the State issued a total of over

[4] Enforcement of Strip Mining Laws, by the Center for Science in the Public Interest, 1975. (CSPI).

1,400 permits, up from 677 the preceding year. Unfortuantely, at the time of the survey, the office responsible for the reviewing of the mining permits had only three staff members, two of whom were responsible for permit review in the eastern part of the State and the third was responsible for the western half.

As of August, 1975, notwithstanding the doubling of the permit applications over the preceding year, the staff responsible for reviewing these permits had not been increased. Assuming that there are 220 days in the standard working year, this would mean that each of the three staff members would be responsible for processing at least two permit applications each day of the year. CSPI concluded that:

". . . Kentucky's system of permit review is conducted in a deficient and hurried fashion by an untrained and understaffed section of DNREP (Department of Natural Resources and Environmental Protection). Inspectors—also involved in the permit review procedure—are overworked and incompetent. Citizens, who could serve as a check upon the state's review system are prevented from participating by lack of notice."

Also, according to the following salary schedule of the State inspectors which was included in the CSPI report, the field inspection staff earns a relatively low wage, especially when compared with the wages of the miners:

	Amount per month	Amount per year
Inspectors	$583	$6,996
Senior inspectors	710	8,620
Chief inspectors	802	9,624
Supervisor	951	11,312
Reclamation supervisor	1,048	12,576

The report also observed that the extremely low salaries of the inspectors, especially the field inspectors, made them prime targets for favors from mine operators less than anxious to comply with the State's surface mining laws.

In West Virginia, the authors concluded that the staff of the regulatory agency had, in some instances, become too closely allied with the operators they were responsible for regulating and that the problem was not one of having an adequate staff, but rather, one of inefficient application of the staff that was available.

Because one of the provisions of the existing surface mining law was in litigation at the time the report was written, the authors also reported that the regulatory agency was being too lenient because it expected the court to rule in favor of the operators. Finally, the lack of adequate records, particularly on the frequency of inspections at each mine, was cited as a weakness of the State's regulatory system.

CSPI gave the state of Pennsylvania relatively high marks in the field of reclamation enforcement, primarily in the bituminous coal fields. In the anthracite areas in the eastern part of the State, however, the authors indicated that there was a general lack of inspections. Crucial to this lack of inspections was the feeling that many of the field inspectors had been intimidated by either mine operators or workers whenever they approached the mines to conduct their inspections. CSPI did indicate that Pennsylvania's law did contain elements which served as motivations to reclaim the land. Among these were the fines that could be assessed against operators in noncompliance, the bonding requirements of the State law, and the authority of the field inspectors to issue cease and desist orders on-site. According to the report, the State has the option of imposing a fine of $5,000 and/or imprisoning the operator or relieving the operator of his total profits during the course of his violations. The threat of losing total profits from the operation probably acts as more of a deterrent against violating the law than does the $5,000 fine, especially for the larger operators who could well afford to pay the fine. With respect to the bonding provisions, the State requires that a bond be posted which would be sufficient for the State to reclaim the land in the event that the operator chooses to forfeit the bond. Finally, as an incentive for operators to keep their mines in compliance with existing regulations, the State has empowered the field inspectors to issue cease-and-desist orders at the mine sites. According to CSPI, this type of action is considered by many to be a doubled-edged sword which cuts off the company's profits immediately by halting the operation and forces remedial action before operations may be resumed.

CSPI did indicate, however, that the salaries of some of the inspectors, which on the average are lower than the industry workers, have made them the target for

occasional favors from some operators. The report stated that there is one case on record in which an inspector was convicted of accepting bribes for not enforcing the law. The authors concluded that, of the three States which were surveyed, Pennsylvania appeared to have the most diligent enforcement operations. No statement by the coal mining industry refuting the findings of the CSPI report could be found.

Because of the conflicting claims by proponents and opponents of Federal legislation to regulate surface mining and because of the charges and countercharges in various reports, the Senate Committee on Energy and Natural Resources recently sought information directly from the States involved. In order to determine the effectiveness of existing State laws, the staff of the Committee and the Congressional Research Service developed an extensive questionnaire which was sent to 39 states that have surface mining laws for coal or other minerals. The questionnaire is reprinted in its entirety on the following pages, along with the CRS analysis of the responses by the states and a matrix summary of that information.

SUMMARY

The effectiveness of State regulation of surface mining, as indicated in responses to a questionnaire sent by the Senate Committee on Energy and Natural Resources, varies greatly from State to State. The results from the survey suggest that most requirements of the State laws are far less stringent than the proposed Federal regulations in H.R. 13950 would be. The survey also indicates that the relative weakness of these laws is further compounded in many cases by extremely lenient or even non-existent enforcement of the laws that do exist.

The usefulness of the Committee's survey is limited by the quality of the responses, which differed widely. Some States provided prompt and complete answers as requested. A large number of states, however, including some that produce significant amounts of coal, made only token responses to the Committee's effort to obtain an accurate determination of the existing extent of state control of this problem. The coal mining industry has claimed that State laws are sufficient to prevent future mining abuses; environmentalists and others dispute this claim. An accurate understanding of the degree to which the States actually regulate surface mining, therefore, appears essential to the resolution of the issue of whether or not Federal controls are needed.

Some States expressed interest in formulating a workable surface mining control and reclamation policy for the Federal Government and were grateful for the opportunity to provide input to the legislative process. Much of the information which was forwarded by the states was too complex to fit into the matrix and had to be footnoted for further explanation.

Some of the information requiring more detailed analysis was included in the text of the report.

As shown in the matrix, virtually all of the states which have surface mining laws require that mine operators first obtain permits before engaging in active mining. This concept appears compatible with the requirements of the Federal bill, H.R. 13950, with which, the various states were asked, by the Senate Energy and Natural Resources Committee through its survey, to compare their respective laws. Even though the permit requirements are similar in most instances, procedures for permits in H.R. 13950 are for the most part much more detailed than those of the States, the Ohio law being an exception. Ohio mining law is very similar to the Federal proposal and requires detailed information from prospective mine operators.

Abandoned Lands Reclamation Programs

Few of the states in the survey have implemented any programs of reclaiming land which was mined prior to the passage of the State mining laws. Exceptions to this include Kentucky and Virginia which have either directly appropriated money for such reclamation or have procured money from other government agencies such as the TVA. Some of the other states have also initiated programs to reclaim abandoned lands by using the proceeds from fines for noncompliance or from permit application fees. Of the States that reported such programs, Kentucky had the largest expenditures with approximately $1.5 million designated for reclamation of abandoned lands. A large percentage of the coal-producing states which admitted having problems with abandoned lands also indicated that the largest percentage of these lands either had been or were being left to be reclaimed naturally.

Mine Inspectors

Mine inspection problems reported by the various states consisted of:

Inadequate number of mine inspectors for the number of mining operations under permit in the state.

Inadequate professional training for surface mine inspectors.

Distance of the mine inspectors to the mines being inspected.

The inspection capabilities vary considerably from State to State. Some of the key coal-mining states such as Kentucky have ratios of one inspector for 75 coal mines. Others, which are not major coal producers, such as Kansas, have only one inspector for the entire state. In this instance, one individual is responsible for the regulation of the total of 97 surface mining operations in the State. In Georgia, the ratio is one inspector to 85 mines, and in Idaho one to 362. Pennsylvania, one of the most important coal-producing States, replied that it had an inspector-to-mine ratio of between one to 50 and one to 100. Ratios such as these usually require inspectors to devote much less time to the inspection of each mine at the cost of the thoroughness of the inspection. For example, in the case of West Virginia, the law requires inspectors to inspect each mine at least once every two weeks.

With the ratio of mine inspectors to mines in West Virginia being about one to 17.5, that law on the face of it could be hard to administer. An inspector has a difficult time inspecting one mine a day. Given a five-day work week, an inspector in two weeks would have to exert a rigorous effort to thoroughly review 10 mines; 17.5 mines would be that much more difficult. Such high ratios may be the result of inadequate funding for mine inspection in the various states; if true, the ratios could be alleviated by the implementation of Federal strip mine controls with their associated appropriations for mine inspection. In any case, if the demands for coal production projected by the FEA materialize between now and 1985, it is open to question whether the present mine inspection personnel can assume the additional workload that will be generated by the almost certain increase in the number of surface mines that will be opened.

Many State inspection officers have not had adequate training to detect reclamation problems. A large number of these officials are not graduates of mining engineering programs and, according to the States, lack training in other disciplines such as agronomy, forestry, hydrology, and geology, which are vital to adequate reclamation efforts. It should be noted, however, that many of the enforcement officers that lack the technical training or have degrees in liberal arts are older and have been with the enforcement agencies for many years and thus have much experience. The States, however, do appear to be hiring young field inspectors with more substantial backgrounds in environmental sciences and actual mining experience.

The location of mine inspectors near the mines which they are to inspect was also perceived as a problem. Such close proximity could result in the intimidation of mine inspectors and their families by uncooperative operators; in some cases, substandard wages of the mine inspectors could make them susceptible to favors from the mining industry.

Citizens Complaints

Many State mining laws do not have adequate mechanisms for the filing, consideration, and disposition of citizen complaints related to coal surface mining. This is evidenced by the disproportionately small number of operations that were either halted or modified as a result of citizen complaints. With the exception of Kentucky and West Virginia, very few of the major coal-mining states conducted hearings arising from such complaints. Although many of the opponents of the Federal bills have complained that the review and hearings procedures in the bills would be an unnecessary hindrance, the State survey reveals that some improvements in the present State systems could be made. Of all of the States participating in the survey, Tennessee, South Dakota, Montana, and Kentucky were the only ones which indicated that a mining operation had either halted or been modified as a result of a citizen complaint.

Enforcement

The survey also indicates that even when violations have been discovered in a State, fines assessed against the operators were small in size and in number. Kentucky, Montana, Ohio, and Virginia were among the few States which have actually assessed fines against mine operators for non-compliance with the law.

One of the largest coal producers, West Virginia, indicated in the survey that no fines or prison sentences had yet been imposed.

Bonding

The survey indicates that the most serious shortcoming of the state surface-mining laws seems to be that of not requiring an adequate amount of performance bond to insure reclamation in the event of forfeiture by the operator. Indiana, Virginia, Kentucky, Missouri, and Kansas reported that the average amount of performance bond required of the mine operators would not cover reclamation costs in the event that the State has to perform that reclamation itself or award a contract to have the job done. In the case of Indiana, the State agency responded that it had not reclaimed lands under forfeited bond because the costs exceeded the amount of the bond required of the operator. Indiana indicated that the average amount of bond forfeited per acre under permit was $268.05. When the State accepted estimates for the reclamation of the land, however, it learned that the reclamation cost could range between $2000 and $4000 per acre, leaving a shortfall between $1700 ans $3700 per acre in the amount of performance bond. Not all of the coal-producing States have seen this discrepancy develop. Illinois and Ohio are two states that require apparently adequate amounts of performance bonds, in the $3000/acre range; some of the other states require the performance bond to be sufficient to reclaim the land, whatever the cost, by the state or by a third party in the event of forfeiture by the operator. This is the same concept proposed by H.R. 13950. In instances where the mining operation is carried on over a long period of time and where contemporaneous reclamation is not required, it may be desirable to require a bond in an amount sufficient to reclaim the affected areas at the end of the projected period for mining. The bond could cover any increases in costs between the time the permit is granted and the actual reclamation is started.

Regardless of the mechanisms used to require reclamation, a feature of the performance bond which would give it more authority is that an amount be set which is sufficient to motivate the operators to completely reclaim the affected areas. The action of forfeiting performance bond in all cases, therefore, should be a less attractive alternative than incurring the cost of adequate reclamation.

THE COAL INDUSTRY AND AIR QUALITY: STATUTORY PROVISIONS AND REGULATIONS AFFECTING THE MINING AND PROCESSING OF COAL*

Numerous sections of the Clean Air Act Amendments of 1977 (P.L. 95–95) mandate controls for installations which use coal as their major fuel, and therefore affect the marketability and utilization of various types of coal. In addition, the law contains several provisions which are designed to limit emissions from the activities of the coal mining industry itself. Together, they reflect the Nation's policy that, while the use of coal should be increased significantly, this effort should be carried out in a manner consistent with a continuing national commitment to protect and improve air quality.

The statutory provisions affect four major operational categories: coal extraction, coal preparation, coal transportation, and siting of major coal extraction and coal burning facilities. Of these, the most significant, from the standpoint of the industry's current and future operations, are those provisions in the Act which affect the location of mining and coal preparation sites, and those which seek to prevent large-scale local economic disruption and unemployment by maximizing the use of local coal and minimizing long-distance transport of coal. These provisions also are likely to have a strong impact on the siting of new major coal burning plants.

---

*Maria H. Grimes, Analyst in Environmental Policy, Congressional Research Service.

Coal extraction

Underground mining operations are not subject to regulations under P.L. 95–95. Strip mining, however, generates large amounts of particulates, one of the pollutants subject to limitation under the Prevention of Significant Deterioration (PSD) provisions of the law (secs. 160–169), sec. 169A, Visibility Protection and under secs. 171–178, Plan Requirements for Nonattainment Areas.

a. Prevention of Significant Deterioration (PSD)

Particulates generated on the site of a strip mine are mainly in the form of fugitive dust—dust created by mining, handling and hauling operations. For example, estimated particulate emissions on the site of a strip mining operation which produces approximately 10 million tons of coal per year and disturbs about 76 acres during that time period, are 819 tons per year.[1] This level of emission would make the source a "major emitting facility" subject to PSD requirements, which, by definition, is "any . . . source with the potential to emit two hundred and fifty tons per year or more of any air pollutant."

All classifications provided for by the PSD program allow only small increases in particulate pollution above existing (baseline) concentrations. The permissible maximum increments are as follows:

[In micrograms per cubic meter]

	Annual geometric means	24-hour maximum
Class I	5	10
Class II	19	37
Class III	37	75

The Act provides for a possible redesignation of an area. Application may be made to the State for a redesignation to a classification with a more generous permissible increment. The State's decision is subject to EPA approval. If the application is approved, the change is embodied in the State's Implementation Plan which is designed to attain and maintain national ambient air quality standards by a given date, and thus must be suitably adjusted to attain its goals despite the classification change. Therefore, the applicant would have to show, at a minimum, that emissions from his projected operation will not exceed the limits set for the redesignated area.

In addition, the applicant must use "best available control technology" (BACT) to abate particulates emitted from the proposed new facility; an assessment must be made of the anticipated effects of growth in the area which results from the construction and operation of the new facility; and the applicant must agree to monitor the effect on the air quality in other areas of the emissions resulting from his operations.

A construction permit hinges also on the determination by a Federal Land Manager responsible for a nearby Class I area, or for the Class I

---

[1] (U.S. Department of Interior, Draft Environmental Statement, Proposed Mining and Reclamation Plan, East Gillette Mine, Campbell County, Wyo., 1974).

area in which the facility is to be located, that visibility and other air quality values will not be impaired as a result of the particular emissions generated by the new facility. A permit cannot be issued if EPA, an adjoining State or the appropriate Federal Land Manager identify a potential adverse effect on the air quality of the regions for which they are responsible. (sec. 165—Preconstruction requirements).

b. *Nonattainment Areas* (secs. 171–178)

Many areas of the country have thus far failed to attain ambient air quality standards set for individual air pollutants, including particulates. Therefore the 1977 Act requires the "nonattainment area" States to have a revised implementation plan approved by July 1, 1979, with final compliance by December 31, 1982. All new or substantially modified stationary air pollution sources are required to secure a preconstruction permit and to demonstrate progress toward emission reductions, culminating in final compliance by a specified date.

Requirements which an applicant must meet to secure a preconstruction permit are similar to those for PSD. Adjustments to be made in the State Implementation Plan (SIP) to accommodate a new source are, however, more specifically defined in order to ensure that air quality standards for a pollutant which is not yet adequately controlled, will be met on schedule. The SIP revisions must contain:

1. A definition of the geographic area for which control strategies have been or will be developed;
2. an accurate, comprehensive, and current (1977 calendar year) inventory of existing emissions;
3. A determination of the level of control needed to demonstrate attainment by 1982 (including growth);
4. Legally enforceable control measures for attainment;
5. Emission reduction estimates for each control measure;
6. Provisions for reasonable further progress toward attainment of primary and secondary standards;
7. Identification and quantification of emission growth increments from new or modified stationary sources or from an emission offset regulation;
8. Provisions for annual reporting of progress. (See 43 FR 21673 for details.)

To ensure that economic growth would not be impeded in a nonattainment area, EPA has developed an "offset policy" with an Interpretative Ruling (41 FR 55524) that establishes a preconstruction review requirement for facilities to be built in nonattainment areas. It requires reductions from one or more existing sources. New source performance standards must be met through the use of BACT. The net total emissions from new sources together with additional reductions must contribute to a reasonable progress toward attainment of ambient standards.

The States are not required to adopt the offset strategy; instead, they may adopt or enforce any standard or limitation more stringent than the Federal requirements.

In terms of the impact of these regulations on strip mining operations, the statute holds that no department, agency, or instrumentality of the Federal Government shall (1) engage in, (2) support in any way or provide financial assistance for, (3) license or permit, or

(4) approve any activity that does not conform to a plan after it has been approved or promulgated. Furthermore, the Act prohibits EPA from approving any projects or awarding any grants in any area where ambient air quality has not been attained in the absence of an approved implementation plan.

Coal Preparation

The main purpose of coal preparation is to beneficiate, i.e., increase the heating value of the coal by mechanical removal of impurities: raw coal may incorporate as much as 60% of reject matter, much of which must be removed in some cases if the product is to become marketable. When this process can be accomplished at or near the mine site considerable freight savings can be realized, and the rejected materials disposed of more easily.

Real costs involved in coal preparation, however, vary widely depending on actual conditions and requirements. The following table illustrates one approach to quantifying such costs although it is suitable only for comparing relative costs of beneficiating coals at different levels of preparation. It was adapted from data developed by the Commerce Department for its "Report on Sulfur Oxide Control Technology."

RELATIVE COSTS OF COAL INCLUDING PREPARATION

[2,000,000 tons per year clean coal production]

1. Levels of preparation	A	B	C	D	(E)	(F)	
						Full beneficiation	
2. Brief designation	Absence of preparation	Breaking only	Coarse beneficiation	Deliberate beneficiation	Elaborate beneficiation	Clean coal	Middlings
3. Yield: Percent weight (Y)	100	95	80	75	70	80	
4. Recovery: Percent Btu (R)	100	99	95	90	87.5	95	
5. Btu content ROM coal, Btu/pounds (B_r)	12,000	12,000	12,000	12,000	12,000	12,000	12,000
6. Btu content clean coal, Btu/pounds (B_c)	12,000	12,505	14,250	14,400	15,000	15,200	13,620
7. Hourly input, ROM coal, tons per hour	667	700	840	890	950	280	560
8. Hourly output, clean coal, tons per hour	667	667	667	667	667	222	445
9. Total capital investment, dollars	0	2,000,000	7,600,000	17,000,000	21,000,000	26,000,000	
10. Cost per tons per hour ROM coal capacity, dollars/tons per hour	0	3,000	9,000	19,000	22,000	31,000	
11. Cost per annual ton clean coal, dollars/tons per year	0	1.00	3.80	8.50	10.50	12.75	
12. Fixed charges on capital, dollars/ton	0	0.30	1.14	2.57	3.17	3.83	
13. O&M costs including refuse disposal	0	0.12	0.56	1.33	2.23	2.50	
14. Cost of preparation, dollars/ton clean coal (P/C)	0	0.42	1.70	3.90	5.40	6.33	
15. Cost of prepration, dollars/10^6 Btu (C_p)	0	0.017	0.060	0.135	0.180	0.625	0
16. Cost of Btu loss, dollars/10^6 Btu (C_b)	0	0.006	0.033	0.069	0.089	0.100	0
17. Total cost of preparation, dollars/10^6 Btu (C_T)	0	0.023	0.093	0.204	0.269	0.725	0
18. Cost of ROM coal, dollrs/10^6 Btu (C_R)	0.625	0.625	0.625	0.625	0.625	0.625	0.625
19. Cost of clean coal dollars/10^6 Btu (C_C)		0.648	0.718	0.829	0.894	1.350	0.625
20. Cost of clean coal, dollars/ton	15.00	16.20	20.46	23.88	26.82	41.04	17.03
21. Percent increase, thermal cost		4	15	33	43	116	0
22. Preparation cost, mills/kWh		0.23	0.93	2.04	2.69	7.25	0

Coal preparation plants which process more than 200 tons of coal per day are subject to New Source Performance Standards (NSPS), published by EPA in 41 FR 10, January 15, 1976. The facilities in the plants which are affected by these standards are thermal dryers, pneumatic coal cleaning equipment, coal processing equipment including breakers and crushers, and coal transfer and loading facilities. However, transfer and loading docks are included only if they are a part of the coal preparation plant. Isolated coal storage and transfer stations and open coal storage piles are excluded.

Coal Transportation

Conveyors are used to deliver the coal from the mines to the processing plant. Centrally located cleaning plants are served by trucks and rail cars which transport raw coal from the individual mines, cleaned coal to stockpiles or loading terminals and refuse to disposal sites. Conveyors are subject to NSPS. Emissions from trucks and other heavy duty vehicles are regulated by Sec. 202 of P.L. 95–95.

The additional traffic generated by the mining and coal processing activities may also be regulated by statutory provisions. Facilities or installations which attract, or may attract, mobile sources of pollution are termed "indirect sources". A State which has difficulties controlling pollutants generated by mobile sources, especially carbon monoxide, may, under terms of the 1977 law, take measures to decrease pollution generated indirectly by facilities to which the additional traffic gravitates. Trucks and other vehicles which serve mines and coal processing facilities would be subject to such State-imposed regulations.

Facilities Siting

Largely in order to minimize transportation costs, and because proximity to the source can ensure a steady supply of the desired grade of coal, large users of a mine's product try to locate as close to their source of supply as possible. In areas subject to PSD or nonattainment regulations this practice can create a competitive situation if the available pollution increment is small or has been used up, or an existing major plant or plants cannot be found that can further reduce emissions to compensate for the entry into the area of a new major polluting facility. Although such problems are likely to arise mainly in the case of sulfur oxides (SOx) rather than particulate pollution, they may, for example, preclude or delay the construction of a new coal processing plant which, in turn, may determine whether a mine could be opened or enlarged in a given area, and affect the marketability of its product. Similarly, if a potential user of the coal from a given mine cannot obtain a permit to build his facility nearby, he may conclude that it will be more cost effective to contract for his fuel supply elsewhere. Congress recognized that such constraints could result in appreciable economic disruption in areas which expect to benefit from expanded mining operations, and in regions which experience a decrease in demand for their coal because of air quality safeguards. Therefore, the Act includes provisions which are designed to cushion or offset such detrimental economic effects.

Prevention of Economic Disruption and Unemployment

Measures designed to offset the possible negative effects on local economies are concerned particularly with the implementation of

PSD and nonattainment provisions, New Source Performance Standards for major coal users, and other requirements involving increased capital and operating expenditures to which coal burning facilities are subject.

Section 125 is concerned with actions to prevent or minimize significant local or regional economic disruption or unemployment which would result from the use of fuels other than those produced regionally or locally, in order to comply with emission control requirements. This action is subject to the following requirements:

After notification and an opportunity for a public hearing, the Governor of a State, the Administrator of the Environmental Protection Agency (EPA), or the President may determine that action is necessary to prevent or minimize significant local or regional economic disruption or unemployment. The action would have to be based on the finding that the projected economic disruption is due to continued use by a major stationary source located in the State of fuels that are not produced locally, but are used to comply with emission control regulations incorporated in the State's Implementation Plan (SIP).

Upon arriving at such a determination, the President (or the Governor with the President's written consent) may by order or rule prohibit these sources from using fuels other than locally or regionally produced fuels to comply with SIP requirements. (Locally or regionally available coal or coal derivatives are characterized as fuels which the State or EPA determines are, or are feasible to be, locally mined or produced).

A source to which this prohibition is issued must contract to be supplied with regional coal or coal derivatives for at least ten years, unless the President modifies this requirement for good cause; contract for the purchase of additional emission control systems which may be needed to comply with the law during this period; and meet all attainment schedules and other SIP requirements.

A determination of this type must take into account the final cost to the consumer resulting from the decision. The subsequent order to switch to local coal is contingent on the long-term availability of the fuel as expressed by the contract, and a contract to acquire additional emission control technology to meet attainment schedules and other requirements to assure compliance with the Act.

Only "existing or new major fuel burning stationary sources" are subject to these provisions. The Clean Air Act characterizes them as installations which EPA has determined to have been designed to produce at least 250 million BTU's per hour (or its equivalent); are not in compliance with the applicable SIP; or are prohibited by any law from burning oil or natural gas or both. This description also applies to new plants which must comply with standards of performance required for a specific industrial category (sections 111 and 120) and to plants which, because they have been modified, emit a larger volume of a pollutant, or an additional pollutant.

Large coal washing plants usually are located in the mining area and, for optimum economy, are sometimes used for more than a single mine. Coal screening and crushing plants are found at all mine loading sites as well as near the user plants at widely scattered locations. Thus they are also subject to the same restrictions contained in the PSD, visibility and nonattainment provisions as are all major emitting facilities.

Enforcement Procedures Applicable to the Coal Industry

In the case of a violation of an existing State Implementation Plan provision, the industrial violator, the State administering the plan, or both, must be ordered to comply and can be subject to a civil action suit. A similar order to comply, a civil action suit, and levy of a daily penalty also are required in the case of noncompliance with other mandated requirements, and must be issued to the appropriate State or to the noncomplying industry and its responsible corporate officer.

A delay of compliance with applicable standards by stated deadlines may be granted by EPA when a major installation has been ordered to convert to coal as its primary energy source. EPA may also establish priorities for the delivery of emission reduction systems to noncomplying facilities depending on the air quality in the area in which the plant is located, with preference to nonattainment areas. In such an event, the affected installation must take interim abatement measures to avoid any "imminent or substantial danger" to public health.

The Act also requires the levy of a noncompliance penalty against the owner or operator of any major emitting source which fails to meet appropriate standards or compliance deadlines (section 120). The plant may obtain a waiver of the penalty if it demonstrates that its noncompliance is due solely to a Federal order to convert to coal, a prohibition from using fuels other than coal as the primary energy source, or an emergency suspension of requirements which a Governor may issue when a severe national or regional energy emergency exists which is causing high local unemployment.

COAL MINE HEALTH AND SAFETY*

The health and safety hazards associated with the mining of coal have long been a issue of Federal concern. As far back as 1825, a bill was introduced in Congress to establish a Federal Mining Bureau but it wasn't until 1910, after a series of major mine disasters, that such an agency (the U.S. Bureau of Mines in the Department of the Interior) was established. The Bureau was given the responsibility of investigating and adapting mining methods particularly those related to the safety of miners, improving mine working conditions, and preventing mining accidents.

A series of mine health and safety laws was subsequently enacted during the next 50 years but their scope and enforcement authority were very limited. It wasn't until the enactment of the Coal Mine Health and Safety Act of 1969 (Public Law 91–153) that the coal industry was required to comply with Federal standards that encompassed almost every aspect of the day-to-day mining operations of an underground coal mine, and that also set standards for the surface work areas of an underground mine and for surface mines.

Responsibility for the administration of the 1969 Act was delegated primarily to the U.S. Bureau of Mines. On July 16, 1973 the regulatory functions of the Act were taken over by the newly organized Mining Enforcement and Safety Administration (MESA) of the Department of the Interior. On March 9, 1978 the Federal Mine Safety and Health

---

*Barbara Bascle, Senior Reference Assistant, Senior Specialist Division, Congressional Research Service, and Geraldine Carr, Analyst, Science Policy Division, Congressional Research Service.

Amendments Act of 1977 (Public Law 95–164) became effective, providing a single law for all types of mining operations under the Coal Mine Health and Safety Act of 1969. The law establishes the Mining Safety and Health Administration (MSHA) and transfers the regulatory authority from the Department of the Interior to the Department of Labor. In addition, the new law provides for: (1) new procedures to streamline and speed up the regulation-making process; (2) stronger mechanisms for enforcing compliance with Federal health and safety standards, including increased capability of dealing with the most dangerous mine hazards and with operators who have an established pattern of violations; (3) increased emphasis on protection of miners' health; (4) greater involvement of miners or their representatives in processes affecting workers' health and safety; and (5) improved procedures for assessing and collecting civil penalties imposed for violating mine health or safety requirements.

The 1969 Act is often cited as a major factor in the decline in productivity [1] in the underground coal industry because of the increased number of personnel and time required to comply with the regulations. Of the total payroll of a large underground mine, it has been estimated that from 15 to 20 percent of the employees are engaged in the performance of Act-related tasks.[2]

An industry spokesman[3] testified at Congressional hearings that the impact and far-reaching implications of the Act on the underground coal mine industry caused a drastic change in the manner in which coal mines were operated and had a major economic impact on the coal industry. Cited as an example of the inclusiveness of the Act were the numerous mandatory safety standards (200 were introduced on just one day) and health standards. Industry felt that regulations were coming out so fast that it was an impossible task for the operators to keep up with the various amendments and changes to the regulations. In some instances, it was felt that the requirements mandated by the Act actually outpaced existing technologies and availability of prescribed equipment. A prominent government official [4] has been quoted as saying: "Simply stated, the Act required a safety revolution in the coal mines within 90 days and a health revolution in an additional 90 days".

Increased operating costs in undergound coal mines have been attributed by government experts to the Coal Act:

> Definite changes were required in most mine operations to achieve respirable dust control, to increase general ventilation requirements, to make appropriate equipment changes and modifications, and to comply with manpower training and certification criteria. These measures, as would be expected, increased mining costs considerably.[5]

In 1973, a Department of Interior expert reported:

> Few new underground mines were opened in 1971, and scores of existing deep mines were closed because of increased production costs of operating under regula-

---

[1] See the section on coal mine productivity for a more detailed discussion on the subject.

[2] Statement by Ralph E. Bailey, Chairman and Chief Executive Officer, Consolidation Coal Co., Pittsburgh, Pa. Hearings before the House Committee on Education and Labor Subcommittee on Labor Standards. Mar. 29, 1977. Washington, D.C., U.S. Govt. Print. Off., 1977, p. 31.

[3] Ibid, p. 27.

[4] Statement by Henry Wheeler, Jr., Deputy Director Health and Safety, U.S. Bureau of Mines. "The Federal Coal Mine Health and Safety Act of 1969" *in* Coal Mining and Processing, January 1971, p. 49.

[5] U.S. Bureau of Mines, "Coal—bituminous and lignite" *in* Minerals Yearbook, 1970. Washington D.C., U.S. Government Printing Office, 1972, p. 327.

tions imposed by the Federal Coal Mine Health and Safety Act of 1969. The total number of deep mines declined from 2,939 in 1970 to 2,268 in 1971 * * *[6]

The 1969 Coal Mine Health and Safety Act is, therefore, considered a cause of increased operating costs, reduction in productivity, and mine closings. However, looking at health and safety of miners solely from an economical standpoint implies that a dollar value can be placed on the value of a miner's life and health. Therefore, it is also important to analyze the effect of the 1969 Act with regard to increased safety in the coal mining industry and improvement in the working environment of coal miners since its enactment.

The frequency rate per million man-hours for fatalities in bituminous coal and lignite mines has shown a steady decline during most of the last ten years, from 0.93 in 1967 to 0.34 in 1977 (Table 1). For disabling injuries in bituminous and lignite mines the frequency rate has also dropped, but less consistently, from 42.3 per million man hours in 1967 to 37.5 in 1977. Fatality rates per million man hours in anthracite mines, however, have not shown any consistent decline, with 1977 having the highest rate in ten years (Table 1). Likewise, the disability rate for anthracite mines has fluctuated greatly, and no real trend in improvement has occurred with the passage of the 1969 Coal Act.

TABLE 1.—INJURY STATISTICS IN COAL MINING

[Per million man-hours]

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Bituminous and lignite:[1]											
Fatality frequency rate[2]	0.93	1.37	0.84	1.02	0.72	0.59	0.48	0.45	0.42	0.37	0.34
All disabling injury frequency rate[2]	NA	42.3	42.3	45.2	47.1	46.6	40.5	28.9	30.3	37.7	37.5
Anthracite:[1]											
Fatality frequency rate	.73	.36	1.29	.49	.54	.48	.17	.39	.40	.19	2.17
All disabling injury frequency rate	NA	46.1	50.1	49.7	59.9	51.5	56.4	48.8	51.2	56.8	54.6
Bituminous—Underground:[3]											
Fatality frequency rate	1.04	1.66	.95	1.21	.87	.68	.55	.50	.48	.37	[4].40
All disabling injury frequency rate	48.11	48.36	49.72	52.83	53.62	55.88	49.12	35.32	37.59	45.70	[4]50.06
Bituminous—Surface:[3]											
Fatality frequency rate	.55	.67	.64	.59	.43	.37	.30	.36	.35	.30	4.23
All disabling injury frequency rate	22.64	24.67	22.86	25.46	25.84	24.04	20.18	16.49	17.49	18.50	[4]18.12

[1] D. K. Walker, MSHA—Chief, Health and Safety Analysis Center, Denver, Colo. Personal communication, Aug. 28, 1978.
[2] All disabling injuries—Includes any injury suffered by a person that arises out of and in the course of employment that results in death, permanent total disability, permanent partial disability, or temporary total disability.
[3] National Coal Association. "Coal Facts," 1977–78. Washington, D.C., 1978, p. 90.
[4] MESA. MESA Safety Reviews, December 1977, p. 9. (Data for surface mines includes only strip mines. All data are preliminary for 1977.)

As can be seen in Table 1, the fatality and disabling frequency rates for underground bituminous mines[7] are more than double those of the surface bituminous coal mines. Fatality frequency rates for both underground and surface mines have declined since 1967. However, disabling frequency rates for underground mines have actually increased since then, while disabling injury frequency rates for surface mines have decreased since 1967.

The Federal Coal Mine Health and Safety Act of 1969 also established the Black Lung Benefits Program under Title IV. The program

[6] U.S. Bureau of Mines. "Coal—bituminous and lignite" *in* Minerals Yearbook, 1971. Washington, D.C:, U.S. Government Printing Office 1973, p. 325.
[7] Bituminous mines account for almost 97 percent of total coal production and almost 98 percent of the total workforce employed in coal mining in the United States; therefore, data excluding anthracite and lignite mines is considered to be representative of the industry.

provides monthly payments and medical treatment benefits to coal miners totally disabled from pneumoconiosis (black lung) and benefits for their surviving dependents. In February, the Black Lung Benefits Revenue Act of 1977 (P.L. 95–227) was signed, and in March 1978, the Black Lung Benefits Reform Act of 1977 (P.L. 95–239) was signed. Public Law 95–239 removes certain eligibility restrictions that had previously prevented many coal miners and their survivors from obtaining benefits, and makes the Black Lung Benefit Program permanent. Public Law 95–227 establishes a Black Lung Disability Trust Fund to finance the cost of black lung claims, and thereby places a greater share of the cost of financing the program on the coal operators.

Some of the major changes regarding the eligibility of claimants include:

1. The term "miner" is amended to include not only those individuals responsible for the actual mining of the coal (surface and underground) but those working in and around the mine engaged in the extraction, preparation, mine construction or transportation of the coal and also those who are self-employed miners.
2. Any coal miner or dependent whose claim was previously denied or which is pending will be reviewed.
3. Pneumoconiosis (black lung disease), previously defined as a chronic dust disease of the lung arising out of coal mine employment, is amended to include any other respiratory and pulmonary impairment that arises out of employment in or around U.S. coal mines.
4. "Total disability" can not be ruled out because the person filing a claim is still working, or was at the time of death employed in a coal mine.
5. The 3-year limitation for a survivor or widow to file a claim after a death has been eliminated.
6. A miner who died on or before enactment of the 1977 Law is "presumed" to have been totally disabled from black lung disease (unless it can be proved otherwise) if the miner had worked at least 25 years in the coal mines; all time limitations for filing a claim by the dependent survivor(s) are eliminated.

The new law establishes the Black Lung Disability Trust Fund, which is supported by excise taxes on coal producing companies to finance the Black Lung Disability Trust Fund. Underground mined coal is taxed at the rate of $.50 per ton and surface mined coal at the rate of $.25 per ton (but in no case is the tax to equal more than 2 percent of the selling price of the coal). The coal mine operator is responsible for the payment of this tax. In Fiscal Year (FY) 78, receipts from the coal tax were estimated at $114,200,000, and for FY 79 receipts are estimated to reach $311,425,000.[8]

The Black Lung Disability Trust Fund is to finance the cost of black lung claims (a) where the coal miner's last employment was before January 1, 1970, or (b) where no responsible coal mine operator has been identified, and also to pay for administrative expenses.

---

[8] Estimates for fiscal year 1978 and fiscal year 1979 are from the U.S. Department of Labor fiscal year 1978 and fiscal year 1979 Justifications for Supplemental or Amended Appropriation Estimates for the Committee on Appropriations. The estimate receipts for both fiscal year 1978 and fiscal year 1979 have subsequently been substantially lowered by the U.S. Treasury Department.

In addition to payment of the coal excise tax to the Trust Fund, coal mine operators (when they can be identified) are individually responsible for payment of monthly and medical benefits to black lung victims whose last coal mine employment was January 1, 1970, or later. The coal mine operator must secure benefits through a private insurance carrier or self-insure their liability in accordance with regulations established by the Department of Labor; a fine of $1000 per day is assessed to any coal mine operator who fails to secure such benefits.

The payment of black lung benefits by the Federal Government since 1969, prior to the enactment of the 1978 legislation, amounted to over $4 billion. In 1976, there were over 500,000 recipients of monthly black lung benefit checks which amounted to about $1 billion in total annual payments.[9] In simplest of terms, the Federal Government will retain the responsibility for payment of benefits to those black lung victims already receiving Federal money under Part B of the Law, and the coal mine operators will be responsible for all new claims that result from the new legislation under Part C.[10] The National Academy of Sciences has estimated that black lung benefits could total as much as $8 billion annually by 1980.[11] However, one of the benefits from the Mine Health and Safety Act stringent coal dust control regulations will hopefully be a significant reduction in black lung cases. It should be noted, though, that because of the liberalization of black lung benefits and the easement of dependent survivor stipulations, any reduction in cost from decreased numbers of black lung victims may be offset.

---

[9] Testimony of Stephen Kurzman, Assistant Secretary for Legislation, Department for Legislation, Department of Health, Education, and Welfare, before the Subcommittee on Labor of the Senate Committee on Labor and Public Welfare. Hearing. 94th Congress, Second Session, Mar. 26, 1976. U.S. Government Printing Office 1976. pp. 184–186.

[10] There will, however, be crossovers between the Part B and Part C black lung benefit recipients, because the Law has a number of provisions which allow such procedures.

[11] National Academy of Sciences. The Implications of Mineral Production for Health and the Environment: The Case of Coal *in* Mineral Resources and the Environment. Washington, D.C. 1975. pp. 187–255.

Appendix

In the foregoing sections of this report, a number of individual regulatory programs are described. The point is made in the introduction to this section that, to the operator of a new or existing coal mine, the collection of individual, independent regulatory programs represents costs and timing needs which complicate his planning and add uncertainty to his economic calculations.

How a major coal company deals with the range of requirements is clearly described in the document which follows, a presentation made by James R. Jones, Director of Environmental Quality, of Peabody Coal Co. to the Colorado Mining Association, February 4, 1977. Since that time, the Surface Mining and Reclamation Act has been passed, adding to the process described here by Mr. Jones.

The Process of Developing a Western Coal Mine

When a corporate decision is made to develop a Western mine, the prospect is that a lengthy period of time will be extended in acquiring the coal reserve and surface, assuming that the operation will be one for surface mining of coal. If it is an underground mine, the surface ownership is less difficult. A second major requirement is to conduct an adequate exploratory program to identify the nature of the coal reserve, as well as the extent. It must be recognized that the principal market at the present time for such coal is a long-term, utility contract, probably 20 to 35 years in duration requiring an annual mine production of several million tons.

There are many uncertainties, which take time for determination of a market, including projected energy growth patterns, potential non-deterioration air pollution requirements, compliance with EPA sulfur limitations for new sources, and competitive methods of electrical generation. In addition, capital for financing both the mine and the generating station, as well as lead-time for the permitting process, equipment acquisition, and construction are important considerations.

The method of transportation is another involvement in the overall process, because the end result is a marriage between a particular coal mine, a particular method of transportation, and a site-specific generating station. Since this must be a long-term marriage for all three parties to the agreement, the potential pitfalls, alternatives and economics must be evaluated. These discussions can extend into a period of several years. The lead-time for coal production has escalated rapidly in the last few years and has probably approached that of the electric utility industry—somewhere in the neighborhood of at least 10 years.

All of these requirements add up to greater front-end investment costs, significantly greater risks, and potentiality for abandonment of a project somewhere in the development phase. Varying and uncertain governmental policies play a major involvement in this risk.

Today I will primarily discuss the mine development process, but it will highlight some of the decisions which cannot be made without adequate input from transportation and fuel burning considerations.

MAJOR STEPS IN MINE DEVELOPMENT PROCESS

There are 10 major steps required in the mine development process. All companies do not utilize the exact same procedures, because of variations for site-specific situations, corporate management structure, and varying governmental policies. But approximately these steps will prevail. I will briefly describe the activities under each step and refer to a timing-bar chart (Fig. 1) to illustrate how these follow a necessary format. Constraints and uncertainties which effect each

35-270—78——9

step will also be discussed. It should be noted the chart was developed for a 5,000,000 ton per year mine. For a smaller mine some time periods could be shortened, but not all. Timing requirements are not directly proportional to mine size. This is an illustrative example only. The timing for each site-specific mine must be determined for that situation.

I. Assembly of a mineable coal package

The first major requirement is to assemble a mineable package, which can be offered in response to a bid request from a prospective customer or to have available as a reserve while seeking a market. This is a continuing process that can extend for eight or more years. Activities proceed at an intensive pace in the early years and then slacken off as the mine nears the operations phase. What are the functions performed under this first step in the process? How long do they take? What are the constraints and uncertainties?

1. *Lease acquisition*

Rights to the prospective coal reserve must be obtained, usually in the form of a lease, either from the Bureau of Land Management, the state or a private owner. Some sections are owned by a railroad. In the checkerboard pattern of ownership which exists in the West, how long does this take? Federal coal leases must be obtained now under the new EMARS regulation promulgated by the Department of Interior. The exact timetable is unknown and the regulation is too new for anyone to have any valid experience, either the government or the potential coal operator. The numerous investigative requirements, public hearings, environmental studies, and other requirements, will probably dictate three to four years before lease issuance.

2. *Drilling program development*

Even though an area may have been classified as one of known coal reserves, the information which satisfies that classification for the Geological Survey is totally inadequate from a commercial standpoint for marketing purposes. Therefore, a drilling program must be initiated. Under the old Department of Interior regulations, application for a prospecting permit would have been submitted, and when issued the applicant had a two year period for drilling, plus the option for drilling for an additional two year period. That, of course, is all changed with the new requirements of the Federal Coal Leasing Act Amendments of 1976.

In place of a prospecting permit an applicant can seek an exploration license, but its term is only two years without a renewal option. Similarly, drilling rights will have to be obtained from the state where it has ownership of the coal or from the private owner for those sections. It would be logical to obtain all of these drilling approvals before starting the actual field work in order to have most efficient utilization of the drill rigs. Unfortunately, this does not happen in practice. Instead the drills have to be moved from section to section, sometimes in an illogical order only because drilling rights may not yet be available on certain sections.

This initial drilling will probably be accomplished on approximately 660 ft. centers with additional drilling on 165 ft. centers along the crop and burn lines. The purpose of this drilling program is to obtain an initial idea of the coal reserve, its physical and geological conditions and analytical characteristics. At this point, we are not obtaining complete data for coal utilization purposes nor detail mining plan.

3. *Surface drilling rights acquisition*

Because surface ownership or control is often different from that of the underlying coal, negotiations for the surface must compliment and be conducted simultaneously with coal drilling rights. Usually the surface acquisition will contain some sort of an option for acquiring mining rights providing the drilling program determines the project to be feasible.

4. *Drilling, sampling, logging, analysis*

Once the legal rights for drilling have been obtained the actual core drilling program must be developed. Each drill hole must be logged, the sample prepared for shipment to the laboratory, and the analysis determined.

5. *Determination of commercial quantities present*

The results of the drilling program must be analyzed and a determination made of whether there are commercially mineable and marketable coal reserves present. This becomes a judgement factor on the part of the operator. If the answer is "Yes", he is then commiting himself to substantial capital requirements to move

forward in the coal mine development process. If federal coal is involved, the operator muct comply with the new "Diligent Development & Continuous Operations" (Fed. Register 12/29/76).

6. *Drilling on closer centers*

Once that particular go-no-go decision has been made, if the green light still prevails the drilling program must be expanded to drill on closer centers in order to obtain further information necessary for engineering of the mining plan and acquisition of data that will be required by a prospective customer for boiler design.

7. *Sampling, logging, analysis*

These steps must now be continued for the additional drillholes.

8. *Surface acquisition*

Negotiations must now be completed for surface rights as well as coal rights.

II. Market development

The second major function under mine development is that of market development—a customer or customers must be found.

1. *Market survey*

Early market survey activities will probably start as the initial phase of assembly-ing a mineable package is nearing completion. Such questions as these need to be answered: Where are prospective new plants to be built? What are the potential methods of transportation? What are the environmental regulations with regard to utilization of the coal in these potential market areas?

2. *Potential customer identification*

Armed with the data generated from the drilling program, the salesman is now equipped with the information regarding the approximate size of the coal reserve, and its quality, so that he can begin active discussions with potential customers. His prior market survey work should indicate the prime locations of prospects.

During this same period of time, the customer is studying his various options of potential fuel supply. He will be looking at coal quality and the air pollution regulations which apply in his area. He will be having to gaze into a crystal ball and try to estimate what will be the air pollution requirements five or more years down the road. What will be the requirements to obtain the necessary permits to site, construct and operate the plant? Will the non-deterioration provisions of the air pollution regulations already promulgated by EPA be further modified by the Congress in Amendments to the Clean Air Act? Are the options for fuel sources for a longterm commitment so restricted that he is in a difficult position for negotiating the lowest ultimate fuel cost for the new plant? What will be the variability of the sulfur content of the coal on an annual basis? On a monthly basis? On a weekly basis? On a trainload shipment basis? Can one source supply meet all of the requirements? Or is he going to have to build a sophisticated blending plant for two or more sources of supply of differing sulfur content? These are some of the uncertainties he faces, all of which are seriously effected by governmental action. The coal operator may have insufficient data to answer and respond to some of those specific concerns. Additional information may have to be developed.

The electric power utility industry has been in a lull with few commitments for new plants, because of the uncertainty of electric utility future demands. Many of the planned ventures have been postponed. This results in slower development of new coal mines. We are beginning to see some moderation of this slackening with new inquiries being made regarding coal for power plants to be built in the mid-1980's.

3. *Letter of intent to develop and supply*

Once discussions have narrowed down to a specific mining location, and a specific area for the consuming power plant location, the coal operator and utility are ready to enter into a Letter of Intent to sell and purchase coal. The drafting of the Letter of Intent will take a fair amount of time, including the legal language to describe the general intent of the two parties, the range of subject matter to be included in the eventual coal supply agreement and the necessary commitments of capital on the part of both parties.

4. *Contract negotiation*

Contract negotiations can easily consume a year or more of discussions. The range of subjects to be included in the contract are extensive. Provisions must be

made for total tonnage of reserve to be dedicated, annual shipments, coal quality agreements, rejection limits, methods of transportation, price escalation provisions, termination proceedings, extensions of contract period. These are but some of the items which must be incorporated into the long-term contractual commitment.

Considerations must be given to what restraints might develop. How are the air pollution regulations apt to change? What happens if this occurs mid-way in the construction of the mine, the coal is no longer acceptable, and some redesign of the plant is necessary to incorporate additional air pollution control equipment? What happens if the utility is unable to obtain the necessary siting approvals and permits and a new location has to be selected? Is there a transportation medium available? Or does a lengthy piece of railroad have to be built that is going to now delay the startup of the power plant and thus delay shipments from the coal mine? Who bears this cost of delay? If the state mining law requires mining all of the coal seams down to a specific depth and one of those seams no longer meets an air pollution restriction imposed upon the consuming plant, how is this sort of dilemma to be resolved? What if it is impossible to obtain the necessary federal lease of some vital section of coal reserve area, how does this effect the dedicated tonnage? Supposing a non-degradation regulation is enacted or modified so that the size of the plant is restricted; and no longer can it be constructed for utilization of 3 million tons per year but only one million tons. What will the coal operator do with the other 2 million tons?

These are but a few of the ever-increasing problems in developing a mine and negotiationg a contract. The rapidly escalating pyramid of laws and regulations are continually removing options available to both the operator and the utility.

III. Environmental and related studies

Environmental and related studies begin very early in the development process and continue at a lower level of monitoring activity during the mining operation itself. Some of the steps required will be briefly enumerated:

1. *Initial reconnaissance*

This includes driving and walking through the area, a look at vegetation, soils, topography, drainage pattern, and obtaining a photographic record of the area of interest. It also includes a preliminary study of surrounding lands and their use. In addition to the general physical observations, a very preliminary investigation will be made of environmental data already available from universities, government agencies, publications, etc. The resulting report will highlight the major areas of environmental concern. Particularly, the operator is looking for any potential serious environmental objection which may prohibit mining in the area at all. This information becomes part of the early decision of whether to proceed with the project or not. At least a month will be consumed in this initial reconnaissance.

2. *Scope of work development*

A scope of work to be performed along with the time schedule and projected costs needs to be developed for management approval. Preparation of this scope of work include consultation with various governmental agencies ot make certain that all of the areas of environmental concerns are to be considered.

3. *Consultant selection*

Once the scope of work is outlined, the operator will have to make a decision as to what portion of the work will be done by his own employees versus those from outside consultants. Requests for proposals from a number of consultants are normally sought and these responses reviewed for a final selection. From that point on Peabody employs a Task Force concept with a representative from the consultant and the Company's Environmental Quality Department to implement the scope of work, review progress and monitor costs.

4. *Implementation*

Implementation of these studies will include as a minimum:

1. Environmental Baseline Studies
2. Socio-Economic Studies
3. Archaeological Studies
4. Environmental Analysis and mitigation

5. *Environmental impact report*

The end product at this stage of investigation is the environmental impact report, which is submitted to the various regulatory agencies from whom permits or approvals must be obtained. These agencies must then respond to the National Environmental Policy Act, a subject to be discussed shortly.

6. *Environmental monitoring*

Once the report has been completed, the level of environmental studies is reduced to that necessary for the monitoring and continuation of data gathering during the review and permitting process. When the mine is in operaton environmental monitoring will continue to make certain that the predictions from the report are fulfilled, and that all necessary mitigating measures are being taken to minimize any adverse impact on the environment.

Gathering of the necessary data base, interpretation of that data and preparation of the report is likely to extend over a period of several years, depending upon the urgency of the project, the rate at which drilling and surface rights are acquired, and many other factors.

IV. Preliminary design, machine ordering

The individual steps enumerated below are conducted simultaneously with the environmental and related studies:

1. Conceptual mining development.
2. Mining systems design development.
3. Stripping machine ordering.
4. Mining plan development.

It should be noted that these activities must be conducted along with the market development, as well as the assembly of a mineable coal package. All of these functions are closely interrelated, none of which can be conducted by themselves. As will be noted from the schedule (Fig. 1) as much as six years can be consumed in attaining this point in the development of a surface mine in the West.

V. NEPA process

Most of you are aware of the National Environmental Policy Act of 1969 and the resulting requirements placed upon federal agencies. Basically, the law is designed to require these agencies to place environmental concerns high on the list of factors being considered during agency decisions on policies and issuance of permits or approvals. An Environmental Impact Statement (EIS) is required for activities by the agency which "have a major significant effect upon the quality of the human environment." The steps involved are listed below:

1. Identification of lead agency for EIS.
2. Draft EIS.
3. EIS review and comments.
4. EIS hearing and record.
5. Federal EIS review.
6. CEQ filing.
7. Mining, and or reclamation plan approval.

Until recently the operator could assume that 33 months was a representative time period required to perform the environmental studies, submit the applicant's report, have the federal agency prepare and issue a draft Environmental Statement, go through the review process, revise the draft, and publish the final EIS, which must remain with the Council of Environmental Quality (CEQ) for at least an additional 30 day comment period before issuance of approval for a mining and reclamation plan. That time schedule is now too short.

A newer approach is the preparation and issuance of a regional environmental impact statement. In theory, completion of a final environmental impact statement for a region would eliminate the necessity of preparing a complete EIS for each specific mining site within the region. It has been hoped that once the regional EIS is completed only an environmental assessment would be required for the individual mine. In many instances, this concept seems practical to both speed the process of mine development, where required, and also provide adequate protection for the environment. However, there are questions of whether such a program is adequate, and it may become the subject of future legal challenges. We have shown the timing sequence in the schedule (Fig 1.) with a break between the regional and site-specific EIS because of some uncertainties. We are not supporting the idea of both, but rather reflecting the worst timing possibilities which must be considered in the planning of a new mine, and the cost involved therewith. Hopefully, either the regional EIS concept will be found to be adequate and a site-specific EIS will not be required, or the preparation of a site-specific EIS can be moved forward earlier in the timing schedule. What is going to be the future governmental regulatory policy? If the operator has a contractual commitment to deliver coal by a certain date, he needs to look at the NEPA process to make

35-270—78——10

certain that governmental policies will not cause a time delay over which he has no control, and thus result in a failure to deliver coal at the appointed date.

VI. *Permits*

The number of permits and agencies, both Federal and state, involved will vary with each mining site. There is no one general rule that applies. The list below is merely illustrative of some of those which will be required, but it is by no means inclusive of all of those. Generally speaking, to start a mine today 15 to 20 permits will be required from a variety of Federal, state and county agencies:

1. State water well and rights appropriation permits.
2. State special use permit—such as a reservoir.
3. State mining permit.
4. State industrial siting permit.
5. Federal NPDES permit.
6. Federal Forest Service special land use permit.

Usually the environmental report prepared by the applicant must be submitted with these permit applications. Therefore that work must be accomplished before preparation of the permit application. Another consideration in the timing is the necessity that the customer has been identified, along with his needs, which will establish mining production rates, delivery time and other factors. The operator would be reluctant to submit all of the permit applications until he is certain that he is going to be able to market the coal.

In this particular illustrative example we have allotted 2½ years to obtain the permits. The time required becomes a matter of judgment on the part of the operator. What does he know about the regulatory attitude in the particular state involved? What have been his experiences with Federal agencies concerned with this area? Is he anticipating some new law or regulation which will further complicate and extend the time for obtaining permits?

VII. Design and construction

The various steps involved in this portion of the development schedule are:

1. Preliminary design and estimation.
2. Material ordering and contracting.
3. Water well development.
4. Access roads and site preparation.
5. Railroad construction.
6. Power supply installation.
7. Facilities and coal handling construction.
8. Warehouse building and yards.
9. Coal preparation and loading facilities construction.
10. Overland conveyor construction.

Obviously some of these are applicable to a site-specific situation while others are not. The important item is that we are talking about an approximate 2-year period which partially overlaps with the permitting process. In some cases construction permits must first be obtained before an operating permit. If that is the situation, obviously construction cannot begin until that particular permit is issued. These individual procedures must be carefully analyzed ahead of time. Failure to do so can result in an unplanned delay, which not only becomes expensive, but also may prevent delivery of coal on schedule.

VIII. Mining preparation

In addition to some of the support equipment construction performed under prior step, these additional procedures must be accomplished in order to commence production:

1. Stripper erection.
2. Loader erection.
3. Support equipment readying.
4. Manpower recruitment and training.

IX. Production buildup

The initial startup of a mine is normally at a slower rate of production than that to be accomplished when contract terms are fulfilled. Usually the coal produced in the early "debugging" of the system will be that required to be placed in storage at the power plant before initial startup of its operations.

X. Full production

Usually the contract terms will specify maximum production to be obtained by a certain date and continue thereafter, with gradual reduction in the later years as the generating station operates fewer hours per year.

Peabody Coal Company

ILLUSTRATIVE SURFACE MINE DEVELOPMENT SCHEDULE (Federal Coal-West)

Years Elapsed	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
I. Assembly of Mineable Coal Package															
II. Market Development															
III. Environmental & Related Studies											CONTINUOUS MONITORING				
IV. Prelimiary Design, Machine Ordering															
V. NEPA Process															
VI. Permits															
VII. Design & Construction															
VIII. Mining Preparation															
IX. Production Build-up															
X. Full Production															
Development Time															

Fig. 1

LIBRARY OF CONGRESS

CONGRESSIONAL RESEARCH SERVICE

LIBRARY SERVICES DIVISION

SPECIAL BIBLIOGRAPHY

CITATIONS

Complete collection*----------to October 30, 1978

*Prepared by Kristin Vajs, Library Services Division, Congressional Research Service.

U.S. Congress. Conference Committees, 1977.
Surface Mining Control and Reclamation Act of 1977; conference report to accompany H.R. 2. [Washington, U.S. Govt. Print. Off.] 1977. 116 p. (95th Cong., 1st sess. House. Report No. 95–493)

U.S. Congress. Conference Committees, 1978.
Black Lung Benefits Reform Act of 1977; conference report to accompany H.R. 4544. [Washington, U.S. Govt. Print. Off.] 1978. 29 p. (95th Cong., 2d sess. House. Report No. 95–864)

U.S. Congress. Conference Committees, 1978.
Powerplant and industrial fuel use; conference report to accompany H.R. 5146. [Washington, U.S. Govt. Print. Off.] 1978. 106 p. (95th Cong., 2d sess. Senate. Report No. 95–988)

U.S. Congress. House. Committee on Education and Labor. Subcommittee on Labor Standards.
Oversight hearings on the Coal Mine Health and Safety Act of 1969 (excluding title IV). Hearings, 95th Cong., 1st sess. Washington, U.S. Govt. Print. Off., 1977. 724 p. Hearings held June 7–29, 1977.

U.S. Congress. House. Committee on Education and Labor. Subcommittee on Labor Standards.
To amend the Federal Coal Mine Health and Safety Act. Hearing, 95th Cong., 1st sess., on H.R. 4287. Mar. 29, 1977. Washington, U.S. Govt. Print. Off., 1977. 329 p.

U.S. Congress. House. Committee on Energy and Natural Resources. Subcommittee on Public Lands and Resources.
ICF Inc. study inquiry. Hearing, 95th Cong., 1st sess. May 11, 1977. Washington, U.S. Govt. Print. Off., 1977. 78 p. Publication No. 95–35; Report by ICF, Inc., on the energy and economic impacts of the surface mining control and Reclamation Act of 1976.

U.S. Congress. House. Committee on Interior and Insular Affairs.
Amending the Surface Mining Control and Reclamation Act of 1977 (Public Law 95–87) raising certain authorized funding levels contained therein, and for other purposes; report together with dissenting views to accompany H.R. 11827 including the cost estimate of the Congressional Budget Office. [Washington, U.S. Govt. Print. Off.] 1978. 11 p. (95th Cong., 2d sess. House. Report No. 95–1143)

U.S. Congress. House. Committee on Interior and Insular Affairs.
Surface Mining Control and Relamation Act of 1976; report together with additional, dissenting, and separate views to accompany H.R. 9725. Washington, U.S. Govt. Print. Off., 1976. 161 p. (94th Cong., 2d sess. House. Report No. 94–896)

U.S. Congress. House. Committee on Interior and Insular Affairs.
Surface Mining Control and Reclamation Act of 1976; report together with concurring, additional, separate, and dissenting views and including the Congressional Budget Office cost estimate to accompany H.R. 13950. Washington, U.S. Govt. Print. Off., 1976. 152 p. (94th Cong., 2d sess. House. Report No. 94–1445)

U.S. Congress. House. Committee on Interior and Insular Affairs.
Surface Mining Control and Reclamation Act of 1977; report together with additional, concurring, separate and dissenting views to accompany H.R. 2 (including the Congressional Budget Office cost estimate). Washington, U.S. Govt. Print. Off., 1977. 199 p. (95th Cong., 1st sess. House. Report No. 95–218)

U.S. Congress. House. Committee on Interior and Insular Affairs. Subcommittee on Energy and the Environment.
Constraints on coal development. Oversight hearing, 95th Cong., 1st sess. June 9, 1977. Washington, U.S. Govt. Print. Off., 1977. 251 p. Serial No. 95–17.

U.S. Congress. House. Committee on Interior and Insular Affairs. Subcommittee on Energy and the Environment.

Implementation of the Surface Mining Control and Reclamation Act of 1977: Oversight hearings, 95th Cong., 2d sess. Jan. 19 and 20, 1978. Washington, U.S. Govt. Print. Off., 1978. 295 p. Serial No. 95–27.

U.S. Congress. House. Committee on Interior and Insular Affairs. Subcommittee on Energy and the Environment.

Public Energy Competition Act. Hearings, 95th Cong., 1st sess., on H.R. 7816. Washington, U.S. Govt. Print. Off., 1978. 413 p. Hearings held June 21–Sept. 22, 1977. Serial No. 95–21.

U.S. Congress. House. Committee on Interior and Insular Affairs. Subcommittee on Energy and the Environment.

Reclamation practices and environmental problems of surface mining. Hearings, 95th Cong., 1st sess., on H.R. 2. Jan. 10 and 12, 1977. Washington, U.S. Govt. Print. Off., 1977. 282 p. Serial No. 95–1 (part I).

U.S. Congress. House. Committee on Interior and Insular Affairs. Subcommittee on Energy and the Environment.

Surface Mining Control and Reclamation Act of 1977. Hearings, 95th Cong., 1st sess., on H.R. 2. Feb. 24–25, 1977. Part III. Washington, U.S. Govt. Print. Off., 1977. 582 p. Serial No. 95–1.

U.S. Congress. House. Committee on Interior and Insular Affairs. Subcommittee on Energy and the Environment.

Surface Mining Control and Reclamation Act of 1977. Hearings, 95th Cong., 1st sess., on H.R. 2. Part IV. Washington, U.S. Govt. Print. Off., 1977. 570 p. Serial No. 95–1. Hearings held Feb. 28 and Mar. 4, 1977.

U.S. Congress. House. Committee on Interior and Insular Affairs. Subcommittee on Mines and Mining.

Oversight on Federal coal leasing. Oversight hearings, 94th Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1976. 221 p. Hearings held Mar. 26; Apr. 1 and 5, 1976. Serial No. 94–53.

U.S. Congress. House. Committee on Interstate and Foreign Commerce. Subcommittee on Energy and Power.

FEA authorization—fiscal year 1978. Hearing, 95th Cong., 1st sess. Apr. 1, 1977. Washington, U.S. Govt. Print. Off., 1978. 109 p. Serial No. 95–61.

U.S. Congress. House. Committee on Interstate and Foreign Commerce. Subcommittee on Oversight and Investigations.

Proposed national energy plan. Hearing, 95th Cong., 1st sess. June 14, 1977. Washington, U.S. Govt. Print. Off., 1977. 257 p. Serial 95–42.

U.S. Congress. House. Committee on Interstate and Foreign Commerce. Subcommittee on Transportation and Commerce.

Report . . . on coal slurry pipelines and H.R. 1609, the Coal Pipeline Act of 1978. Washington, U.S. Govt. Print. Off., 1978. 63 p. At head of title: 95th Cong., 2d sess. Committee print No. 95–56.

U.S. Congress. House. Committee on Interstate and Foreign Commerce. Subcommittee on Transportation and Commerce.

Transportation by slurry pipeline. Hearings, 95th Cong., 2d sess., on H.R. 6248, H.R. 6643, and H.R. 10663. Feb. 7 and 16, 1978. Washington, U.S. Govt. Print. Off., 1978. 224 p. Serial No. 95–104.

U.S. Congress. House. Committee on Science and Technology. Subcommittee on Energy Research, Development and Demonstration (Fossil Fuels).

Coal combustion; report. Washington, U.S. Govt. Print. Off., 1977. 59 p. At head of title: 94th Cong., 2d sess. Committee print. Serial YY.

U.S. Congress. House. Committee on Science and Technology. Subcommittee on Energy Research, Development and Demonstration (Fossil Fuels).

Oversight hearings: coal mining research and development. Hearings, 94th Cong., 2d sess. Vol. V. Washington, U.S. Govt. Print. Off., 1976. 1373 p. Hearings held July 27–Sept. 16, 1976. No. 97.

U.S. Congress. House. Committee on Science and Technology. Subcommittee on Fossil and Nuclear Energy Research, Development and Demonstration.

1979 Department of Energy authorization. Hearings, 95th Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1978. 729 p. No. 55. Volume II—Fossil fuels research. Hearings held Jan. 26–Feb. 9, 1978.

U.S. Congress. House. Committee on Science and Technology. Subcommittee on the Environment and the Atmosphere.

Environmental implications of the new energy plan. Hearings. 95th Cong., 1st sess. Washington, U.S. Govt. Print. Off., 1978. 1194 p. Hearings held June 8–Sept. 29, 1977. No. 45.

U.S. Congress. House. Committee on Ways and Means.

Black lung benefit trusts; report to accompany H.R. 13167. [Washington, U.S. Govt. Print. Off.] 1978. 14 p. (95th Cong., 2d sess. House. Report No. 95–1656).

"To amend the Internal Revenue Code of 1954 to insure that the deduction for contributions to a black lung benefit trust be allowed for any such contributions which are made for the purpose of satisfying unfunded future liability."

U.S. Congress. Joint Committee on Taxation.

Energy program. Washington, U.S. Govt. Print. Off., 1977. 13 v. At head of title: Committee print.

U.S. Congress. Senate. Committee on Energy and Natural Resources.

Economic impact of President Carter's energy program. Hearing, 95th Cong., 1st sess. May 3, 1977. Washington, U.S. Govt. Print. Off., 1977. 180 p. Publication No. 95–33.

U.S. Congress. Senate. Committee on Energy and Natural Resources.

Increasing authorizations in the Surface Mining Control and Reclamation Act of 1977; report to accompany S. 2463. [Washington, U.S. Govt. Print. Off.] 1978. 10 p. (95th Cong., 2d sess. Senate. Report No. 95–788)

U.S. Congress. Senate. Committee on Energy and Natural Resources.

Interior nomination. Hearing, 95th Cong., 1st sess., on the nomination of Walter N. Heine to be Director of the Office of Surface Mining Reclamation and Enforcement. Oct. 31, 1977. Washington, U.S. Govt. Print. Off., 1978. 53 p. Publication No. 95–79.

U.S. Congress. Senate. Committee on Energy and Natural Resources.

Natural Gas and Petroleum Conservation and Coal Utilization Act of 1977; report together with minority views to accompany S. 977. Washington, U.S. Govt. Print. Off., 1977. 124 p.

U.S. Congress. Senate. Committee on Energy and Natural Resources.

Surface Mining Control and Reclamation Act of 1977; report together with additional and minority views to accompany S. 7. [Washington, U.S. Govt. Govt. Print. Off.] 1977. 132 p. (95th Cong., 1st sess. Senate. Report No. 95–128)

U.S. Congress. Senate. Committee on Energy and Natural Resources. Subcommittee on Energy Production and Supply.

Coal conversion legislation. Hearings, 95th Cong., 1st sess., on S. 272, S. 273 [and] S. 977. Part 1. Mar. 21 and 29, 1977. Washington, U.S. Govt. Print. Off., 1977. 915 p. Publication No. 95–46.

U.S. Congress. Senate. Committee on Energy and Natural Resources. Subcommittee on Energy Production and Supply.

Department of Energy fiscal year 1979 authorization (energy production and supply). Hearings, 95th Cong., 2d sess., on S. 2692. Apr. 13–14, 1978. Washington,

U.S. Govt. Print. Off., 1978. 143 p. Publication No. 95–117.

U.S. Congress. Senate. Committee on Energy and Natural Resources. Subcommittee on Energy Production and Supply.

Effects of coal strike. Hearing, 95th Cong., 2d sess. Mar. 6, 1978. Washington,

U.S. Govt. Print. Off., 1978. 73 p. Publication No. 95–112. Hearings on "the effects of the present coal strike against the broader background of increased coal utilization."

U.S. Congress. Senate. Committee on Energy and Natural Resources. Subcommittee on Public Lands and Resources.

Implementation of Public Law 95–87. Hearing, 95th Cong., 2d sess. Apr. 24, 1978. Washington, U.S. Govt. Print. Off., 1978. 168 p. Publication No. 95–112.

U.S. Congress. Senate. Committee on Energy and Natural Resources. Subcommittee on Public Lands and Resources.

Surface Mining Control and Reclamation Act of 1977. Hearing, 95th Cong., 1st sess., on S. 7. Washington, U.S. Govt. Print. Off., 1977. 1203 p. Publication No. 95–32. Hearings held Feb. 7–Mar. 3, 1977.

U.S. Congress. Senate. Committee on Environment and Public Works. Subcommittee on Environmental Pollution.

Environmental implications of coal conversion. Hearing, 95th Cong., 1st sess. May 24, 1977. Washington, U.S. Govt. Print. Off., 1977. 129 p. Serial No. 95–H26.

U.S. Congress. Senate. Committee on Finance.

Energy Tax Act of 1977. Hearings, 95th Cong., 1st sess., on title II of H.R. 8444. Washington, U.S. Govt. Print. Off., 1978. 1439–1830 p. Part 5—Oral testimony, Sept. 15, 1977, and communications.

U.S. Congress. Senate. Committee on Finance.

Tax aspects of black lung benefits legislation. Hearing, 94th Cong., 2d sess., on H.R. 10760. Sept. 21, 1976. Washington, U.S. Govt. Print. Off., 1976. 129 p.
"An act to amend the Federal Coal Mine Health and Safety Act to revise the black lung benefits program established under such act in order to transfer the residual liability for the payment of benefits under such program from the Federal Government to the coal industry, and for other purposes."

U.S. Congress. Senate. Committee on Labor and Public Welfare. Subcommittee on Labor.

U.S. Congress. Senate. Committee on Finance. Subcommittee on Taxation and Debt Management Generally.

Tax aspects of the Black Lung Benefits Reform Act of 1977. Hearing, 95th Cong., 1st sess., on S. 1538. June 17, 1977. Washington, U.S. Govt. Print. Off., 1977. 98 p.
"To amend title IV of the Federal Coal Mine Health and Safety Act to improve the Black Lung Benefits Program established thereunder, to impose an excise tax on the sale or use of coal, and for other purposes."

U.S. Congress. Senate. Committee on Interior and Insular Affairs. Special Subcommittee on Integrated Oil Operations.

The structure of the U.S. petroleum industry; a summary of survey data. Washington, U.S. Govt. Print. Off., 1976. 449 p.

U.S. Congress. Senate. Committee on Labor and Public Welfare. Subcommittee on Labor.

Black Lung Benefits Reform Act, 1976. Hearings, 94th Cong., 2d sess., on H.R. 10760 and S. 3183. Washington, U.S. Govt. Print. Off., 1976. 819 p.
Hearings held Mar. 23, 26, and Apr. 2, 1976.

U.S. Congress. Senate. Committee on Labor and Public Welfare. Subcommittee on Labor.

Federal mine safety and health amendments of 1976. Hearings, 94th Cong., 2d sess., on S. 1302. Washington, U.S. Govt. Print. Off., 1976. 1171 p. Hearings held Mar. 24–31, 1976.

U.S. Congress. Senate. Committee on Public Works. Subcommittee on Transportation.

Energy impacted roads. Hearing, 94th Cong., 2d sess. May 26, 1976. Washington, U.S. Govt. Print. Off., 1976. 310 p.
"The need for special Federal assistance in the construction and reconstruction of highways necessary for the transportation of coal." Serial No. 94–H41.

U.S. Congress. Senate. Committee on the Judiciary. Subcommittee on Antitrust and Monopoly.

Competitive aspects of President Carter's energy plan. Hearings, 95th Cong., 1st sess. June 23 and July 15, 1977. Washington, U.S. Govt. Print. Off., 1978. 239 p.

U.S. Congress. Senate. Committee on the Judiciary. Subcommittee on Antitrust and Monopoly.

The Energy Industry Competition and Development Act of 1977, S. 1927. Hearings, 95th Cong., 1st sess., on S. 1927 and S. 1916. Part 1. Aug. 2 and 4, 1977. Washington, U.S. Govt. Print. Off., 1978. 438 p.

U.S. Library of Congress. Congressional Research Service.

National energy transportation: vol. I—current systems and movements; report. Prepared . . . at the request of Henry M. Jackson, chairman, Committee on Energy and Natural Resources and Warren G. Magnuson, chairman, Committee on Commerce, Science, and Transportation, United States Senate. Washington, U.S. Govt. Print. Off., 1977. 587 p., 19 maps. Publication No. 95–15. At head of title: 95th Cong., 1st sess. Committee print.

U.S. Library of Congress. Congressional Research Service.

Petroleum industry involvement in alternative sources of energy. Prepared at the request of Frank Church for the Subcommittee on Energy Research and Development of the Committee on Energy and Natural Resources, United States Senate. Washington, U.S. Govt. Print. Off., 1977. 385 p. Publication No. 95–54. At head of title: 95th Cong., 1st sess. Committee print.

U.S. Library of Congress. Congressional Research Service.

U.S. energy demand and supply 1976–1985 limited options, unlimited con, straints. Prepared for use by the Subcommittee on Energy and Power of the Committee on Interstate and Foreign Commerce, House of Representatives-Ninety-fifth Congress, first session. Washington, U.S. Govt. Print. Off., 1978. 146 p. At head of title: 95th Cong., 2d sess. Committee print 95–43.

U.S. Library of Congress. Environment and Natural Resources Policy Division.

Environmental challenges of the President's energy plan: implications for research and development. Report prepared for the Subcommittee on the Environment and the Atmosphere of the Committee on Science and Technology, U.S. House of Representatives. Washington, U.S. Govt. Print. Off., 1977. 174 p. At head of title: Committee print. Serial J.

U.S. Library of Congress. Environment and Natural Resources Policy Division.

Research and development needs to merge environmental and energy objectives; report prepared for the Subcommittee on the Environment and the Atmosphere of the Committee on Science and Technology, U.S. House of Representatives, 95th Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1978. 264 p. At head of title: Committee print. Serial T.

U.S. Library of Congress. Environment and Natural Resources Policy Division.

State surface mining laws: a survey, a comparison with the proposed Federal legislation, and background information. Prepared at the request of Henry M. Jackson, chairman, Committee on Energy and Natural Resources, United States Senate. Washington, U.S. Govt. Print. Off., 1977. 169 p. At head of title: 95th Cong., 1st sess. Committee print. Publication No. 95–25. Bibliography: p. 159–169.

ARTICLES

Adversaries reach agreement on critical coal issues. Coal mining and processing, v. 15, Apr. 1978: 96–98, 100, 133–134.

Describes the conclusions reached by the five task forces of the National Coal Policy Project, a group representing environmental and industrial organizations. The task forces produced recommendations on the mining, transportation, and utilization of coal as well as addressing the issues of air pollution and the pricing of electricity.

Alexander, Tom.

A promising try at environmental détente for coal. Fortune, v. 97, Feb. 13, 1978: 94–96, 100–102.

Describes the achievements of the National Coal Policy Project, a series of meetings between conservationists and executives from coal-mining and coal-consuming industries. The group has produced recommendations on how and where coal should be mined, transported, priced, burned, and consumed.

Alfers, Stephen D.

Accommodation or preemption? State and Federal control of private coal lands in Wyoming. Land and water law review, v. 12, No. 1, 1977: 73–130.

"With the development of coal on federal land, the [attorney] author anticipates policy conflicts between state and federal interests. Using Wyoming as an example, the author analyzes the nature of the state's interests in terms of Wyoming's environmental and land use legislation. The author then turns to limitations upon the state's power to regulate federal coal lands. Finally, the author examines the utility of the Preemption Doctrine for resolving policy conflicts."

American Bar Association. Special Committee on Energy Law.

Report of the Special Committee on Energy Law. Natural resources lawyer, v. 10, No. 4, 1978: 655–728.

"The report is designed to help lawyers better understand the nature of the energy problem, the manner in which it affects interests of concern to lawyers and the institutions that contribute to the problem and can contribute to solutions." The report surveys energy supply and demand, alternative and traditional energy sources and government policy and regulation.

Bagge, Carl E.

Coal: the once and future king. Coal mining and processing, v. 15, Jan. 1978: 55–57 ,106.

Contends that the coal industry is capable of meeting the increased production demands called for in the National Energy Act. Criticizes environmental and labor restrictions imposed by government as constraints on expanding production.

Bagge, Carl E.

Our nation's march to the sea. Public utilities fortnightly, v. 98, Sept. 23, 1976 36–39.

The author, president of the National Coal Association, "appraises the prospects for a heightened contribution from the industry toward filling the nation's near- and long-term energy needs."

Bagge, Carl E.

The outlook for better coal utilization in electric power. Public utilities fortnightly, v. 97, Apr. 22, 1976: 35–37.

"In the interest of a more balanced national energy supply posture, action to develop more effective use of the nation's coal resources is said to be needed—with emphasis on improved conventional combustion technology as well as coal liquefaction and gasification."

Bardach, Ann.

The UMW contract: can labor survive the 1980s? Village voice, v. 23, Sept. 25, 1978: 53–54, 56, 58.

Examines relations between the leadership and the rank and file in the UMW. Concentrates on dissatisfaction with the recently negotiated mine workers' contract.

Barry, Hamlet J., III.

Reclamation of strip-mined Federal lands: preemptive capability of Federal standards over state controls. Arizona law review, v. 18, No. 2, 1976: 385–404.

Discusses the conflict over the jurisdiction and control of public lands during and after strip mining. Federal and state efforts to require reclamation are described. Urges the negotiation of a "workable compromise" between states and the Federal Government on the development and administration of reclamation laws.

Bethell, Thomas N.

The UMW: now more than ever. Washington monthly, v. 10, Mar. 1978: 13–23.

A former research director of the UMW gives a long term perspective on labor relations in coal mining and explains miner antipathy toward recent contract proposals by the mine owners.

Bethell, Thomas N.

The United Mine Workers—does it have a future? Wall Street transcript, v. 58, Dec. 26, 1977: 49313–49314.

Presentation before a seminar entitled "Coal—the frustrated energy savior" sponsored by the Financial Analysts Federation and the Richmond Societv of Financial Analysts, at the Richmond Hyatt House, Richmond, Va.

Binder, Denis.

Strip mining, the West and the Nation. Land and water law review, v. 12, No. 1, 1977: 1–72.

"With the anticipated development of western coal lands, much attention has been directed at the existing patterns of strip mining regulation. Focusing upon the particular problem of reclamation, Professor Binder analyzes the sufficiency of applicable state and Federal regulations. It is the author's thesis that Federal regulation of strip mining, applicable to all coal lands, is needed for adequate regulation."

Blakely, J. Wes.

One ton of coal produces one ton of paper! Coal mining and processing, v. 13, June 1976: 56–61.

Describes and criticizes the paperwork required by Federal, state and local regulatory agencies in order to open a surface coal mine.

Boulding, Russell.

What is pure coal? Environment, v. 18, Jan.–Feb. 1976: 12–17, 35–36.

Compares the value of coal as an energy resource with its impurity defects as an air polluter.

Bowden, J. R.

Prospects for coal as a direct fuel and its potential through application of liquefaction and gasification technology. Energy sources, v. 3, No. 1, 1976: 1–11.

Bowers, Howard I. Delene, Jerry G.

Competition between fossil and nuclear fueled power plants. Oak Ridge National Laboratory review, v. 10, fall 1977: 18–23.

Research on the cost difference between coal-fired and nuclear power generation. Concludes "that coal and nuclear base-load generation will remain mutually competitive in the future and that the price of electricity will rise significantly."

Burke, Donald P.

FBC may be a better way to burn coal. Chemical week, v. 119, Sept. 22, 1976: 24–28.

"Fluidized-bed combustion is emerging as the most promising new technology for getting energy from coal. It could be environmentally sound, cheaper, more more efficient than ordinary firing."

Cameron, Roy E. Carter, Ralph P. Cameron, Margot E.

Surface mine reclamation legislation: a critique. Earth law journal, v. 2, 1976: 273–287.

"The first section of this paper briefly summarizes the political, legal and administrative factors which have affected the adoption of surface mine regulations at the national level in the United States, followed by some of the major environmental objections to the coal surface mine regulations recently promulgated by the U.S. Department of Interior * * * The second section of the paper presents a more general overview of surface mining regulations in selected foreign countries."

Caudill, Harry M.

American serfdom: the backward coal industry. Atlantic, v. 241, June 1978: 35–41.

"The recent coal strike didn't settle everything. Miners feel that a generation of social progress has passed them by; they feel betrayed by everyone from the White House to their own union. If the nation is truly to depend on coal, the author argues, it must listen more closely to the men in the mines."

Caudill, Harry M.

Dead laws and dead men: manslaughter in a coal mine. Nation, v. 224, Apr. 23, 1977: 492–497.

"In March of 1976, a series of explosions in the mine operated by the Scotia Coal Company under Big Black Mountain in Letcher County, Kentucky, killed twenty-six men. The disaster was predictable, and when it was not predicted it became inevitable. Though by no means the worst tragedy in the history of coal mining in the United States, it was perhaps the most foolish."

Coal burning reignites air quality battle. Conservation Foundation letter, Sept. 1977: whole issue.

Focuses on electric power plant conversion to coal (as a result of the pending National Energy Act) and the environmental health aspects of the increased sulphur dioxide emissions.

Cockrell, William Foster, Jr.

Coal conversion by electric utilities: reconciling energy independence and environmental protection. Hastings law journal, v. 28, May 1977: 1245–1273.

Surveys coal conversion efforts under current legislation and urges the passage of new legislation which would reconcile the commitment to conversion with air quality standards. A greater effort to develop low-cost air pollution equipment must be made.

Confusion reigns in DOE's coal operations. Coal age, v. 83, Jan. 1978: 11, 13, 15.

Voices coal industry dissatisfaction with the organization of the Department of Energy, which fragments responsibility for coal operations into many offices.

Craft, James A.

Transition in the mineworkers union and the impact on labor relations. Pittsburgh business review, v. 45, summer 1976: 1–7.

Explains "how the sudden emergence of democracy [in the UMW], the growth and change in the composition of the membership, and the lack of strong leadership and emergent factionalism have led to problems in collective bargaining and increased wildcat strikes in the coal industry."

Davis, John C.

Conversion to coal firing picks up steam. Chemical engineering, v. 84, Feb. 14, 1977: 40, 42, 44.

"U.S. chemical-process-industries firms are making a big shift to burning coal, instead of oil or gas, in steam plants, furnaces and some processes. Spurring the moves: fears of oil and gas shortages, long planning lead-times, and regulatory-agency pressures."

Dowd, A. Joseph.

The winter of '78 in coal burning country. Public utilities fortnightly, v. 101, June 8, 1978: 15–20.

"The author tells the story of how the electric utilities of the East Central United States, relying heavily upon coal produced in the same general region for the bulk of their power generation, came through the longest strike in history by the United Mine Workers, the largest labor union in the coal-mining industry."

Early, Steve.

"It's not like the old days". United Mine Workers journal, v. 87, May 1976: 16–31.

"Union organizing today is a complicated job. Organizers must be trained to be part missionary, saleman, psychologist, teacher, and lawyer. How well they do their job is crucial to non-union miners—and the UMWA."

Essenhigh, Robert H.

Future fuel supplies for industry: bases for choice. ASHARE journal, v. 20, Apr. 1978: 37–43.

Evaluates the methods of obtaining energy from coal for industrial uses. Concludes that industry will use direct firing of furnaces by coal and coal gasification to meet their short term energy needs. Believes that synthetic fuels will not constitute a significant energy source until the next century.

Fairman, R. Paul, and others.

Respiratory status of surface coal miners in the United States. Archives of environmental health, v. 32, Sept.-Oct. 1977: 211–215.

Findings from a 1972–73 Public Health Service study of 1438 surface coal miners.

Ferguson, Frederick N.

Impact of new legislation relating to Federal coal resources. Journal of contemporary law, v. 4, spring 1978: 255–265.

Reviews four pieces of legislation enacted between August 1976 and August 1977 which extensively revise the methods of granting and managing coal leases on public lands.

The Gloom in coal: government's contradictory stance. Business week, No. 2511, Nov. 28, 1977: 76–80, 85, 88, 92–93.

Surveys the future of coal use and the coal industry by describing Federal energy policy, environmental legislation, coal transportation, and the production of synthetic fuels from coal.

Gordon, Richard L.

Hobbling coal-or how to serve two masters poorly. Regulation, v. 2, July-Aug. 1978: 36–45.

Posits that current policies restraining coal use were designed to attain legitimate social objectives which have not been well served. Expresses fear that the energy policy now being debated in Congress could further hinder coal extraction by imposing an intolerable burden of regulation and costs.

Guccione, Eugene.

Wage incentives: pros & cons. Coal mining & processing, v. 15, Aug. 1978: 51–54, 86.

Discusses wage incentive techniques which might be used to increase coal mine productivity. Sees problems in designing methods to measure miners' performance. Plans would need union cooperation which might not be forthcoming.

Guccione, Eugene.

Why industry can't cope with the 1977 Surface Mining Act. Coal mining and processing, v. 15, June 1978: 66–69.

Describes the coal industry's response to interim regulations implementing the Surface Mining Control and Reclamation Act. Outlines the performance standards mandated by the act and lawsuits initiated by the coal industry to restrain their their enforcement.

Holmes, Eugene T.

Negotiating, drafting, and enforcing coal supply contracts. Natural resources lawyer, v. 9, No. 3, 1976: 353–395.

Article provides an overview of some of the practical problems associated with coal supply contracts. It suggests "some solutions, based partly on statutory law and reported cases and partly on the experiences of those industries and utilities which have used coal for years."

Horvitz, Wayne L.

What's happening in collective bargaining? Labor law journal, v. 29, Aug. 1978: 453–464.

In a speech, the director of the Federal Mediation and Conciliation Service talks about the recent coal negotiations and about the state of collective bargaining in the U.S.

Ikard, Frank N.

The National Energy Act: will it work? Natural resources lawyer, v. 10, No. 4, 1978: 625–631.

The president of the American Petroleum Institute criticizes the House-passed version of the National Energy Act because it fails to stimulate domestic oil and gas production and involves high costs for consumers, business and the economy as a whole. Contends that the plan's production targets for coal and atomic energy are overly optimistic.

Jimeson, R. M. Maddocks, R. R.

Sulfur compound cleanup: trade-offs in selecting SOx emission controls. Chemical engineering progress, v. 72, Aug. 1976: 80–88.

Authors assess "the features of control methods for attaining sulfur oxide emission limitations for large combustion units burning coal, the nation's most abundant fuel resource." Also, "the economic and intangible trade-offs that exist among these emission control methods are discussed here."

Johnson, John E.

Finite capital resources limit conversion from oil to coal. Hydrocarbon processing, v. 57, July 1978: 107–110.

Surveys the capital requirements and other economic considerations which will help U.S. chemical industry to decide when to convert from petroleum and natural gas fuels to coal.

Jones, Julian W.

Disposal of flue-gas-cleaning wastes. Chemical engineering, v. 84, Feb. 14, 1977: 79–85.

"The projected increase in use of coal for power will byproduce large quantities of ash and sulfur compounds from the cleaning of flue gases. Here is a summary of current technology for disposing of those byproducts."

Keiner, Sue Ellen.

NEPA requirements for coal development. Natural resources lawyer, v. 9, No. 3, 1976: 491–494.

Article discusses the National Environmental Policy Act's requirements for the timing and scope of environmental impact statements for the development of federally-owned and leased coal resources as reflected in two court decisions.

Kennedy, Edward M.

Big oil's ominous energy monopoly. Business and society review, No. 26 summer 1978: 16–20.

Senator Kennedy urges the passage of legislation preventing the petroleum industry from acquiring interests in any more coal or uranium properties.

Kilcullen, John L.

"Personal liability" for safety, health violations shaping up as major headache for coal managers. Coal age, v. 81, June 1976: 95–100.

Asserts that "coal men may soon see a rash of civil penalties—and possible criminal prosecutions—against individuals for alleged violations of the 1969 Coal Mine Health and Safety Act."

Kirschten, Dick. Singer, James W. Samuelson, Robert J.

The lessons of the long strike. National journal, v. 10, Mar. 25, 1978: 460–470.

"Examines the energy implications of the coal strike, the future of the UMW and mine unionization in general and the economic impact of the settlement."

Kirschten Dick.

The new clean air regs—more at stake than breathing. National journal, v. 10 Sept. 2, 1978: 1392–1396.

"The Environmental Protection Agency, preparing to propose rules governing pollution from power plants, wants to require utilities to clean up 85 per cent of the sulfur dioxide that might be generated by coal—almost without regard to the sulfur content of the coal. Ironically, the tough standards might not mean cleaner air. The utility industry is warning of billions of dollars in needless expense, and the Energy Department is urging EPA to make its standards less stringent."

Kirschten, J. Dicken.

Converting to coal—can it be done cleanly? National journal, v. 9, May 21, 1977: 781–784.

"In proposing increased national reliance on coal as an energy source while insisting that the goal of cleaner air will not be abandoned, President Carter may have set unachievable goals for himself and for the nation. Or so his critics say. They predict that either the schedule for converting oil and gas furnaces to coal will be set back in the face of strict environmental standards or that clean air goals will be sacrificed to meet the conversion timetable."

Kite, Marilyn S.

The Surface Mining Control and Reclamation Act of 1977: an overview of reclamation requirements and implementation. Land and water law review, v. 13, No. 3, 1978: 703–745.

Outlines the provisions of the Surface Mining Control and Reclamation Act and attempts to determine where the responsibilities for enforcement and administration of the act lie.

Koeppel, Barbara.

Why miners strike. Progressive, v. 40, Oct. 1976: 27–30.

Contends that miners view strikes as the most successful way of struggling for their interests.

Krause, Carolyn.

The fluidized-bed coal burner . . . a new look. Oak Ridge National Laboratory review, v. 9, summer 1976: 1–8.

"Fluidized-bed coal burners coupled to air, helium, or potassium-steam cycles for generating electricity and usable heat for housing complexes and industry may

reach fruition in the 1980s if the wrinkles in such systems are ironed out in the next several years by researchers at Oak Ridge National Laboratory and elsewhere." A discussion of the design and engineering concepts is included.

Libbin, James D. Boehlje, Michael D.

Interregional structure of the U.S. coal economy. American journal of agricultural economics, v. 59, Aug. 1977: 456–466.

Constructs a model of the U.S. coal industry to assess the impact of increased demand for coal and tightening environmental standards.

Liverman, James L.

Some perspectives on land restoration in the United States. Environmental conservation, v. 4, summer 1977: 109–114.

Cites the need for the development of a national land reclamation program and long term research on strip mined sites to develop effective reclamation techniques. Describes the Energy Research and Development Administration's involvement in reclamation research.

Lockwood, Don L.

A supply-demand forecast thru the year 2000. Coal mining and processing, v. 15, Aug. 1978: 55–56, 86, 88.

"If federal leasing resumes in 1980, western coal may account for half of the total U.S. supply by the end of the century."

Mason, Richard H.

Surface mining regulations spell disaster for Appalachia. Coal mining and processing, v. 15, June 1978: 70–72, 124.

Contends that the terrain of the Appalachian region makes compliance with the Surface Mining Control and Reclamation Act almost impossible, especially for the small operators.

McCarthy, Colman.

Trouble on the land: after the floods. Progressive, v. 41, Dec. 1977: 44–47.

Contends that strip mining was responsible for intensifying the effects of catastrophic flooding of the Big Sandy River in West Virginia. Discusses mounting opposition to strip mining by the inhabitants of affected areas.

Mills, Ted.

Altering the social structure in coal mining: a case study. Monthly labor review, v. 99, Oct. 1976: 3–10.

"An underground experiment using autonomous work groups showed increased production, motivation, and safety, but created discontent among other workers at the mine."

Mink, Patsy T.

Reclamation and rollcalls: the political struggle over stripmining. Environmental policy and law, v. 2, Dec. 1976: 196–180.

A Member of Congress outlines recent congressional attempts to regulate stripmining in order to control its environmental and social costs.

Mintz, Robert E.

Strip mining: a policy evaluation. Ecology law quarterly, v. 5, no. 3, 1976: 461–529.

Article analyzes "the relationships between strip mining and the various social values connected with it" and presents the "policy conclusions of this analysis as well as considerations going to the effective implementation of the suggested policy. Finally, these results are compared to the approach taken by recent Congressional legislation and recommendations are made for future lawmaking on the subject."

Moore, William W.

Environmental aspects of converting industrial boilers. Power engineering, v. 81, Feb. 1977: 48–51.

"Converting boilers from oil to coal firing requires close study of each individual installation in order to be certain that pollution control regulations are met."

Mortensen, Ronald W.

Coal severance taxation in the United States. Utah economic and business review, v. 37, Jan. 1977: 1–5, 8.

"Within the past seven years, states have shown an increased interest in the severance taxation of coal. This article review(s) the arguments put forth both for and against coal severance taxes" and "analyze(s) how severance tax revenues are used by those states imposing the tax."

Murray, Francis X. Granzow, Sandra.

Coal, the environment, and the rule of reason. Washington review of strategic and international studies, v. 1, Apr. 1978: 86–91.

Describes the deliberations of the National Coal Policy Project, a group formed of corporate and environmental representatives, and their use of the "rule of reason" techniques in their discussions. The project attempted to reach a consensus on the way to develop domestic energy sources in an environmentally responsible manner.

New developments in labor arbitration. Labor law journal, v. 29, Aug. 1978: 465–486.

Contents.—Expedited arbitration experience in the U.S. Postal Service, by F. Frost.—The bituminous coal experiment, by R. Valtin.—Recent development at the American Arbitration Association, by M. Hoellering.—Arbitration trends: an agency (Office of Arbitration Services) perspective, by L. Schultz.

Nolden, Carol.

Environmental consultants obtain a niche in coal. Coal mining and processing, June 1976: 68–72.

"Working as scientists in conducting environmental baseline studies on new mining projects, the environmental consultants have become an essential element in the industry's expansion process."

Nordlund, Willis J. Mumford, John.

Estimating employment potential in U.S. energy industries. Monthly labor review, v. 101, May 1978: 10–13.

"Most new energy-related jobs will occur in coal mining and power plant construction during the next few years, according to a new, interagency labor-demand model."

Nyden, Paul J.

As the coal business booms, turmoil hits the mineworkers. Working papers for a new society, v. 4, winter 1977: 46–53, 108.

Discusses coal mining labor relations and internal political conditions in the miners' union.

O'Gara, Geoffrey.

Should this marriage be saved? Environmental action, v. 9, Mar. 11, 1978: 10–13.

Describes the controversy among environmentalists over the recommendations and methods of the National Coal Policy project. The project, which attempted to achieve a consensus between industrialists and environmentalists on the development of coal resources has been criticized by environmentalists who contend that it is necessary to maintain an adversary relationship with industry.

Olds, F. C.

The availability of fuels for power plants. Power engineering, v. 80, Sept. 1976: 42–49.

"Much of the world has yet to be searched for fuels, especially solid fuels, but for the United States, the matter of new reserves is overshadowed by questions of permission to mine, ability to transport, security of transport, cost outlook, restrictions on the use of fuels, and the evolving concept of fuels as globally shared resources."

Pendley, W. Perry. Morgan, J. Michael.

The Clean Air Act amendments of 1977: a selective legislative analysis. Land and water law review, v. 13, No. 3, 1978: 748–812.

"The Clean Air Act Amendments of 1977 represent the first major revisions and adjustments of the Clean Air Act since 1970. In this article, the authors examine the changes brought about by the 1977 Amendments, particularly in the prevention of significant deterioration of air quality and the new source performance standards in combination with the requirement for the utilization of locally available coal."

Phillips, Peter J. DeRienzo, Paul P.

Fixing up coal: what it can cost. Public utilities fortnightly, v. 99, Apr. 14, 1977: 29–33.

The authors discuss the costs of reducing the sulphur content in coal used as boiler fuel in electric power generation.

Primack, Joel.

Energy: how and where should we get it? From coal; from nuclear power? How do they compare? Vital issues, v. 26, June 1977: whole issue.

Compares the economic, environmental and social aspects of using coal or atomic power in electric power production.

Primack, Phil. Whipple, Dan.

The United Mine Workers: bad days in boom times. Nation, v. 224, June 11, 1977: 714–720.

Consists of two articles: Falling apart under Miller, by P. Primack.—The losing of the West, by D. Whipple.

Prospective Boys Markets injunctions. Harvard law review, v. 90, Feb. 1977: 790–804.

Comment discusses the permissible scope of prospective Boys Markets' injunctions against the United Mine Workers in light of labor law policy; also, suggests limits on judicial discretion to enjoin future strikes.

Rankin, Bob.

Coal conversion: key to Carter plan. Congressional quarterly weekly report, v. 35, June 18, 1977: 1211–1218.

Describes President Carter's proposal for converting electric power plants from the use of petroleum or gas as fuel to coal and the issues it raises—ranging from coal production to its transportation and actual use.

Raskin, A. H.

Coal dust darkens the bargaining table. Fortune, v. 97, Apr. 24, 1978: 58–60, 63, 64.

"Some union leaders have a large new problem in the wake of the miners' demonstration that 'anarchy pays.'"

Reale, F. N. Anderson, Thomas.

Coal, total energy and ZEG. Building systems design, v. 73, Aug.–Sept. 1976: 1–15.

Examines the Modular Urban Development concept which, the author feels, could do much to attain zero energy growth. "Nodular Urban Development revolves about a central total energy plant which supplies electrical and other forms of energy to surrounding industrial commercial and residential areas."

Reddy, Nallapu N.

Japanese damend for U.S. coal: a market-share model. Quarterly review of economics and business, v. 16, autumn 1976: 51–60.

Measures the price elasticities of the American coal share in the Japanese import market. Observes that the U.S. share of the Japanese market is declining relative to the Australian share due to lower Australian coal prices.

Rose, David J.; Walsh, Patrick W.; Leskovjan, Larry L.

Nuclear power—compared to what? American scientist, v. 64, May–June 1976: 291–299.

"From environmental, economic, and societal points of view, nuclear power appears at present more acceptable for the generation of electricity than coal-burning and other technologies."

Rosengerg, William G.

Oil as a generating fuel is not an option. Public utilities fortnightly, v. 98, July 15, 1976: 17–20.

"To reduce oil imports and to attain our national energy policy objectives the use of alternative fuels by electric utilities for power generation is recommended."

Samuelson, Robert J.

The arithmetic doesn't look good for industry-wide pension plans. National Journal, v. 9, Dec. 17, 1977: 1955–1957.

"The Pension Benefit Guaranty Corp., an obscure federal agency, hopes the current strike by the United Mine Workers is settled quickly. The reason: a long strike could bankrupt one of the union's pension funds and put pressure on the PBGC to pay off, which it isn't prepared to do. What's more, the miners' fund is just one of several multi-employer pension funds in financial trouble, something Congress didn't anticipate when it passed the pension reform law a few years ago."

Sandalls, Helen.

Coal—and consequences. Environmental action, v. 9, Nov. 5, 1977: 3–5.

Enumerates the negative effects the increased use of coal can have, including the occupational risks of mining, increased air pollution and the health problems associated with it, and encouraging global climatic changes. Criticizes the proposed National Energy Act's emphasis on coal and contends that implementation of current air pollution standards would be in conflict with the act.

Saugstad, Kathryn.

Indian coal authorities: the concept of Federal preemption and independent tribal coal development on the Northern Great Plains. North Dakota law review, v. 53, No. 3, 1977: 469–497.

Discusses the possibility of Indian tribes forming a tribal coal authority which would direct the development of coal resources on Indian lands. Reviews Federal leasing policy and finds that Congress has not expressly or implicitly prohibited independent tribal initiative over its mineral resources.

Schlottmann, Alan; Spore, Robert L.

Economic impacts of surface mine reclamation. Land economics, v. 52, Aug. 1976: 265–277.

"The primary purpose of this paper is to analyze the regional economic impact of back-to-contour surface mining regulations on the dominant coal market (the use of 'steam-electric' coal by electric utilities) and its coal suppliers." Focuses on Appalachia, the Midwest, and the West.

Schlottmann, Alan.

A regional analysis of air quality standards, coal conversion, and the steam-electric coal market. Journal of regional science, v. 16, Dec. 1976: 375–387.

Investigates "the possible impacts that (sulphur emission) standards for existing power plants would have on coals with different sulfur contents and, consequently, the regional effects on the entire coal industry. . . . The feasibility of placing sulfur limits directly on coal use is then considered. With these results [the author] investigate[s] the implications for public policy emphasizing power plant conversions to coal. The regional impacts of sulfur-reducing technology, which would permit current high sulfur coal production, are analyzed for their interaction with coal conversion and air quality."

Schlottmann, Alan; Abrams, Lawrence.

Sulfur emissions taxes and coal resources. Review of economics and statistics, v. 59, Feb. 1977: 50–55.

Creates a model of the market for coal in electric power plants to analyze the effects of a sulfur emissions tax on regional coal production.

Scollon, T. Reed.

An assessment of coal resources. Chemical engineering progress, v. 73, June 1977: 25–30.

Summarizes the results of a coal reserve base study which uses a coal resource classification system developed by the Bureau of Mines and the U.S. Geological Survey. States that "the reserve base indicates at least 219 billion tons, or 300 years of coal, at the rate we are using it now."

Setzer, Curtis.

Health care by the ton. Health/PAC bulletin, No. 79, Nov.-Dec. 1977: 1–8, 25–33.

"Traces the history of the (welfare, retirement, and health). Funds, recounts their important accomplishments and seeks to identify the underlying causes of the present crisis. The roots of the crisis in the Funds, the author suggests, lie both in the financial manipulations of Fund monies by UMWA presidents Lewis and Boyle and the unusual financing mechanism by which Fund income—and miner benefits—are linked directly to the tonnage of coal mined."

Sheridan, David.

A second coal age promises to slow our dependence on imported oil. Smithsonian, v. 8, Aug. 1977: 31–36.

Describes the impact of the increased use of coal proposed by the National Energy Plan. Methods of coal combustion, health problems, pollution effects, and industrial impacts are discussed.

Sherrill, Robert.

Ploughing the highways: truckers blitz the interstate. Nation, v. 226, Apr. 29, 1978: 498–502.

Discusses the damage that overloaded trucks do to highways. Concentrates on coal trucking in Appalachia and local nonenforcement of load limits. Also examines the efforts of truck lobbyists and state and Federal officials to raise load limits for trucks in the face of deteriorating roads, including the interstate highway system.

The Story of America's most innovative health care system. Southern exposure, v. 6, summer 1978: 95–104.

Outlines the history of the United Mine Worker's Welfare and Retirement Fund from its beginning in 1946 to its dissolution with the 1977 contract. Details the many health care innovations which the Fund brought to rural areas, "including regionalization of care, comprehensive health centers, limited prepayment schemes, and the use of salaried physicians."

Symposium on energy and the environment: is coal the key to the solution? Duquesne law review, v. 14, summer 1976: 543–776.

Partial contents. Increasing coal production and utilization through the next decade: some technical aspects of the problem, by B. Blaustein and others. The future of the coal substitution option, by S. Rosenblum. Coal conversion and amendments to the Clean Air Act, by D. Synder and D. Worthen. The Federal Coal Mine Health and Safety Act of 1969: its impact on safety and coal production, by R. Bailey.

Thompson, Donald B.

World steel: the race for dominance; 2000 future focus. Industry week, v. 197, May 15, 1978: 74–80.

Believes that steel demand in the U.S. and the third world will expand rapidly in the next 20 years. Reviews Japan's emergence as the lowest-cost steel producer and sees opportunities for U.S. and other producers to improve their positions.

U.S. Dept. of Health, Education, and Welfare.

Health and environmental effects of increased use of coal utilization. Federal Register, v. 43, Jan. 16, 1978: 2229–2240.

"The Advisory Committee Report concludes that it is safe to proceed with significantly increased use of coal in the U.S. to generate energy, as proposed in the National Energy Plan through 1985 if strong environmental and safety policies are followed. The Committee identified six major areas of uncertainty and concern requiring further investigation and finally strongly recommended establishment. of an improved national environmental data collection, modeling and monitoring system."

Wagner, James R.

Strip mining bills begin to move. Congressional quarterly weekly report, v. 35 Apr. 2, 1977: 606–610.

Comments on the various issues to be debated while strip mining legislation is being considered, such as reclamation of land and Federalism.

Walter, Douglas H.

Tax changes effected by the Black Lung Benefits Revenue Act of 1977. Taxes v. 56, May 1978: 251–254.

"The author points out the considerable benefit to the coal mining industy of the Black Lung Benefits Revenue Act of 1977 that enables the coal mine operator to take a current deduction for self-insurance reserves and permits those reserves to be invested and reinvested tax free until the black lung benefit claims are actually to be paid."

Witt, Matt.

Over our dead bodies. United Mine Workers journal, No. 7, Apr. 16, 1976: 9–16.

"With the growing dmeand for coal, the mine construction business is booming. UMWA mine construction workers are willing to help meet the nation's energy needs, but not at the expense of their health and safety."

Yarrow, Mike.

What the miners really want. Nation, v. 226, Mar. 4, 1978: 230–235.

The author presents viewpoints on current coal mine labor negotiations based in part on interviews with miners in West Virginia.

Young, Marvin O.

Conflicting governmental regulations and policies affecting coal development. Natural resources lawyer, v. 9, No. 3, 1976: 503–509.

Article by the vice president of a coal company discusses the importance of coal as a source of energy and comments on government policies regarding coal.

EXECUTIVE DEPARTMENT DOCUMENTS

Altschuler, Z. S., and others.

EPA program conference report; fuel cleaning program: coal. [Washington, U.S. Environmental Protection Agency, Office of Research and Development, available from NTIS] 1976. 132 p. EPA–600/7–76–024.

"This report is composed of papers presented at two sessions of the Fourth National Conference on Energy and the Environment at Cincinnati, Ohio on October 6, 1976. They represent the Environmental Protection Agency's interagency program for coal cleaning. . . . The purpose of these sessions, and this report, is to spotlight coal cleaning technology as the primary means for reducing and controlling the undesirable emissions resulting from the combustion of coal."

Barrager, Stephen M.; Judd, Bruce R.; North, D. Warner.

The economic and social costs of coal and nuclear electric generation: a framework for assessment and illustrative calculations for the coal and nuclear fuel cycles. [Washington, National Science Foundation, for sale by the Supt. of Docs., U.S. Govt. Print. Off.] 1976. 127 p.

"This report presents a method for extending economic comparisons of nuclear and coal-fired electric power to include health, safety, and environmental impacts in the same quantitative framework. This method is illustrated by considering the decision between a light water nuclear reactor and a conventional coal-fired power plant to satisfy a 1000 MWe increase in electrical demand in the northeastern United States." The report concludes that "the social costs of coal appear to significantly overshadow those from nuclear."

Bucek, M. F.; Emel, J. L.

Long-term environmental effectiveness of close down procedures—Eastern underground coal mines. Cincinnati, Office of Research and Development, U.S. Environmental Protection Agency [available from NTIS] 1977. 140 p. EPA–600/7–77–083.

"This report describes the long-term effectiveness of deep mine closures that have been or are planned to be implemented in the eastern United States coal mining regions. The data provide a basic understanding and a general assessment of the various sealing techniques and the problems the user may encounter with each."

Cavallaro, J. A.; Johnston, M. T.; Deurbrouck, A. W.

Sulfur reduction potential of the coals of the United States. [Washington] U.S. Bureau of Mines [1976] 323 p. (U.S. Bureau of Mines. Report of investigations 8118) EPA–600/2–75–091.

"This report presents the results of a washability study of 455 raw coal channel samples with special emphasis on sulfur reduction. These raw coals contained on the average 14.0 percent ash, 1.91 percent pyritic sulfur, and 3.02 percent total sulfur."

Clark, W. S., and others.

Monitoring environmental impacts of the coal and oil shale industries; research and development needs. Las Vegas, Nev., U.S. Environmental Protection Agency, Office of Research and Development, 1977. 193 p.

"This report describes existing and developing technologies associated with the extraction and processing of coal and oil shale, identifies the pollutants likely to be produced by these technologies, discusses the potential impacts of these emissions, and recommends monitoring systems research and development to help alleviate the impacts." References: p. 168–189. EP–600/7–77–015.

The commodity shortages of 1973–1974; case studies. [Washington, National Commission on Supplies and Shortages, for sale by the Supt. of Docs., U.S. Govt. Print. Off.] 1976. 1 v. (various pagings)

Consists of a series of eight commodity case studies sponsored by the National Commission on Supplies and Shortages as part of its effort to understand the widespread shortages experienced during 1973–74. The eight industries studied are titanium, aluminum, steel scrap, pulp and paper, petrochemicals, livestock-feed grains, fertilizer, and low sulfur coal.

Dames and Moore.

Development of pre-mining and reclamation plan rationale for surface coal mines. Springfield, Va., Reproduced by NTIS, 1976. 3 v. (U.S. Bureau of Mines. Open file report 100(1)–76) PB–258 042; PB–258 043; PB–258 044.

Vol. 1.—The rationale for data acquisition.—Vol. 2.—Methods of data acquisition.—Vol. 3.—Legal controls of surface mining.

Dickson, Edward M., and others.

Impacts of synthetic liquid fuel development. [Washington, U.S. Energy Research and Development Administration] for sale by the Supt. of Docs., U.S. Govt. Print. Off. [1977] 4 v.

"This study assesses the impacts of the development of synthetic liquid fuels from coal and oil shale; the fuels considered are synthetic crude oils from coal and oil shale and methanol from coal. Key issues examined in detail are the technology and all of its resource requirements, net energy analyses of the technological options, a maximum credible implementation schedule, legal mechanisms for access to coal and oil shale resources, financing of a synthetic liquid fuels industry, decision making in the petroleum industry, government incentive policies, local and national economic impacts, environmental effects of strip mining, urbanization of rural areas, air pollution control, water resources and their availability, and population growth and boom town effects in previously rural areas." ERDA 76–129/1–4.

Duda, John R.; Hemingway, E. L.

Basic estimated capital investment and operating costs for underground bituminous coal mines developed for longwall mining; mines with annual production of 1.3 and 2.6 million tons by longwall mining from a 48-inch coalbed. [Washington] U.S. Bureau of Mines [for sale by the Supt. of Docs., U.S. Govt. Print. Off., 1976] 23 p. (U.S. Bureau of Mines. Information circular 8720).

"This study estimates the required capital investment, operating costs, and selling prices for two hypothetical mines designed to produce 1.3 and 2.6 million tons per year (MM tpy) by using a longwall system in conjunction with a continuous-mining system. The coal properties being mined are assumed capable of sustaining a 20-year production period. Wages and union welfare payments used in this study are those in effect as of December 6, 1975, as set forth under the National Bituminous Coal Wage Agreement of 1974. Costs of materials and equipment are based on January 1976 indexes."

Effects of trace contaminants from coal combustion; proceedings of a workshop. [Washington, Energy Research and Development Administration, available from NTIS, 1977] 79 p. ERDA 77–64.

Concerns the "health and ecological effects of trace contaminants that are produced and may be released by large-scale combustion of coal."

Energy and Environmental Analysis, Inc.

Benefit/cost analyses of laws and regulations affecting coal. [Washington, Office of Minerals Policy and Research Analysis, U.S. Dept. of the Interior] for sale by the Supt. of Docs., U.S. Govt. Print. Off., 1977. 1 v. (various pagings)

"This study focuses on three sets of regulations affecting coal production and consumption. The objective was to quantify the costs and benefits and analyze the impacts of these regulations on the nature of future coal development. The regulations selected for study were: Reclamation Regulations—requirements for the restoration of strip mined areas and prevention of water pollution. Air Pollution Regulations—Limitations placed on sulfur dioxide emissions from utility and industrial sources. Health and Safety Regulations—requirements to install cabs or canopies (protective coverings) on underground mining equipment."

Energy and Environmental Analysis, Inc.

Laws and regulations affecting coal with summaries of Federal, state, and local laws and regulations pertaining to air and water pollution control, reclamation diligence and health and safety. [Washington, Office of Minerals Policy and Research Analysis, U.S. Dept. of the Interior] 1976. 1 v. (various pagings)

Gordon, Richard L.; Schenck, George H. K.

Historical trends in coal utilization and supply. [Springfield Va., U.S. National Technical Information Service, 1976] 1 v. (various pagings) PB 261 278.

". . . the historical behavior of coal consumption, the forces that are affecting prospective coal use and provide[s] various scenarios of future consumption in selected markets."

Gotchy, R.L.

Health effects attributable to coal and nuclear fuel cycle alternatives. Washington, U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, 1977. 25 p.

"It was concluded that, although there are large uncertainties in the estimates of potential health effects, the coal fuel cycle alternative has a greater health impact on man than the uranium fuel cycle. However, the increased risk of health effects for either fuel cycle represents a very small incremental risk to the average individual in the public." Period under consideration was 1975–1985.

Imhoff, Edgar A., Friz, Thoms O.; LaFevers, James R.

A guide to state programs for the reclamation of surface mined areas. [Washington, U.S. Geological Survey] 1976. 33 p. (U.S. Geological Survey. Circular 731).

Presents a "display, analysis, and interpretation of the State programs for the reclamation of surface mine lands. Underground mining, lands underlying freshwater lakes, and submarine lands of the Continental Shelf are not covered. 'Orphan' mined lands (lands mined but not reclaimed) are not discussed."

Lee, Hong, and others.

Potential radioactive pollutants resulting from expanded energy programs. Las Vegas, Nev., U.S. Environmental Protection Agency, Office of Research and Development, 1977. 130 p.

"This radionuclide releases and the resulting population exposure doses from several energy systems for four projected energy utilization scenarios were calculated and compared. The energy system components examined were:" coal, coal gasification and liquefaction, oil shale, geothermal power, uranium mining and processing, and nuclear power plant operations.

Morgan, John D., Jr.

Availability of conventional energy resource materials—coal. [Washington] U.S. Bureau of Mines [available from NTIS] 1976. 17 p. PB–255 798.

Fifteen 8 x 10½ figures give details concerning coal reserves and use in the U.S. and worldwide coal reserves. Includes references.

National Gas Survey Advisory Committee.

National gas survey: report to the Federal Energy Regulatory Commission by the Supply-Technical Advisory Task Force on Nonconventional Natural Gas Resources. Washington, U.S. Federal Energy Regulatory Commission [available from NTIS] 1978. 108 p. DOE/FERC–00 10.

Partial contents.—Methane in coal.—Gas generated under natural conditions in recent organic material.—Gas in tight formations.

Secor, Edwin S., and others.

Coal recovery from bituminous coal surface mines in the Eastern United States, a survey. [Washington] U.S. Bureau of Mines [1977] 14 p. (U.S. Bureau of Mines. Information circular 8738).

"Estimates of 80 percent coal recovery in strip mining and 50 percent recovery in auger mining are commonly used in reserve base studies. These recovery rates are assumptions based on investigations and observations over a period of years. The present study was initiated to determine if these assumptions are supportable by measuring surface mining losses at active operations in the Eastern United States."

Shah, Yatendra M.; Burke, James R.; Kulujian, Norman J.

Inspection manual for the enforcement of new source performance standards: coal preparation plants. Washington, U.S. Environmental Protection Agency, 1977. 1 v. (various pagings) (U.S. Environmental Protection Agency. Stationary source enforcement series) EPA 340/1–77–022.

"This report presents procedures for inspection of coal preparation facilities toward determination of their compliance with New Source Performance Standards (NSPS). It also provides background information that will aid the inspector in understanding the coal preparation process and the effects of operating parameters on process emissions."

Shotts, Reynold Q.; Sterett, Eric; Simpson, Thomas A.

Site selection and design for minimizing pollution from underground coal mining operations. Cincinnati, Industrial Environmental Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency [available from NTIS] 1978. 98 p. EPA–600/7–78–006.

"The objective of this investigation [was] (1) to select two coal mining sites that will be developed in the near future, (2) to evaluate state-of-the-art techniques to be applied to these sites which will minimize pollution from underground coal mining operations, and (3) to design mining programs prior to mining that will utilize the most favorable technology available to prevent pollution. This investigation encompass[ed] studies in physiography, water quality, geology, hydrology, and other pertinent factors that will influence the pollution potential of the sites during and after mining."

Tetra Tech, Inc.

Energy from coal; a state-of-the-art review. Washington, For sale by the Supt. of Docs., U.S. Govt. Print. Off. [1976] 1 v. (various pagings) ERDA 76–67.

"Energy From Coal is an overview of coal as an energy source. The report may serve as an introduction to and/or a comprehensive review of all aspects of coal." Includes references.

U.S. Advisory Committee on Coal Mine Safety Research.

Annual report. [Washington] U.S. Dept. of the Interior, 1976. 21 p.

U.S. Congress. Senate. Committee on Energy and Natural Resources.

Coal conversion; report to accompany S. 1468. [Washington, U.S. Govt. Print. Off.] 1977. 5 p. (95th Cong., 1st sess. Senate. Report No. 95–123).

U.S. Council on Wage and Price Stability.

A study of coal prices. [Washington, 1976] 97 p.

U.S. Dept. of Energy.

Draft environmental impact statement: Coal Loan Guarantee Program (Public Law 94–163). Washington, 1978. 1 v. (various pagings) DOE/EIS–0004–D.

"This report constitutes the draft programmatic environmental impact statement (EIS) for the proposed Coal Loan Guarantee Program. The purpose of this draft EIS is to identify potential environmental impacts which may occur as a result of the Coal Loan Guarantee Program."

U.S. Dept. of Energy.

Environmental Development Plan (EDP): conservation research and technology, fiscal year 1977. Washington [Available from NTIS] 1978. 1 v. (various pagings) DOE/EDP–0017.

U.S. Dept. of Energy.

"The Environmental Development Plan (EDP), a component of ERDA's Program Planning, Budgeting and Review (PPBR) cycle, is the basic environmental planning document. The EDP identifies environmental issues and schedules appropriate research and analysis for ERDA energy systems. . . . Within Conservation, numerous technologies are transferred to Conservation end-use division following successful development and prototype testing of the technology by the front-end division (Conservation Research and Technology, and Energy Storage Systems). The Conservation Research and Technology (CONRT) EDP covers the environmental concerns related to CONRT technology R&D, whereas the end-use division EDPs cover the environmental concerns of system demonstrations and applications."

U.S. Dept. of Energy.

Environmental development plan (EDP); direct combustion program. Washington [available from NTIS] 1978. 1 v. (various pagings) DOE/EDP–0010.

Evaluates three new technologies for direct combustion of coal including potential environmental, health and safety problems. Considers the use of coal/oil mixtures, atmospheric fluidized bed combustion, and pressurized fluidized bed combustion.

U.S. Dept. of Energy.

Fossil energy research and development program of the U.S. Department of Energy. Washington, Assistant Secretary for Energy Technology, 1978. 475 DOE/ET–0013(78).

"This document focuses on DOE's and ASET's [Assistant Secretary of Energy Technology] programs and projects, particularly the nation's fossil energy resources: coal, oil, natural gas and oil shale."

U.S. Dept. of Justice.

Competition in the coal industry; report . . . pursuant to section 8 of the Federal Coal Leasing Amendments Act of 1975. [Washington, For sale by the Supt. of Docs., U.S. Govt. Print. Off.] 1978. 133, 52 p.

Contents.—Role of the FCLAA and the antitrust laws in the preservation and promotion of competition in the coal industry.—The nature of coal and its manner of trade.—The nature of competition in coal.—The competitive effects of leasing to particular companies.—Conclusions.

U.S. Environmental Protection Agency. Office of Energy, Minerals and Industry.

Coal cleaning with scrubbing for sulfur control: an engineering/economic summary. [Washington, Available from NTIS] 1977. 16 p. EPA–600/9–77–017.

Compares the costs of meeting air quality standards by using flue gas desulfurization techniques alone or in combination with coal cleaning. Concludes that the combined approach is the most cost effective.

U.S. Federal Energy Administration. Office of Coal Utilization.

Coal conversion program: Energy Supply and Environmental Coordination Act (as amended) section 2; final revised environmental impact statement. [Washington] 1977. 2 v. FES–77–3.

"Discusses the Federal Energy Administration's authorities under ESECA [Energy Supply and Environmental Coordination Act], as amended by, PL 94–163, the Federal Energy Administration's issuance of orders to fossil fuel-fired facilities prohibiting them from burning natural gas or petroleum products as their primary energy source and requiring facilities in the early planning process to be built with the capability of burning coal, and the probable environmental impacts assocaiated with issuing such orders."

U.S. Federal Trade Commission. Bureau of Competition.

Report to the Federal Trade Commission on the use of automatic fuel adjustment clauses and the fuel procurement practices of investor-owned electric utilities. [Washington, For sale by the Supt. of Docs., U.S. Govt. Print. Offi.] 1977. 147 p.

Attempts to determine whether automatic fuel adjustment clauses create a disincentive for utilities to obtain coal at the lowest possible price.

Walker, Flora K.

Bibliography and index of U.S. Geological Survey publications relating to coal, 1971–1975. [Reston, Va.] Geological Survey, 1976. 32 p. (U.S. Geological Survey. Circular 742)

"This bibliography and index contains about 390 reports and maps relating to coal published by the U.S. Geological Survey in the 5-year period, January 1971 through December 1975. It is supplementary to Bulletin 1377 titled, 'Bibliography and Index of U.S. Geological Survey Publications Relating to Coal, 1882–1970,' and it supersedes Circular 709, titled 'Bibliography and Index of U.S. Geological Survey Publications Relating to Coal, January 1971–June 1974.' "

White, Philip C.; Neuworth, Martin B.

Coal conversion and utilization: 1967 technical report. Washington, Energy Research and Development Administration, 1976. 225 p. ERDA 77–86.

Describes projects funded by ERDA for research and development "to provide technology that will permit rapid commercialization of processes for improved direct combustion of coal, for advanced coal-burning power equipment, and for converting coal to synthetic fuels."

White, Philip C.; Rial, George A.

Coal demonstration plants: 1976 technical report. Washington, Office of Fossil Energy, Energy Research and Development Administration, 1976. 37 p. ERDA 77–87.

Describes projects funded by an ERDA research and development program "to provide technology that will permit rapid commercialization of processes for

converting coal to gaseous and liquid fuels and for improved direct combustion of coal."

OTHER DOCUMENTS

Auer, P. L.; Manne, A. S.; Yu, O. S.

Nuclear power, coal, and energy conservation; with a note on the costs of a nuclear moratorium. [Palo Alto, Calif., Electric Power Research Institute, 1976] 32 p. (Electric Power Research Institute. Special report 34)

"A programming model is used to explore some of the options by which the Uuited States may realistically move away from its present heavy dependence on oil and gas to a more diversified energy economy, based on nuclear power and/or coal. The model incorporates both own- and cross-price elasticities. In this way it allows for price-induced interfuel substitution and price-induced energy conservation."

Austin, Richard Cartwright.

Spoil: a moral study of strip mining for coal. [New York, Board of Global Ministries, United Methodist Church, c1976] 120 p.

This book "related strip mining—a major national issue in its own right—to a broader context of social, environmental, political, moral and theological concerns."

Ayres, Ronald F.

Coal: new markets/new prices: ramifications of the Federal coal conversion program. [New York] McGraw-Hill [1977] 71 p.

Summarizes the status of the Federal coal conversion program and the new coal markets created by it. Evaluates those markets and the implied prices for the coal buyer.

Bagge, Carl E.

Coal. [n.p.] 1978. 9 p.

This item is the text of an address made by Carl Bagge, President of the National Coal Association, to the Executives' Club of Chicago on March 3, 1978. It concerns the role of coal in future U.S. energy supplies and comments on the President's energy policy.

Bagge, Carl E.

Divestiture and the capital needs of the coal industry. [Washington, National Coal Association] 1976. 13 p.

"An address by Carl E. Bagge, President, National Coal Association to the Southern Governors' Conference, St. Louis, Missouri."

Booz, Allen and Hamilton, Inc.

An evaluation of the economics and efficiencies of heat pump and gas furnance space conditioning systems using coal as a primary source of fuel. [Washington, U.S. Dept. of Energy] 1978. 1 v. (various pagings) HCP/M1227–02.

"A mathematical model representing the cost of each system was developed. The factors that determine the effectiveness and cost of each system were defined. These factors were then transformed into a set of relationships which mathematically represent the total cost and energy efficiency for each of the system elements defined. . . . The cost and efficiencies of the alternative space conditioning systems were then determined. By assigning typical values for the factors identified in the system models, the overall cost and effectiveness of each system was quantified and the results compared for each of the alternative system options studied. A sensitivity analysis was performed. By considering the variability that may be expected in the important factors identified for each system, their impact on the relative cost and efficiency of each system could be evaluated."

Coal as an energy resource: conflict and consensus. Washington, National Academy of Sciences, 1977. 326 p. (National Academy of Sciences, Washington, D.C., Academy forum)

This forum was convened to develop dialogues regarding the use of coal as a fuel. It identifies the issues that will emerge with the increased use of coal, as proposed by the President, and discusses possible alternative actions. It provides some enlightenment as to actions that might prevent or resolve, in an acceptable way, problems of concern to all Americans in the areas of economics, politics, the law, technology and society.

Council of State Governments.

Coal: state coal severance taxes and distribution of revenues. Lexington, Ky. [1976] 34 p. Council of State Governments. RM–589.

"Two basic tasks were involved in accomplishing the purpose of this study: (1) collect and analyze data regarding existing types of state coal severance taxation and, (2) collect and analyze data regarding existing methods of distributing revenues generated from state coal serevance taxation." Includes references.

Elstein, Steve.

State issues in rail transportation of coal. [Lexington, Ky.] Council of State Governments [1978] 11 p. (Council of State Governments. RM–637).

"This report explores some of the policy options available to state officials in revitalizing the rail environmental impacts due to increased rail transportation of coal."

Gordon, Richard L.

Coal and Canada–U.S. energy relations. [Montreal] Canadian-American Committee [1976] 75 p.

"In commissioning this study, the Committee [the Canadian-American Committee] had two general purposes that would marshall the available facts and provide an appraisal of the opportunities for developing these seemingly large coal reserves in each country. Second, the Committee sought to obtain an expert evaluation of Canadian fears about the availability or U.S. coal supplies in the future."

Gordon, Richard L.; Schenck, George H. K.

Historical trends in coal utilization and supply. University Park, Pennsylvania State University [available from NTIS, 1976] 1 v. (various pagings) (U.S. Bureau of Mines. Open file report 121–76) PB 261 278.

"This study examined in considerable detail the historical behavior of coal consumption, the forces that are affecting prospective coal use and provided various scenarios of future consumption in selected markets. The study has made three basic contributions in the areas it treated. First, the report has consolidated and analyzed available historical data on the role of coal in the U.S. energy economy. Second, the proliferation of materials analyzing the forces affecting coal market developments has been synthesized. Third, an effort has been made to delineate possible patterns of future coal use."

Jones, D. C., and others.

Monitoring environmental impacts of the coal and oil shale industries: research and development needs. Austin, Tex., Radian Corp. [available from NTIS] 1977. 193 p. PB 266 292, 500; EPA–600/7–77–015.

"Recommendations are presented for monitoring and predictive technology for the coal conversion and oil shale industries. The recommendations are based upon a literature survey of the emissions and potential impacts of these industries. Descriptions of the technologies are included."

Kalter, Robert J.

The presidential energy initiatives: some relevant policy considerations. Ithaca, Dept. of Agricultural Economics, Cornell University, 1977. 32 1. NSF/RA–770510.

Discusses the future effect of provisions of the National Energy Act. Estimates the price elasticity of supply for U.S. petroleum and natural gas, the impact of deregulating domestic petroleum prices on the energy industry and the number and location of coal mine developments for the period from 1977 to 1994.

Levins, R. A., and others.

An analysis of the national coal economy and a marginal producing region, 1976–1990. Ames, Center for Agricultural and Rural Development, Iowa State University, 1976. 123 p. (U.S. Dept. of Agriculture. Car report 68).

Evaluates the economic feasibility of a major coal producing industry in Iowa and provides an economic analysis of the mining restoration, refining, transportation, and use of U.S. coal.

Lin, King.

Coal data, 1976. [Washington, National Coal Association] c1977. 1 v. (various pagings).

". . . provides detailed information relating to all aspects of the coal industry. It also reports on energy reserves, production and consumption by energy sources in the United States."

Maize, Kennedy P.

America's coal economy. [Washington] Editorial Research Reports, 1978. 283–300 p. (Editorial research reports, 1978, v. 1, No. 15).

Sketches some coal mining history; considers coal's post-strike future in terms of energy policy, labor relations, transport bottlenecks, and environmental impact; and appraises the long-term outlook for coal.

McGraw-Hill Publishing Company, Inc.

The Federal surface mining regulations; a guide to meeting the mandate of the law. [Washington, c1978] 1 v. (various pagings).

"This guidebook is designed to summarize the regulations in fewer words that are more easily understood than the government's legalese. In addition, where possible, the authors have noted those areas in which further government intervention can be expected. This is important because the government's regulatory program for strip mining is still evolving and it can be safely assumed that amendments to both the Act and the regulations will be forthcoming."

Moore, W. S., ed.

Horizontal divestiture; highlights of a conference on whether oil companies should be prohibited from owning nonpetroleum energy resources. Washington, American Enterprise Institute for Public Policy Research [c1977] 62 p.

Partial contents.—Horizontal divestiture in the petroleum industry: an affirmative case, by W. Adams.—Market structure and horizontal divestiture of the energy companies, by J. Markham.—Horizontal integration in energy: organizational and technological considerations, by D. Teece.—The implications of divestiture on investment in the coal industry, by G. Swenson.

National Academy of Sciences, Washington, D.C. Study Committee to Assess the Feasibility of Returning Underground Coal Mine Wastes to the Mined-Out Areas.

Underground disposal of coal mine wastes. Washington, 1975. 172 p.

Concludes that "underground waste disposal is technologically feasible in most instances and is one of a number of ways of dealing with waste in an environmentally satisfactory manner. Underground waste disposal is technologically feasible in most abandoned mines and in active mines where longwall mining or partial recovery (a method of room and pillar mining) is practiced."

National Center for Productivity and Quality of Working Life.

Recent initiatives in labor-management cooperation. Washington. For sale by the Supt. of Docs., U.S. Govt. Print. Off., 1976. 62, 27 p.

"The report is designed to provide suggestions for similar labor-management committee efforts, with the clear reservation that experience in a labor-management committee structure is not directly transferable, but does provide guides and background for problem solving.

National Coal Association.

Coal facts. 1978–79 ed. Washington [1978] 95 p.

Includes discussion and statistics on the status of coal and coal mining in the United States.

National Research Council. Committee on Processing and Utilization of Fossil Fuels. Ad Hoc Panel on Direct Combustion of Coal.

Assessment of advanced technology for direct combustion of coal. Washington, National Academy of Sciences [available from NTIS] 1977. 89 p. FE/1216–1.

Partial contents.—Assessment of direct combustion technology.—FBC [fluidized bed combustion] processes.—FBC technology research and development needs.

Symposium on Coal Dilemma: How and Where to Use It, Colorado Springs, 1977. Proceedings. [Denver, Cameron Engineers, Inc., 1977] 326 p.

Partial contents.—Mining and transportation.—Gas from coal—Coal utilization for electricity generation.

Texas. Governor's Energy Advisory Council.

Natural gas pricing provisions of President Carter's energy plan; a briefing paper for Governor Dolph Briscoe. Austin, Tex., Governor's Energy Advisory Council, 1977. 91.

"This paper is a brief summary of major findings to date concerning the effects of implementing the natural gas pricing and coal conversion provisions of President Carter's Energy Plan."

U.S. Congressional Budget Office.

President Carter's energy proposals: a perspective. Washington. For sale by the Supt. of Docs., U.S. Govt. Print. Off. [1977] 133 p.

"This report analyses five major sets of proposals in the Administration's plan: pricing of crude oil; pricing of natural gas; conversion to coal; automobile-related proposals; and, tax credits for home insulation and solar heating equipment."

U.S. Congressional Budget Office.

Replacing oil and natural gas with coal: prospects in the manufacturing industries. Washington, For sale by the Supt. of Docs., U.S. Govt. Print. Off. [1978] 83 p.

"This report discusses the likely impact of alternative federal policies aimed at encouraging the replacement of oil and natural gas with solid coal in the manufacturing industries. It focuses on the industrial sector because that is the most likely candidate for increased use of solid coal over the next 10 to 15 years."

U.S. General Accounting Office.

Actions needed to improve the safety of coal mine waste disposal sites; report to the House Subcommittee on Energy and Power, Committee on Interstate and Foreign Commerce by the Comptroller General of the United States. [Washington] 1977. 75 p. CED–77–82, Sept. 21, 1977.

"GAO believes that the Surface Mining Control and Reclamation Act of 1977, independent of the 1969 Act, gives Interior the authority to periodically inspect abandoned coal waste disposal sites in connection with its reclamation responsibility under the act. Interior does not plan to conduct such periodic inspections because it does not believe it is authorized to do so. If Interior does not conduct safety inspections of abandoned sites, the Congress should clarify Interior's legislative authority to direct Interior to make such inspections."

U.S. General Accounting Office.

Domestic energy resource and reserve estimates—uses, limitations, and needed data; report to the Congress by the Comptroller General of the United States. [Washington] 1976. 56 p. EMD–77–6, Mar. 17, 1977.

"This report examines the Government's data on domestic resources and reserves of crude oil, natural gas, uranium, and coal. Estimates of resources and reserves of these fuels can be greatly improved."

U.S. General Accounting Office.

Evaluation of the analysis supporting President Ford's veto of H.R. 25, the Surface Mining Control and Reclamation Act of 1975, Department of the Interior, Federal Energy Administration; report to the Congress by the Comptroller General of the United States. [Washington] 1977. 25 p. EMD–77–37, Apr. 15, 1977.

"On May 20, 1975, President Ford vetoed the proposed Surface Mining Control and Reclamation Act of that year. At the request of Senators Henry M. Jackson and Lee Metcalf, GAO evaluated the Ford administration's assessment of the bill. The report concludes that lack of data hindered the analysis of the issue."

U.S. General Accounting Office.

The state of competition in the coal industry; report to the Congress by the Comptroller General of the United States. [Washington] 1977. 1 v. (various pagings) EMD–78–22, Dec. 30, 1977.

"The state of competition in the coal industry is analyzed in this report as an indicator of the potential for domination of this industry by the petroleum industry. Under present circumstances and outlook, a viable state of competition exists in the coal industry and it is unlikely that the industry could be dominated by any firm or group of firms. Circumstances could change, however. The situation is dynamic in Western markets and requires the continued vigilance by the Federal Trade Commission, Department of Justice, and the Interior Department through its coal leasing program."

U.S. General Accounting Office.

U.S. coal development—promises, uncertainties; report to the Congress by the Comptroller General of the United States. [Washington] 1977. 1 v. (various pagings) EMD–77–43, Sept. 22, 1977.

"This report presents [GAO's] analysis of the prospects for developing America's vast coal resources. The report summarizes available knowledge on U.S. coal development, and seeks to identify the major policy issues that must be considered—especially if we are to achieve the coal production and use goals in the Administration's National Energy Plan."

○