Chapter IV

FACTORS AFFECTING COAL PRODUCTION AND USE

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TABLES

FIGURES

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FACTORS AFFECTING COAL PRODUCTION AND USE

Chapter I I shows a range of projections for coal use. Actual growth will depend on the decisions of users and producers. The major factors affecting these decisions are the cost, convenience, and availability of coal relative to competing fuels.

Unlike oil and gas, coal will not be subject to absolute resource constraints or the resulting scarcity-induced price increases over the next few decades. But the availability of coal depends on much more than its presence in the ground. The legal right to mine a specific reserve must be established through ownership or leasing arrangements, A mining company must decide whether it can sell its product profitably for the life of the mine. A number of studies and extensive planning must be carried out, and a host of permits secured to comply with various regulatory processes. Arrangements must be made for adequate capital, equipment, and labor. Once mining starts, recent laws and regulations (e. g., the Surface Mine Control and Reclamation Act (SMCRA) and the Coal Mine Health and Safety Act (CM HSA)) affect methods and costs. Labor-managernent conflicts can limit coal availability and color customers' perceptions of future reliability. Transportation of coal is a problem in the East and will demand attention in the West,

On the demand side, the Clean Air Act makes coal combustion more complicated and costly and presents new problems of waste disposa1. Smaller users may have difficulty i n physically accommodating the necessary equipment or obtaining regular coal supplies, Converting current oi1- and gas-f i red equipment to coal will be especially difficult. Public opposition to particular sites for surface mines or coal-burning facilities may cause substantial delays or force expensive plant modifications. Other regulatory requirements do not impose constraints on local combustion as severe as those of the Clean Air Act, but their cumulative impact will also make combustion more complicated and costly.

The factors listed above increase either the cost or the difficulty of producing and using coal. (The environmental, health, and social benefits from these restrictions are discussed in chapters V and Vl.) But powerful incentives are at work, on the other hand, for users to turn to coal. Given favorable market conditions, many of the potential constraints on coal may never materialize. Others, such as Government regulation, are not directly subject to market pressures and may slow the growth in coal demand, especially in very high-growth scenarios.

This chapter analyzes the factors that affect the components of the coal system outlined in chapter I I I Analysis provides a framework for policy discussion of the problems of increasing coal output and consumption and for determining the effect on coal development of measures designed to ameliorate its negative impacts.

COAL AVAILABILITY

Coal is plentiful enough on a national basis to meet even rapidly growing demand. As described in chapter 11, a massive increase of Western coal production is underway because of its low production cost and low-sulfur characteristic. Unlike Eastern reserves, however, which are almost all privately owned and more accessible, about 65 percent of all Western reserves are owned by the Federal Government and can be mined only under Federal lease. Much of the remaining Western coal is owned by States or Indian tribes. As more than half of all domestic coal reserves are found in the West, Federal leasing policy is an important factor in determining long-run coal availability. Federal leasing law is analyzed in chapter

VI 1. This section discusses the eftect of current leasing policy on Western coal production.

The Interior Department's Bureau of Land Management (BLM)–the agency responsible for administering Federal leases–reports that about 5 percent of federally owned coal resources has been competitively leased. This now represents 17,3 bill ion tons of known coal reserves. ' About 9 billion tons is subject to existing applications for preference-right (noncompetitive) leases, obtained when a prospector demonstrates that commercial quantities of coal have been found in an area previously not known to have any.

Since 1971 a Federal leasing moratorium has been imposed and the amount of leased reserves has remained relatively constant (only 30,460 additional acres leased). Short-term (3-year) leasing criteria were developed to allow current coal producers to obtain mining rights on adjacent Federal lands, but a successful suit by the National Resources Defense Council (NRDC) resulted in the criteria for short-term leases being limited to those required to maintain an existing operation or to meet existing contracts. The moratorium was imposed because most leaseholders were not mining their leases. This gave rise to the charge that Federal coal reserves were being held primarily for speculative purposes. In the mid-1 970's, coal production from leased reserves stepped up considerably as rising coal prices and increasing demand made Western coal economical and attractive. Western coal production has more than tripled since 1971. About 166 million tons were mined there in 1977. One recent study reports that total output from the 67 active Federal coal leases in 1977 was 52.4 mill ion tons, a 241-percent increase since 1973. ' Those leases represented about 14 percent of the total of all Federal leases. Federal coal lands under lease contributed about 31 percent of Western coal production in 1977. Coal production on Indian lands doubled between 1973 and 1977 to almost 23 miilion tons.

Because coal leases are often not contiguous, some operators have found it difficult to assemble the 20 to 30 years' worth of reserves needed for **a mine large enough to be economical. The moratorium and the NRDC suit have created uncertainty among operators, who may defer opening a new mine until they can lease Federal coal adjacent to their current holdings. Some operating mines must also** know soon whether they will be allowed to move into adjacent areas or should plan to close down when present leases are exhausted. Regardless of what the Carter administration chooses to do about leasing, prolonged uncertainty is a constraint on rapid Western coal expansion. A continuation of the moratorium past 1980 will affect coal development if demand approaches current forecasts. In any case, if leasing were to be resumed, regional environmental impact statements would have to be prepared before mining could begin, a process that may take more than a year. Additional delay in the form of court challenges to renewed leasing can also be expected. Despite these constraints, sufficient Western coal has been leased to meet anticipated increases in demand through the 1980's. However, currently leased reserves would not be adequate to support expected coal production levels in the 1990's. The long leadtime required to put a mine into operation requires a resumption of leasing in the early 1980's to meet these levels.

There is little chance that a significant number of new leases will be offered before the 1980's, according to the best available information. ' The terms of any future leasing are unresolved. If leasing is reinstituted, the new criteria may limit the amount of coal available. If the administration chooses to initiate a leasing policy soon, this coal would probably be commercially available after 1985.

'*An Analysis of Existing Federal* Coa/ *Leases* (Washington, D C U.S Department of the Interior, Bureau of Land Management, 1976), p 6

'Reserve *Data System Report No. 2A* (U.S. Department of the Interior, Geological Survey, Dec 31, 1976).

'James Cannon, *Mine Control: Western Coal Leasing and Development (New* York, N Y.: Council on Economic Priorities, 1978), p 7

"'Completion of Interior's Coal Leasing Program Targeted for Mid-1980," U S Department of the Interior News Release, Oct. 25, 1977,

INDUSTRY PROFILE

Coal is mined by companies ranging from major corporations to one-family operations. The future of the coal industry depends in large part on how these companies react to changing conditions. This section describes these companies and how they market their coal. The competitive situation in the industry is examined. Finally, the mechanisms for setting prices for coal are analyzed.

Ownership and Markets

The coal industry has evolved from a large number of small- and medium-sized independent companies to a small number of very large companies (most of whom are subsidiaries) and a large number of small independents Most major, noncaptive producers are now owned by energy companies or conglomerates. Of the top 15 coal producers in 1977, as shown in table 13, only two were independent. Five were captives of steel companies or utilities, three were subsidiaries of conglomerates, and five were owned by integrated energy companies. Sixteen years ago, all major coal companies were independent except for those few owned by industrials.

The terms "commercial" and "captive" arose in an earlier time when companies could be differentiated by their markets and whether their product competed freely. "Commercial" is a term that no longer means quite what it did in the 1930's and 1940's. Then, a commercial operator sold to a variety of customers and often in several markets. As the utility market ascended after 1950, big operators negotiated long-term contracts with major utilities, a trend that is still increasing. I n 1976, 86 percent of all coal shipped to utilities was under long-term contract. Sometimes these contracts span 20 years or more and, in effect, turn "commercial" coal into dedicated or "capt[ve" coal, as the coal no longer competes in an open market. Such coal is in market competition only when the buyer is evaluating bids.

Most modern coal-supply agreements contain price-escalation provisions that allow up-

Table 13.—Top 15 Coal Producers and Parent Companies, 1977

Coal company	1977 Tonnage	Status[a]	Controlling company
1. Peabody Group	65,425,088	c	Peabody Holding Co. (Newmont Mining Co.; Williams Cos.; Bechtel Corp.; Fluor Corp.; Equitable Life Assurance Society; and Boeing)
2. Consolidation	47,994,000	e	Continental Oil Co.
3. AMAX	28,127,161	c	AMAX, Inc. (SOCAL owns 20.6% of AMAX stock)
4. Island Creek Group	16,749,859	e	Occidental Petroleum
5. Pittston	14,309,049	i	Pittston Corp.
6. U.S. Steel	13,959,000	s	U.S. Steel
7. Arch Mineral	12,600,000	e	Ashland Oil (48.9% stock ownership) and Hunt Oil (48.9%)
8. NERCO Group	11,988,906	u	Pacific Power and Light Co.
9. Bethlehem Mine	10,609,970	s	Bethlehem Steel
10. Peter Kiewit	10,298,630	c	Peter Kiewit Corp.
11. American Electric Power	10,223,000	u	American Electric Power
12. Western Energy	9,773,700	u	Montana Power Co.
13. Old Ben	9,720,447	e	SOHIO
14. North American	8,905,203	i	North American Coal Corp.
15. Pittsburg & Midway	8,202,640	e	Gulf Oil Corp.
Total	278,886,654		

[a] Status = c-conglomerate; e-energy company; i-independent; s-steel company; u-utility

SOURCE: *1978 Keystone Coal Industry Manual* ward price adjustments to offset the seller's cost of inflation, overhead, new labor agreements, and taxes. Some contracts have "market reopener" provisions, which allow either party to reopen the contract's negotiated price when the market price for substantially similar coal sold from relevant market areas rises or falls. Typically, a coal supply agreement will contain a force majeure clause, which excuses either party from meeting its obligations when unforeseen or uncontrollable events — such as labor disputes, equipment breakdowns, faults in the coal seam, or new laws — frustrate performance. Most long-term contracts run full term with various price adjustments along the way.

Coal is also sold in a "spot" market. Unlike term contracts, spot sales are totally the creature of short-term, supply and demand forces, Most spot-market suppliers are smaller companies operating small mines, though some big mines sell excess production this way. Many spot sellers enter the market when prices rise. Between 1973 and 1978, the number of mines increased 33 percent from 4,650 to almost 6,200 as the average price per ton rose 140 percent from $8,53 to $20.50. Spot prices rose faster and went higher than contract coal because of the perceived fuel shortage created by the 1973 OPEC embargo and other factors, Because many long-term contracts have reopener clauses pegged to spot prices, industrywide coal prices can be pushed up by very short-term or unique price pressures in the spot market. Although reopener clauses are supposed to work both ways, recent experience suggests that contract prices flow up more readily than down.

Captive producers historically were organized as wholly owned subsidiaries of steelmaker, auto manufacturers, or utilities to assure the parent company of a steady supply of a certain kind of coal. Usually, most captive-produced coal was (and is) sold to the parent company, In 1973, utilities mined about 8.9 percent of their total burn; in 1977, 14.5 percent. Many of the giant new strip mines in the West are utility captives. The Federal Power Commission (now absorbed into the Department of Energy (DOE)) estimated "captive" (utility) coal production will triple from 1975 to 1985, reaching 145.1 million tons per year, about 18.8 percent of the projected 770 mill ion tons of coal to be consumed by the electric utilities in 1985."[5] DOE estimated that utillties control led 11.6 billion tons of recoverable coal reserves as of December 31, 1975.

A utility reaps many advantages from mining its own coal, Supply is made more dependable. Protection is gained against noncost-related price increases. Tax shelters are available, Leverage can be exercised in negotiations with independent coal suppliers, Prices may be adjusted to achieve the "potential for greater return on equity than afforded by regulated utility operations."[6]

The economic implications of this "vertical integration' in the coal industry are disputed and have not been studied adequately, Utilities argue that vertical integration allows them to effect supply reliability and cost control — both to the benefit of the consumer, In return, critics say that utilities sometimes hold back their captive production in order to justify rate increases. A second charge is that utilities have little incentive to keep down production costs in their captive mines as long as they can be passed through to electricity consumers. Consumer advocates say some utilities pay more for their own coal than do utilities without captive production, Utility profits are increased through this inflationary process, it is said. Further analysis is beyond the scope of this report,

Horizontal integration, the ownership of coal companies by companies that produce other forms of energy, has received more attention than vertical integration. In 1963 Gulf Oil took over Pittsburg & Midway Coal Co., beginning what became substantial energy-company (oil and gas producers) investment in coal-producing companies and reserves. The Congressional Research Service reported that 77 percent of all coal producers mining more

[5] *Electric Utilities Captive Coal Operations,* (U.S. Department of Energy, Federal Power Commission, June 1977), p. 17.
[6] Ibid.

than 3 million tons annually were controlled by noncoal companies.[7]

Heated debate over the significance of energy-company ownership of coal producers and reserves was sparked by the unprecedented increase in coal prices, which accelerated after the 1973 OPEC oil embargo. Has horizontal integration of energy production affected coal supply, price, profits, investment, competitiveness, and markets? Did oil-owned coal suppliers, for example, raise their coal prices after the embargo to keep high-priced oil competitive with coal in the Atlantic coast market? Does oil and gas ownership of coal reserves mean anything for the future? Conclusive answers to such questions cannot be offered because the data are unavailable. Some of the needed information may be considered proprietary by coal subsidiaries and parent corporations. It is often difficult to isolate the variable of oil/gas ownership as being the only cause of coal production and price patterns, as many other factors are also at work. However, the general scope of horizontal ownership can be sketched,

Coal production by oil and gas company subsidiaries totaled 166.6 million tons in 1976 (table 14), or 25 percent of national production. Of this, about 125 million tons was steam coal, As much as 35 percent of noncaptive steam coal is currently mined by oil- and gas-owned coal producers.

Energy-company production is expected to increase its share of the total in the years ahead. All horizontally integrated producers plan to increase production. **In addition, a number of other major** energy companies, such as Sun Oil Co,, Kerr-McGee, ARCO, Shell Oil Co., Natural Gas Co., and Mobil Oil,[8] are in the process of opening large surface mines in the West.

Horizontally integrated energy companies account for about 40 percent of all planned new capacity (table 15). Some of this capacity will not be realized, but under the projection of chapter II, about 260 million to 340 million tons of new coal will be mined by horizontally integrated energy companies in 1986, almost all steam coal. To that sum should be added the 125 million tons of coal already being mined by such companies. Therefore, integrated energy companies will mine about 385 million to 465 million tons of steam coal in 1986. This will represent about 48 percent of the total domestic consumption of coal used for energy purposes (table 16).

The top seven companies (in table 15) have 69 percent (233 million tons of a total of 336 million tons) of this planned capacity. These companies are: AMAX (70.5 million),[9] ARCO (32.4 million), Kerr-McGee (30 million), EXXON (27.6 million), Consolidation Coal (25.6 million), Pittsburg & Midway (25 million), and Shell (21.6 million). It is noteworthy that three of these seven—ARCO, Kerr-McGee, and Shell—produced no coal in 1977, and EXXON produced no more than 3 million tons.

The consequences of energy-company ownership of coal are a matter of dispute. The National Coal Association argues that production has increased following acquisition; capital investment in coal subsidiaries has risen, and oil/gas technology and management expertise have benefited the subsidiaries. Critics take opposite positions and fear that an energy oligopoly may emerge capable of manipulating all energy supply and prices for all fuels.

By 1969, four major coal producers—Consolidation Coal, Island Creek, Old Ben, and Pittsburg & Midway—had been acquired by major oil companies. Three of the four mined less coal in 1976 than in 1969. (Together, Consolidation, Island Creek, and Old Ben mined 103.2 million tons in 1969 compared with 83.2 million tons in 1976.)[10] P & M's output rose from 7.6 million to 7.9 million tons. Other oil-owned coal companies increased output after

[7] *National Energy Transportation, Vol. 1—Current Systems and Movements,* prepared by the Congressional Research Service for the Committee on Energy and Natural Resources, May 1977, pp. 93-94.

[8] *The 1978 Keystone Coal Industry Manual* (New York: McGraw-Hill, 1978).

[9] See note in table 14.

[10] William T. Slick, additional material, testimony before the Subcommittee on Antitrust and Monopoly of the Committee on the Judiciary, U.S. Senate *The Energy Industry Completion and Development Act of 1977,* S. 1927 pt.1, 95th Cong., 1st sess., August 2, 4, p. 241.

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Table 14.—Oil and Gas Ownership of Coal Producers (In millions of tons produced, 1976)

Coal company	Parent company	1976 production
	Continental Oil	55.9
	Standard Oil of California[a]	23.1
	Ashland Oil-Hunt Oil	18.0
	Occidental Petroleum	17.6
	SOHIO	9.7
	Eastern Gas & Fuel	8.0
	Gulf Oil	7.9
	Houston Natural Gas	5.2
	Diamond Shamrock	5.2
	MAPCO	3.9
	Quaker State	3.6
	EXXON	2.8
	Panhandle Eastern	2.1
	Coastal States	1.0
	Belco	.9
	McCulloch Oil	.5
	Tesoro	.4
	TOSCO	.4
	International Mining and Petroleum	.3
	Husky Oil	.1
		166.6
Total 1976 production	678.7	
Energy share	25%	
1976 Noncaptive Production	569.7	
Energy share	29%	

[a]AMAX Coal is a wholly owned subsidary of AMAX Inc., 20.6 percent of whose stock is owned by Standard Oil of California. Standard has attempted to extend its control over AMAX Inc., but has encountered resistance. Spokesman for AMAX coal points out that it is not a subsidary of Standard Oil. Twenty-percent ownership, however, does convey the possibility of considerable influence though not outright control. OTA acknowledges that there is a good deal of uncertainty and sensitivity regarding the ownership of AMAX Coal, and include it in this table with the above caveat.

SOURCE: *Keystone Coal Industry Manual, 1978;* William T. Slick (senior vice president of EXXON) additional material submitted to the Subcommittee on Antitrust and Monopoly of the Committee on the Judiciary, U.S. Senate, *The Energy Industry Competition and Development Act of 1977,* S. 1927, Part 1, 95th Cong., 1st. sess., August 2, 4, p. 251; and National Coal Association, *Implications of Investments in the Coal Industry by Firms from Other Energy Industries,* September 1977.

Table 15.—New Steam-Coal[a] Capacity of Horizontally Integrated Energy Companies[b] by 1986 (In millions of tons)

State	Tonnage
Alabama	
ARCO	2.4
Colorado	
Consol	1.0
Empire Energy (Houston Natural Gas)	2.4
Zapata/Getty Oil	2.0
Total	5.4
Illinois	
AMAX	11.4
Arch Minerals	2.0
Consol	2.4
Monterey (EXXON)	3.6
Old Ben	4.0
Shell	1.8
Zeigler	5.7
Total	30.9

Table 15.— New Steam-Coal' Capacity of Horizontally Integrated Energy Companies by 1986 (In millions of tons) (Continued)

State	Tonnage
Indiana	
AMAX	9.1
Old Ben	2.6
Total	11.7
Kentucky	
Island Creek	1.2
Martiki (MAPCO)	3.0
Pontiki (MAPCO)	2.0
Pittsburg & Midway	1.0
Total	7.2
Maryland	
Mettiki (MAPCO)	1.8
Montana	
AMAX	5.0
Consol	5.0
Shell	10.0
Total	20.0
New Mexico	
Arch	6.0
Pittsburg & Mdwy.	5.0
Total	11.0
North Dakota	
Consol	17.3
Husky	.6
Total	18.0
Ohio	
Y & O (Panhandle Eastern)	4.6
Pennsylvania	
Consol	0.3
Texas	
Shell	6.0
Utah	
Braztah	3.5
Coastal States	5.5
Consol	4.6
Valley Camp	4.0
Total	17,6
West Virginia	
Island Creek	5.6
Valley Camp	2
Total	7.6
Wyoming	
AMAX	45.0
Arch	7.2
ARCO	30.0
Carter (EXXON)	24.0
Consol	5.0
El Paso	5.0
Kerr-McGee	30.0
Mobil	8.0
Pittsburg & Midway	19,0
Sunoco	14.0
Shell	4.0
Total	191.2
GRAND TOTAL	335.75

SOURCE *1978 Keystone Coal Industry Marrual*

[a]Not included is the capacity dedicated for gasification and that planned by Utah International, Falcon, and St. Joe Minerals. This represents 47.5 million tons.
[b]See footnote (a) in table 14 for AMAX.

Table 16.—Estimated Energy-Company Share of Noncaptive Utility Consumption, 1985

1985	Total production[a]	Total domestic energy consumption[b]	Total energy-company share of consumption[c]	Utilities consumption	Noncaptive utility consumption[a]	Total energy-company share of noncaptive utility consumption
Case A	955	790	48%	675	548	69%[d]
Case B	1,050	875	48%	725	592	71%
Case C	1,145	955	48%	775	630[e]	73%

[a] Millions of tons. OTA estimates.
[b] Domestic energy consumption includes: utilities, industry, residential commercial, and addition to stocks. It excludes nonenergy consumption (metallurgical coal) and exported production.
[c] Horizontally integrated producers are estimated to mine about 410 million tons by 1986. These percentages are calculated by dividing 410 million tons by the three case estimates of total domestic energy consumption.
[d] OTA estimates that up to 10 percent of the 410 million tons of energy-company production may slip from the utility market. On this assumption, OTA has calculated energy-company shares of noncaptive utility consumption using 369 million tons (410 million less 41 million tons—10 percent) as 1985 energy-company output.
[e] Based on an estimate of 770 million tons of utility consumption, Federal Power Commission Department of Energy estimated 145.1 million tons would be captive through 1985. Case A and Case B estimates were scaled down proportionately by OTA.

acquisition; Arch Minerals is a case in point. The significance of the ownership variable is unclear given this mixed record of gain and loss. Independents, steel-owned captives, and conglomerate-owned producers also showed output declines. AMAX, Arch Minerals, and the utility-owned captives—Pacific Power and Light, American Electric Power, and Western Energy—increased tonnage steadily. No clear lesson can be drawn from these data because other factors—strikes, whether a company mined underground or surface, quality of supervision, equipment maintenance, markets, declining productivity, seam characteristics and the like—obviously affected company output. It would be unusual if the oil-owned companies deliberately restricted their own production in order to force up coal prices so as to maintain oil's competitiveness. The explanation for the 1970's coal price spiral may ultimately be found in another aspect of coal-company behavior.

It is equally difficult to reach conclusions about whether oil companies are investing oil-generated capital into coal subsidiaries, or whether they are putting coal earnings into other corporate activities. Company-by-company data are often either not available or not comparable, owing to differences in accounting methods. Industry argues that "oil and natural gas companies owning coal firms have invested large amounts of money in coal production."[11] This statement is difficult to confirm. Industry spokesmen do not spell out what portion of capital investment was generated by the coal subsidiary and what, if any, was generated and diverted from the oil parent. It is also impossible to estimate what the level of capital investment in coal would have been had these acquired producers remained independent. In some cases, oil companies may have taken coal-generated capital away from their coal operations and shifted it to their oil enterprises. Occidental Petroleum drew 60 percent of Island Creek Coal's income in 1975 into parent-company activities, and SOHIO used Old Ben's coal profits to develop Prudhoe Bay and construct the Trans-Alaska Pipeline, according to one analysis.[12]

Recent-entry oil companies—those that have taken over small producers or acquired large Western reserves—have invested their own capital in their coal subsidiary. The reason is obvious: insufficient coal-generated capital was available to finance development. However, consistent or persuasive evidence that oil capital is expanding established coal production beyond what might normally be expected cannot be found. While the capital expenditures of oil-owned coal companies increased in the 1970's, their share of coal industry investment fell. In 1971, 20 oil and gas owners invested $203 million, or 44 percent of total coal industry investment of $457 million.[13] In 1976, these companies invested $568 million, or 32 percent of the total $1,773 billion invested. This pattern suggests that energy-owned coal affiliates were not investing capital as rapidly as the industry as a whole. Yet without access to corporate decisions, it is impossible to determine how much the ownership variable had to do with the lower rate of investment growth.

In sum, two conclusions can be drawn with confidence about the effect of energy-company ownership of coal. First, the company-specific data that would answer many questions are not available. This information is essential to analyzing the effects of horizontal integration. Second, from the available evidence a strong case cannot be made for coal's being advantaged by oil/gas ownership. Production patterns are mixed and causal relationships are hard to decipher. Proof is not available that coal supply or prices have or have not been manipulated to advantage oil or gas. Nevertheless, if increasing coal supply makes coal mining less profitable, incentives may be created to regulate fuel supplies or prices. Energy companies may not embrace these incentives.

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[11] *Implications of Investment in the Coal Industry by Firms From Other Energy Industries* (National Coal Association, September 1977), p. 19.

[12] Dr. Thomas Woodruff, prepared statement before the Senate Subcommittee on Antitrust and Monopoly, *The Energy Industry Competition and Development Act of 1977*, pp. 348-349.

[13] *Implications of Investments in the Coal Industry by Firms from Other Energy Industries*, p. 28.

Patterns of reserve ownership may shape the future structure of the coal industry, especially if Federal leasing does not resume soon. Reserve ownership affects major market factors: supply, price, and the ability of potential coal producers to enter the field, Six of the top ten reserve holders are wholly or partially owned by energy companies: Continental Oil, EXXON, El Paso Natural Gas, Standard Oil of California, occidental Petroleum, and Mobil. Energy-company representatives argue that coal reserves are widely dispersed, that the share of total reserves controlled by oil companies is not substantial, [4]that large reserve holdings are necessary for long-range development plans, and, finally, that supply, price, and competition have *not* been adversely affected by energy-company ownership. As the Federal Government still controls most reserves, industry spokesmen say any potential anticompetitive situations can be controlled by Federal policy.

The research has not been done that would confirm or deny the actual market implications of coal-reserve control by horizontally integrated energy companies. The major charge against energy companies has been that by speculating and waiting higher coal prices, they did not develop their Western reserves in the late 1960's and early 1970's. Had Western coal been readily available in these years, prices might not have increased. It is worth noting that the major purchasers and leasers of coal reserves in the last decade have been energy companies. Conglomerates do not have significant holdings. As energy companies add to their reserves, it may be increasingly difficult for new entrants to acquire enough long-term reserves to justify the high start-up costs of mining. Smaller companies may not be able to compete with bigger companies because of their capital constraints.

It is worth noting that the major purchasers and leasers of coal reserves in the last decade have been energy companies. Other conglomerates do not have significant holdings.

[14]*The Energy Competition Act,* p. 109 ff.

[15]Ibid., (testimony of William T. Slick) pp. 117-118

Competition

The competitiveness of coal producers is determined by the number of suppliers, degree of production concentration, and ownership structure of reserves and production.

The 6,161 mines operating in 1976 were owned by more than 3,000 individual firms, about 70 percent of which produced less than 50,000 tons. About 600 of these are said to be completely independent producers or producer groups.[16]

The top 15 coal producers mined 279 million tons in 1977, or 41 percent of all domestic production (688 million tons). This list is evolving as utility captives and western mining companies expand more rapidly than eastern underground companies. No one company dominates the industry, but regionally, Consolidation is the key company among eastern-based producers, Peabody in the Midwest, and AMAX in the West.

Coal is not a concentrated industry at the national level. Its top four producers accounted for about 23 percent of total national output in 1977, well below the 35- to 50- percent share that is usually considered to represent a "moderately concentrated oligopolistic core that can produce price manipulation and excess profits."[17] The national concentration ratio understates meaningful concentration because coal does not have a national market. When coal production is divided into four regional markets, the concentration ratio for the top-four producers in 1977 were: Appalachia, 22.3 percent; Midwest, 65.1 percent; northern Plains, 37.7 percent, and Southwest, 64.1 percent.[18] West of the Appalachian fields, moderate to high concentration exists. Even regional markets can be deceptively large. For example, a single Appalachian market does not really exist— northern Appalachian coal is not sold in southern Appalachian markets; east

[16]William T. Slick, Jr., (senior vice president, EXXON, U.S.A.), prepared testimony, Ibid, p. 179.

[17]Joe S. Bain, *Industrial Organization,* second edition (New York: John Wiley and Sons, 1968), p. 142.

[18]*Competition in the Coal Industry* (U.S. Department of Justice, May 1978), p. 63. These market percentages do not distinguish between steam and met coals. That distinction is important in the Appalachian market.

Kentucky coal does not sell in the Northeast. Further, high-grade metallurgical coals do not generally compete against steam coals. Captive coal, moreover, does not generally compete against noncaptive coal. " Similarly, 1 977's 54 million tons of export coal – most of which was metallurgical — does not compete domestically, except when foreign demand slumps. A true assessment of concentration in the coal industry must disaggregate production data and look at concentration in much more precisely defined markets.

DOE estimated that the top four noncaptive suppliers will provide about 47 percent of new noncaptive, electric utility supply now under contract in 1985.[20] The top eight noncaptive producers will supply about 71 percent of this tonnage. Production from the new key coal States, Wyoming and Montana, will be more concentrated: 70 percent for the top four and 92 percent for the top eight.[21]

The long-term contracts discussed above also bear on competition. 1 n effect, these contracts reduce both the real amount of coal available in the marketplace and the number (and needs) of customers. The Federal Trade Commission noted:

> In manufacturing industries, production concentration is also an indicator of the present supply alternatives open to potential buyers, If a firm produces 10,000 units of output per year, it can be assumed that up to 10,000 units are available to any qualified buyer. This is not the case in the coal industry, Due to the prevalence of long-term contracts, the annual production of a coal company may not be a valid measure of the quantity of coal available to potential buyers from that producer. 22

These contracts account for about 86-percent of coal's utility sales. With some exceptions, once a contract of this sort is concluded another supplier does not compete for that utility's needs. The role of long-term contracts will continue to be substantial. DOE estimates that "slightly more than two-thirds, 243 million tons, of the 1985 coal requirements for . . . *new generating units* (emphasis added) have already been committed to contracts, in the majority to long-run contracts."[23] The weighted average contract length is 19.5 years for coal mined east of the Mississippi and 26 years for Western coal.

Competition is also regulated by how long-term, coal-supply agreements are negotiated. Although the Justice Department study finds that coal supply is competitive, its description of the "competition" for long-term agreements suggests a modification of normal market forces:

> Bid prices frequently are used by utilities just as a means of screening for the "best match" suppliers. The actual schedule of delivery prices and other complex contract terms then are arrived at through direct negotiation and bargaining with the leading candidate(s). Sometimes the utility will pay little attention to or not even solicit bids; instead, it will go directly into negotiations with a company which it believes to be in the best position to provide a reliable source of supply.[24]

The proportion of coal that is contracted for under what may amount to sole-source conditions is not known. Lawyers involved in drafting coal-supply agreements indicate that de facto sole-source procurement is common, particularly for new powerplants and those burning Western coal. Accurate analysis of the competitive state of the U.S. coal industry requires examination of the effect of long-term contracts and negotiating procedures.

The final question concerns the possible anticompetitive effects of interlocking directorates and concentrated stockownership.[25] Most

[19]In 1977, captive production amounted to about 17 percent of all coal output, or more than 120 million tons. Of that, utilities mined almost 69 million tons; steel companies 45 million tons; and industrial users, 6 million tons. *1978 Keystone Coal Industry Manual,* pp. 662-663.

[20]Alexander Gakner (Chief, Branch of Fuel and Environmental Analysis, Federal Power Commission (now Department of Energy), testimony, *The Energy Industry Competition Act,* p. 53.

[21]Ibid.

[22]*The Structure of the Nation's Coal Industry, 1964-1974* (U.S. Federal Trade Commission, 1977), p. 66.

[23]Gakner, testimony, *The Energy Competition Act,* p. 48.

[24]*Competition in the Coal Industry,* p. 82.

[25]*Interlocking Directorates Among the Major U.S. Corporations,* U.S. Senate, a staff study prepared by the Subcommittee on Reports, Accounting, and Management of the Committee on Governmental Affairs, January 1978; and *Voting Rights in Major Corporations,* U.S. Senate, a staff study prepared by the Subcommittee on Reports Accounting and Management of the Committee on Governmental Affairs, January 1978.

coal producers, like much of American business, use "outside" boards of directors to guide corporate policy. Directors are often chosen because their expertise or primary affiliation will help a company do business profitably. Many mining companies and manufacturers include representatives of major financial institutions on their boards Major stockholders—which may include families, financial institutions, and other corporations — are also represented. *Direct interlocks* — where one individual serves as a director of at least two corporations — are common between a coal producer and a capital supplier. One coal producer may be indirectly interlocked with others when a director of each sits on the board of a third corporation. *Indirect interlocks* among coal producers, coal consumers (utilities and industrials, especially), and capital suppliers are common. It is also common to find representatives of major financial institutions sitting on the boards of competing coal producers.

Distribution of voting rights differs from corporation to corporation. I n those cases where a single family does not dominate a company, bank trust departments, insurance companies, and mutual funds often own the biggest blocks of stock.[26] Where stockownership is dispersed, holdings below 5 percent can constitute corporate control in some intances. If a single company — a bank, for example— owns substantial voting rights in several coal producers, some analysts argue that the potential for anticompetitive behavior is present.

Consolidation Coal –the Nation's second largest coal producer– is fairly typical of the ownership patterns among energy-owned coal producers Consol is a subsidiary of Continental Oil. Continental's board was tied to 12 coal-reserve holders or coal producers, 9 coal consumers, and 20 capital suppliers through at least one indirect director interlock as of 1976.[28] Continental shared a director with Bankers Trust of New York, Continental Illinois, and Equitable Life Assurance, (Equitable is a major stockholder in Peabody Coal, the Nation's biggest coal producer and fourth largest reserve holder.) Seven of the 20 capital suppliers were among the company's top 20 stock holders .29 Continental's biggest stockholder, Newmont Mining Company (3.29 percent) is also the principal stockholder in Peabody Coal (27.5 percent). Capital suppliers with whom Continental shares a director are major stockholders in other leading coal producers and reserve holders.[30]

It is fair to ask a simple question at this point: What do these interlocks mean? The fairest answer is equally simple: We are not certain. The research needed to confirm or deny the significance of this ownership network has not been done. Although the potential for antitrust abuse exists where corporations with common interests are interlocked, no coal industry case study has been done to determine whether this potential for abuse has been used. Similarly, the implications of coal's stock holding distribution have not been studied.

Price, Profitability, and Productivity

Meeting U.S. coal-production goals depends on price behavior in the utility market. Coal prices must be sufficiently high to provide investment incentives. Increased production then becomes a question of whether long-run price behavior promises a rate of return sufficient to induce the diverse owners of coal companies to invest in coal production.

Price forecasts for 1985 and beyond vary according to consuming region, Btu-content, and sulfur content. The forecasts range from a national average of roughly $22 per ton for high-sulfur coal to $34 per ton (1975 dollars) for low-sulfur coal, with the highest prices predicted for consumers along the Atlantic coast and in the East-Central region.[31] These cost and price projections assume a 15-percent discounted cash flow rate-of-return and imply that prices will rise sufficiently to provide the investment

[26] *Voting Rights*, p. 1 ff.
[27] Ibid., p. 2.
[28] See vol. II, app. VI for complete listing of interlocks

[29] *Voting Rights*, U.S. Senate, pp. 88-89.
[30] See appendix for complete discussion.
[31] Foster Associates, *Fuel and Energy Price Forecasts*, vol. II (Palo Alto, Calif., Electric Power Research Institute, 1977), pp. 124-125.

resources necessary to meet production goals. However, if the realized rate of return does not meet investor expectations, capital is likely to' flow into noncoal investments. Energy companies and conglomerates can choose between alternative investments whereas a nondiversified coal company cannot. **It is** possible that leading coal producers might attempt to encourage price increases and maximize their rates of return by regulating supply. Deregulation of—and higher prices for—oil and gas should lead to higher coal prices, although the increases may not be identically proportional. Higher prices should encourage coal investment and enable operators to spend more on health and safety, environmental protection, and community improvement.

The interaction among price, production costs, profit, and capital investment is central to expanding coal supply. The relationship among these factors changed dramatically in the 1970's. All rose substantially over pre1970 levels, but production did not rise proportionately and productivity fell. The price per ton quadrupled between 1968 and 1975 while labor costs doubled in that period. " The unit labor cost share dropped from 58.5 percent in 1950 to 20,3 percent of per ton value in 1974. It probably amounts to 25 to 30 percent of value today due to increases **in wages and benefits and the** leveling off of the coal price rise. Rising prices helped boost industry profits. Coal's return on net worth exceeded 11 percent only once in the 1950-73 period, but it approached 30 percent in 1974 following the OPEC embargo. " From 1971 through 1974, net coal income of 24 leading coal producers rose 298 percent from $128.4 million to $639.5 million, most of which came in 1973-74. Coal's unprecedented level of profitability in the mid-1970's was due less to rising production than to the price increases that followed the OPEC embargo and to a temporary surge in worldwide demand for met coal.

A precise picture of the financial status of the industry is difficult to develop because much of the necessary data has not been **available to the public. Parent companies have not** been required to separate financial data for their coal subsidiaries in their reports to the Securities and Exchange Commission, A check of the financial data for the Pittston Corp. (primarily a West Virginia-based metallurgical coal producer) and North American Coal (an eastern producer of met and steam coals) adds case-study data to the gross statistics noted above (see table 17). Despite declining productivity and slipping production, both companies recorded increased net income after 1973. Net income per employee increased in both cases, suggesting that income productivity and labor productivity do not necessarily coincide. Between 1970 and 1977, Pittston's net income per employee rose 252 percent and North American's gained 73 percent (current dollars). Consolidation Coal, the second biggest coal producer and a subsidiary of Continental Oil, showed coal revenues being five times greater in 1977 than in 1970, although revenues for 1975 through 1977 were relatively unchanged. 35

Return on investment and profits slacked in 1978 because of the coal strike and demand softness for certain coals. For most companies, this should prove to be a temporary phenomenon.

[12] Joe Baker, *Coal Mine Labor Productivity: The Problem, Policy Implications, and Literature Review* (Oak Ridge, Tenn., Oak Ridge Associated Universities, 1978), pp. 7-8.

[13] Charles Rivers Associates., *Coal Price Information* (Palo Alto, Calif., Electric Power Research Institute, 1977) p.4-40. Based on data collected by Citibank of New York.

[14] T. T. Tomimatsu and Robert Johnson, *The State of the U.S. Coal Industry*, Information Circular 8707 (Washington, D.C.: U.S. Department of the Interior, Bureau of Mines, 1976), pp. 17-19.

[15] Continental Oil Company, *Annual Report, 1977*, p. 36

Table 17.—North American Coai and Pittston Corporations Profitability and Productivity

	1970	1971	1972	1973	1974	1975	1976
North American Coal							
Net operating profit (NOP)	Not available						
Net Income (NI)[a]	$1,894	$1,248	$2,629	$4,452	$4,923	$7,827	$7,286
Employees	2,949	3,700	4,357	4,661	4,970	6,501	6,569
Production[b]	9,633	8,432	11,480	10,783	9,900	9,831	10,866
Productivity[c]	14.3	10.9	11.7	10.3	9.7	6.5	7.3
NOP/Employee	Not available						
NI/Employee[d]	$642	$337	$603	$955	$991	$1,204	$1,109
Pittston							
Net operating profit (NOP)[e]	$62,860	$54,977	$33,228	$32,368	$193,362	$333,185	$222,510
Net income (NI)	$39,442	$43,437	$28,585	$15,341	$107,446	$200,146	$146,372
Employees[f]	16,347	17,028	17,390	16,980	17,100	17,800	17,520
Production[g]	20.5	20.1	20.6	18.8	17.4	18.6	17.1
Productivity[h]	3.5	3.3	3.3	3.1	2.8	2.4	2.7
NOP/employee	$3,845	$3,229	$1,911	$1,906	$11,308	$18,718	$12,700
NI/employee	$2,413	$2,551	$1,644	$903	$6,283	$11,244	$8,485

a In thousands of dollars.
b In thousands of tons. Figure does not include coal sold but not mined by North American.
c Productivity calculated by dividing tonnage by employees, and then dividing the resulting product by the average number of days worked in a given year. Expressed as tons per worker per shift.
d Calculated by dividing net income by employees.
e NOP and NI in thousands of dollars.
f About half of Pittston's employees are found in its Coal Division, although they account for more than 90% of the corporation's income.
g Production in millions of tons.
h Productivity in tons per worker per shift.

SOURCE: Securities and Exchange Commission and National Coal Association

LABOR PROFILE

Some generalizations are unavoidable in describing a work force, but the differences among coal workers are often as important as their similarities. Coal workers include miners (both surface and underground), coal-mine construction workers (at least 7,000), preparation plant and tipple workers, and those who work in mine related repair shops.

Coal workers represent a wide range of cultures, ages, education, political perspectives, income levels, and attitudes. Of the 237,000 coal workers in 1977, about 2,000 were women.[36] (As late as 1970, no women were known to be working in the mines.) Perhaps 10,000 coal workers are black. Another 2,000 or 3,000 are Indian. Mexican-American miners are found in the West, and miners of Mexican descent work underground in the mines of southern West Virginia. In northern Appalachia, the grandfathers of many miners emigrated from Italy, Poland, Russia, Czechoslovakia, and Hungary in the early years of this century. Other miners are descended from earlier miner immigrants coming from Scotland and Wales.

Coal workers are found scattered through two-thirds of the continental United States. Most work east of the Mississippi River and most of those labor in the long diagonal of the Appalachian coalfields. Others work in Utah, Colorado, Wyoming, Montana, and New Mexico. Their jobs vary. Some operate multimillion-dollar earth excavators; others load coal by shovel. Some sweat all day; others

[36]More than 100 coal companies are now negotiating to reach a settlement with a women's rights group—The Coal Employment Project—that has sued them, alleging employment discrimination.

never do. Many are highly skilled; others aren't. Their work environments range from air-conditioned, bucket-seated dragline cabs to 20-inch coal seams where the machine operator lies nearly on his back most of the day. Most coal labor– about 160,000 persons— belong to the United Mine Workers of America (UMWA), which sets many of the wage and benefit standards for the entire industry. Several thousand belong to the Progressive Mine Workers (PMW), Southern Labor Union (SLU), Operating Engineers, and other unions. More than 40,000 probably belong to no union at all, either from choice or lack of opportunity.

One of the most important distinctions between miners is whether they work above or below ground. About 60 percent of all coal production was mined in surface operations in 1977, but 68 percent of all miners worked in underground mines. The perspective of all UMWA presidents has been that of the deep miner. This experience has shaped coal's collective bargaining from the beginning.

Important differences are found between the two groups. Accident frequency, for example, is significantly lower for surface miners, although some kinds of surface mines are less safe than some deep mines. Surface miners are generally older, work more days annually, strike less, and are paid more than their underground counterparts. The average age of most UMWA deep miners was 35 in 1976 compared with 41 for most UMWA surface miners.[37] In 1975 and 1976, an industrywide sample showed one strike per year at surface mines

[37] Information supplied by the Bituminous Coal Operators' Association.

Photo credit: Douglas Yarrow

Last shift comes out at Eccles #5 before the 1977 contract strike

compared with an average of more than three strikes at underground mines.[38] Surface miners work 10 to 20 more days each year than underground miners. Finally, most UMWA underground miners averaged $14,170 in annual income in 1975 compared with $19,456 for most UMWA surface miners. In 1976, UMWA underground miners earned an average of $15,203 compared with UMWA surface miners at $20,643[39] (figure 14).

Survey research of 400 randomly selected West Virginia miners in November 1977 found that 46 percent said their before-tax income was $10,000 to $15,000, and 38 percent reported $15,000 to $20,000.[40]

Although UMWA had roughly 100,000 underground miners in 1976, representing about 63 percent of all underground miners, it had only about 11,500 surface miners, representing 21 percent of all surface miners.[41] The UMWA share of underground tonnage is probably somewhat higher as its members tend to work in the bigger, more productive underground mines. The smallest underground mines are generally not organized by UMWA. However, the UMWA share of surface production is probably less than 21 percent because most of its surface miners work in comparatively less productive eastern surface mines.

A second important set of distinctions among coal workers is the changing age distribution of the work force. As noted, the average age of UMWA underground miners was 35 in 1976. The median was 33. (Median age for UMWA surface miners was about 37.) In contrast, the median age for UMWA workers in 1964 was 48. The age distribution is changing rapidly. In 1974, 53 percent of most UMWA deep miners were under 35 years of age and 22 percent were 50 or older (figure 15). By 1976, 50 percent were under 35 and only 15 percent were older than 50. What had been an aging, underground work force, heavily weighted toward men in their 40's and 50's, had moved toward a heavy imbalance between young and old by the mid-1970's. The age distribution of UMWA surface miners—and probably surface miners generally—is more evenly distributed. In 1974, 34 percent of most UMWA surface miners were under 35, and 20 percent were 50 or older.

In the 1950's and 1960's, the mine work force aged gradually as tight demand and mechanization limited new recruits to a trickle. This resulted in a more experienced work force. Productivity was high. Training was almost nonexistent because there were few new miners to train. This changed quickly in the 1970's. Almost 50,000 experienced miners retired or left because of black lung disability. New contract provisions and new safety requirements, plus expanding demand, brought another 100,000 new workers into the industry between 1969 and 1978. The combination of retirement and work force expansion meant that the work force was becoming younger and less experienced but better educated. In 1974, 61 percent of UMWA deep miners had less than 6 years of mine service; in 1976, 63 percent had less than 6 years.[42] Forty-nine percent of UMWA surface miners in 1974 had less than 6 years service, and 47 percent had less than 6 years in 1976.[43]

A third distinction among coal workers is regional. Of the 190,000 miners recorded in 1975, 94 percent worked east of the Mississippi River. Fully 97 percent of the 136,000 underground miners recorded that year worked in the East along with 87 percent of the 55,000 surface miners. However, the West produces more coal than its share of miners indicates because of the higher productivity of western surface mining systems. Fewer than half of the 34,000 to 43,000 western miners expected by 1986 will work underground. A majority of the new miners in the East will work underground. If current trends continue, western coal miners will be substantially nonunion and mostly surface. The eastern work force will be mostly underground and predominately UMWA. The

[38] Jean M Brett and Stephen B Goldberg, *Wildcat Strikes In the Bituminous Coal Mining Industry: A Preliminary Report* (Northwestern University, 1978), p 23

[39] Data supplied by BCOA

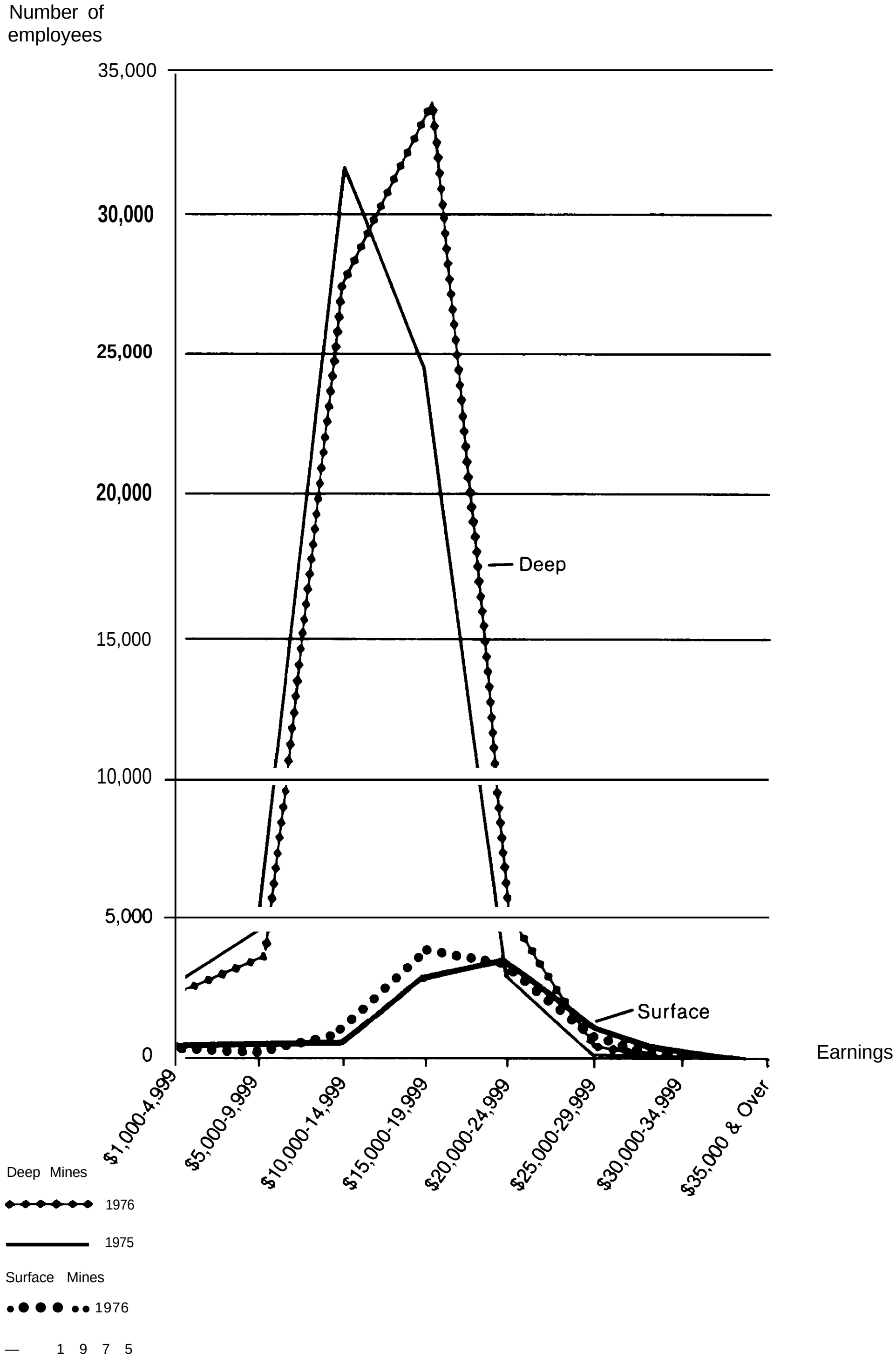
[40] Don R Richardson Associates, *A Survey of West Virginia Coal Miners, 1977*, p 26

[41] OTA made these estimates based on data supplied by BCOA and MSHA

[42] Data supplied by BCOA.

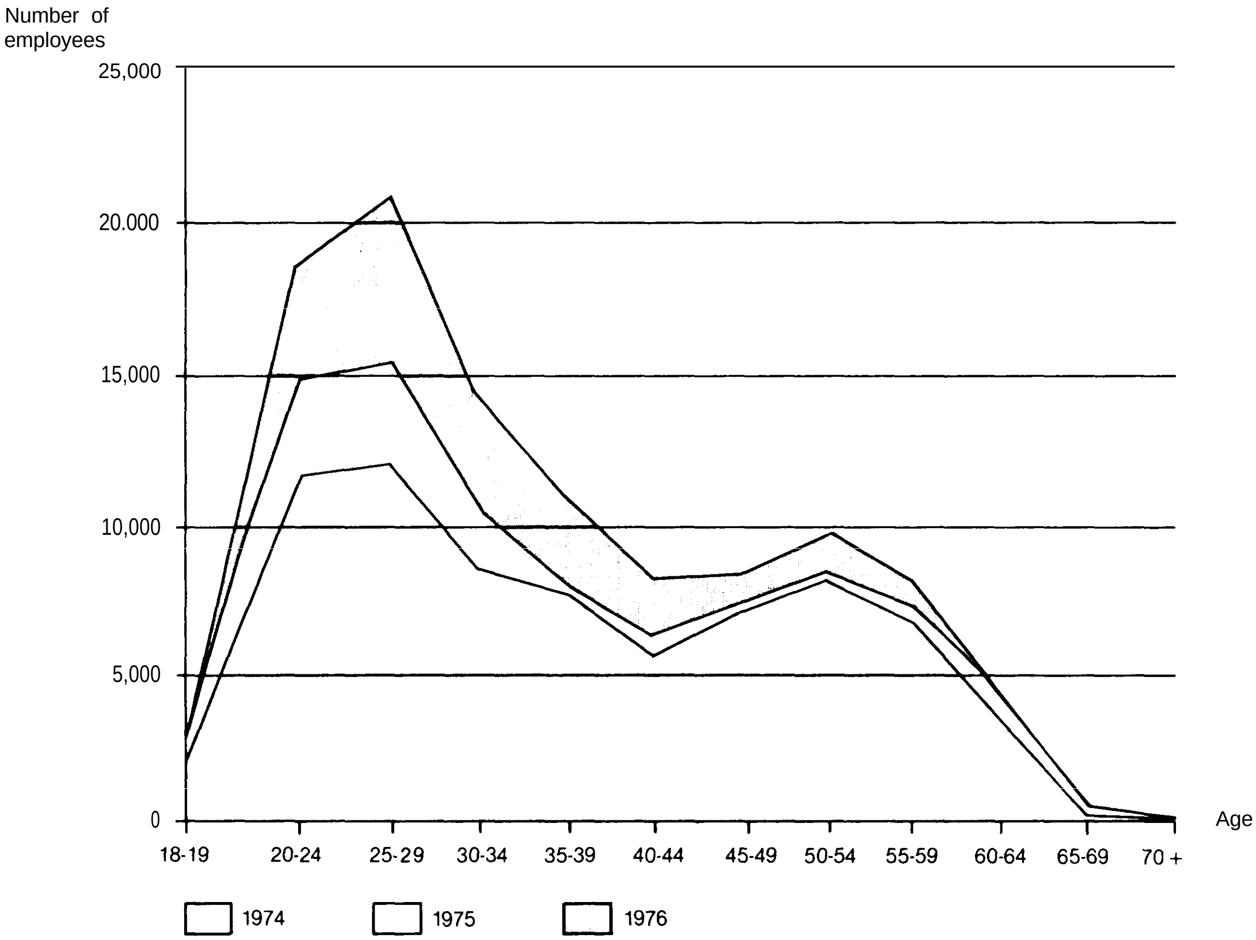
[43] Ibid.

Figure 14.— Distribution of Employees by Annual Earnings at Deep and Surface Mines



SOURCE Income data supplled by the Bltumlnous Coal Operators' Assoclatlon, 1978

Figure 15. —Distribution of UMWA Employees by Age—All Mines' 1974-76



SOURCE: Age data supplied by the Bituminous Coal Operators' Association, 1978.

few cases of moving eastern miners and mine management to the West have not been very successful.

The fourth and perhaps most significant distinction is unionization Those who have not spent time in the UMWA coal fields have a hard time understanding the intensity of the miners' feeling for UMWA. Whether they are disgusted or delighted with its performance, they tee] it is theirs, built by them to serve their interests As harsh as its internal critics are, most believe that unionization is the only thing standing between them and the coal company. "

Non-UMWA miners are located principally in southern Appalachia (southwest Virginia, east Kentucky, and east Tennessee) and west of the Mississippi Few demographic or attitudinal data exist about them. Often they make as much money as — or more than — UMWA miners. This relatively recent phenomenon was made possible by the higher profitability of mining after the OPEC embargo. Most non-UMWA mines are relatively new, They do not carry pension obligations to older miners and retirees that UMWA-organized companies carry Few of their workers have even retired, and many of the smaller, non-organized companies have small pension obligations, if any.

In big, non-UMWA mines health insurance plans and other benefits are comparable to UMWA standards. In a few western surface mines, the benefits are more comprehensive, What many nonunion miners lack contractually are job protections, a grievance procedure, and some safety rights (including the right to elect a safety committee and the right of the individual to withdraw from danger). Non-UMWA miners also lack a national voice. The UMWA, whatever its tailings, speaks for the Nation's coal miners in Washington, D. C., Non-UMWA miners are not represented, although they benefit from legislation or regulatory initiatives UMWA is able to push through.

The extent of unionization varies in the West. The majority of mines in the Carbon and Emery Counties area of Utah is organized by UMWA. On the other hand, only the captive Wyodak Mine associated with the Wyodak Power Plant in Campbell County, Wyo., is organized (International Brotherhood of Electrical Workers (1BEW)). North Dakota mines are organized by several unions. Consolidation Coal and North American Coal have UMWA contracts. Mines of the Knife River Coal Mining Company are organized by the PMW. The Operating Engineers, the predominant union in Colorado, does not represent mines in North Dakota. The captive Baukol-Noonan Mine is organized by the IBEW. The UMWA is a major force in parts of the West. It is the dominant union i n Utah underground mines. It represents mines on the Navajo Reservation. It has lost some of its power to other unions. Only 2,000 to 3,000 surface miners are UMWA-organized in the West. Most Western States have right-to-work laws that limit unionization.

These demographic and social indicators reflect major structural changes that occurred in the coal industry over the last decade. In these years, surface production moved ahead of underground production. The locus of national coal output moved westward, Oil companies took over major coal producers, and most of their effort centered on developing western surface mines. The proportion of coal workers who are UMWA members dropped from between 75 to 80 percent in the late 1960's to around 65 to 70 percent today .[44] UMWA tonnage, however, has fallen to about 50 percent of the total production owing to the increase in nonunion, surface-mined coal.

Still, the heart of the coal industry is in the East. And it is there that one must go to explain labor-management instability and the attitudes that cause it. The 1960's allowed management to become complacent about its labor needs. Mechanization and layoffs meant a large pool of experienced miners. Wildcat strikes were infrequent because of the labor surplus and organizational policy. Coal producers had few incentives to provide better working conditions. Their ranks were not hospitable to policy innovators. An illusion set in that all was well. It deprived management and labor of a vital spirit that both need for continued health. Industry found that its lower management consisted of men too old, too timid, or simply too set in their ways to become good leaders. But as long as coal demand stagnated and prices were more or less constant, the industry's stability was not upset.

[44] OTA estimates that 160,000 coal workers are represented by the UMWA of a total coal worker laborforce of 237,000 (which includes an estimated 7,000 coal construction workers).

COLLECTIVE BARGAINING: A STORMY HISTORY

Labor relations in the U.S coal industry have been characterized by suspicion, acrimony, violence, and, occasional l y, cooperation. Throughout this century the unwillingness of miners to accept the conditions of their work has led to chronic unauthorized work stoppages, turmoil, and prolonged contract strikes. The number, duration, and cost of wildcat strikes have increased since 1970.[45] The absence of equitable and stable labor-management relationships has hampered coal production and supply reliabillty. Coal miners' income, benefits, and health care systems, have been cut back. On the other hand, many miners say wildcat strikes are often the only way to force an employer to deal quickly– and presumably favorably— with one of the miners' concerns. The roots of today's conflict lie deep in the past. But it is simplistic to believe that current practices do not contribute. Many of the sources of discontent are deeply embedded in coal economics and management policies These may not change easily. Finally, even though U.S. energy policy counts heavily on coal, the advisability of Federal intervention in the industry's labor-management relations is not clear

Collective bargaining and labor relations generally have been shaped by the economics and structure of the industry. How miners were treated by operators was often determined by how operators treated each other and how coal was treated in the marketplace. Free enterprise has never produced stable labor relations in coal. Competition, rather than st rengthening industry stability, tended to destroy it. Chronic labor unrest has been related to the cost-cutting pressures of competition amid demand stagnation. Periodically, coal strikes erupted and dragged on for months or even years. Strikes of national consequence occurred in 1902, the early 1920's, the late-l 940's, and the mid-1 970's. Often they occurred when demand was strong. When demand surged and high prices encouraged marginal operators to begin mining, the market was quickly oversupplied and a slump soon followed Miners felt it opportune to press their demands during these booms, and when demand slacked, they struck to maintain their gains. Understanding the boom-bust cycle as they did, operators resisted labor's demands during both the short booms and the long busts.

Apart from market factors, a second source of labor-management strife originates from the attitudes and conditions resulting from the nature of the mine workplace and the work process, The work environment of underground coal mining is unique. Danger is inherent, although control l able. Work has been made easier by mechanization, but the workplace has not been made more pleasant. Modern coal miners end their shifts wet, dirty, often chilled, with mine dust embedded in every pore. Often they work on their knees; standing or kneeling in cold, oily water for hours at a time; listening to the "working" of the mountain above them. A roof that looks safe may double-cross them in a second. Wariness and caution are essential.

Unlike assembly-line work, mining requires workers — as individuals and as part of an interdependent team — to control much of their own work. Miners must constantly adapt their work to ever-changing environmental conditions. The mining process requires a good deal of individual judgment and peer-coordination. The pace of work is determined to a great extent by the miner's minute-by-minute evacuation of physical conditions and machinery. Because so much of mining is a matter of judgment, miners and section supervisors often disagree. Disputes stem from the pace of work; who is to do what; what needs — or doesn't

[45] Between 1974 and 1976, more than 400 additional strikes and 300,000 more days-idle were recorded in bituminous coal mines than between 1970-73. In 1976, 1,132 bituminous coal strikes were recorded during the term of the contract, which accounted for one-fourth of all industrial disputes recorded that year. About 20 percent of all U.S. workers participating in work stoppages in 1976 were bituminous coal miners, most of whom, presumably, were UMWA members. See Linda H LeGrade, *Collective Bargaining in the Bituminous Coal Industry*, Report 514, U.S. Department of Labor, Bureau of Labor Statistics, November 1977.

need —to be done; what precautions must be taken; and what kind of work miners can legitimately be asked to do. Miners and foremen develop routines of interaction that are both adversarial and cooperative. Both take pride in “running” a lot of coal during their shifts. But this shared goal is often subverted when management asserts authority in ways that miners perceive to be arbitrary or as violating their job rights. UMWA miners have developed elaborate work rules and codifications of their rights to protect themselves from perceived management transgressions. If one of the commonly understood rules is breached, miners close ranks and resist.

Workplace-generated attitudes lend themselves to constant confrontations. First, miners are proud of doing useful and dangerous work. Pride is linked to self-confidence; both are combined with a certain truculence against being told how to do their work. Second, the danger of the workplace readies miners for turbulent conflict outside of it. Third, the work process trains miners to work collectively. This interdependence carries over to conflicts with management. A wrong done to one miner is interpreted as a threat to all. Shared dangers and interdependent work produce group cohesion when the group is faced with a common threat. It creates a “them and us” attitude. It enables miners to stick together through prolonged strikes.

The social environment of the coalfields is a third factor contributing to the volatility of labor-management relations. The basic form of social organization in coal’s early years was the company town. In these communities, mine operators owned or controlled everything— housing, medical care, schools, the law, churches, and commerce. Until the 1930’s and 1940’s, miners were often forced as a condition of their employment to accept wages in scrip instead of U.S. currency and to buy only at the company store. The miner’s perception of work victimization was compounded by this same perception in a company-controlled community. The work routine regulated coal-camp existence. Mine operators established the quality of community life. Social equality among mining families reflected the equality of the workplace. When work conflict arose, it quickly enveloped the camp’s entire social system. Mining was not only a job, it was a way of life for workers and their families. Although the coal-camp system was dismantled a generation ago (when mechanization cut employment and spendable income to the bone, thus making the closed system unprofitable), many of the facilities are used today, and the psychology of the system remains.

Finally, industrial conflict plagues coal because of the past. Coal camps were experiential hothouses; each perceived wrong, each dispute became part of the community’s history. The bitterness could never dissipate. Children of miners absorbed — and continue to absorb — the attitudes of their parents. There is no quick remedy for this historical sensitivity; it must be accepted.

The history that follows is necessary to understand present day labor-management relationships and how they will or will not be affected by Federal policy.

The Early History

Unlike other basic industrial activities, coal production did not grow steadily over the first 70 years of this century. The industry’s capacity to produce did not change significantly after 1918. As recently as 1974, the operators produced only slightly more than they had in 1918 and less than in 1947. Demand stagnation forced the industry to be acutely cost-conscious. This often translated into protracted opposition to unionization and continued pressure to reduce labor costs. Both policies occasioned many strikes and much bitterness in the 1920’s and 1930’s. A high level of market competition among hundreds of suppliers intensified the cost-cutting pressures within the industry. Because demand fluctuated but did not grow, operators were less concerned about mining more coal and more concerned about continued lowering of their labor costs to maintain competitiveness. The implications for harmonious labor relations are apparent.

Coal’s industrial relations changed in the 1930’s and 1%0’s, until that period, the majori- , ty of operators had never accepted the principle of unionism. Federal legislation had not protected collective bargaining. But Depression-spurred legislation—Norris-LaGuardia, the National Industrial Recovery Act (NIRA), and the Wagner Act—encouraged collective bargaining and outlawed certain antiunion practices. The New Deal also rescued the coal industry through its price-fixing, production-stabilizing codes. UMWA became the bargaining agent for most coal miners in 1933 following a whirlwind organizing campaign. Although UMWA regularly negotiated contracts with associations of northern and southern operators, collective bargaining was characterized by strikes, threats, denunciations, Federal seizure of the mines, and ritualized hostility. Despite the gains won by UMWA president John L. Lewis, the industry's fortunes generally improved in this period while wages, as a percentage of sales, declined. In the late-1940's, coal demand plummeted as railroads switched to diesel locomotives and residential customers shifted to oil or gas. Market pressure forced Lewis and the operators to modify their adversarial relationship.

To stabilize labor-management relations, each side had to be able to speak with a single voice. Although many hundreds of operators mined coal in the 1940's, political leadership of the industry was assumed by Consolidation Coal Co. under George Love. Consolidation was the product of a 1945 merger between the Hanna-Humphrey-controlled Consolidation Coal Co. of Cleveland, Ohio and the Mellon-owned Pittsburgh Coal Co. The merger made Consolidation the leading coal producer in the late-1940's. From that base, Love reached out to the major steel companies to establish a single industrywide organization to negotiate with Lewis. This took shape in 1950 as the Bituminous Coal Operators' Association (BCOA).

John L. Lewis had established unquestioned control over UMWA by this time. His political opponents had been expelled or neutralized in the 1920's. The rank and file had lost its right to ratify contracts. The union's internal organization was under Lewis' persona I direction. Lewis and Love recognized that the demand-limited situation in 1949-50 threatened both sides with a devastating circle of oversupply, wage cuts, and layoffs — the very pattern that had brought them close to ruin 20 years before. The self-interest of each led to considering ways of saving the other,

Cooperation: 1950-72

Observers of coal's collective bargaining have different interpretations of events after 1950. Neither UMWA nor BCOA has sponsored or endorsed official histories of this era. However, several doctoral dissertations, journalistic accounts, and one major research effort[46] were published in the last few years. All report an undeniable shift from hostility to partnership between the union and the big operators following the 1950 contract. They trace the new dynamics of collective bargaining to economic pressures resulting from soft demand. The relationship of John L. Lewis to the coal operators reversed itself in the 1950's, and these observers criticize Lewis for some of his judgments and policies. Although this interpretation of the past annoys some in industry and labor, it is, in fact, the only body of interpretation available and has not been refuted. In this light, it should be noted that representatives of the operators and UMWA disagree with elements of the narrative that follows.

Labor relations were turned upside down after 1950. Between 1950 and 1972, Lewis and his successor, W. A. (Tony) Boyle, fashioned a strike-free partnership with the major coal operators. All earlier coal stabilization mechanisms—Federal intervention, self-regulation, and union regulation of supply—had failed. But a fourth—labor-management alliance—did not.

BCOA, which represented about half of the industry's output and all of its major companies, had two goals in the 1950 bargaining. On one hand, BCOA's Love sought to stabilize coal production and make it predictable by eliminating strikes and overproduction. On the

[46] Melvyn Dubofsky and Warren Van Tyne, *John L. Lewis: A Biography* (New York: Quadrangle/New York Times, 1978).

other, he hoped that BCOA members could sew up the blossoming utility market, the key to coal's future. Both objectives depended on the ability of BCOA companies to increase productivity and cut labor costs to maintain their competitiveness with oil and gas and eliminate low-priced coal suppliers.

Love and Lewis saw mechanization as the way to increase productivity and reduce labor costs. In underground mining, mechanization meant eliminating hand loading. Machines could produce three times as much coal with 10 workers as 86 workers in a hand loading section. Mechanization also meant more surface mining, which was more efficient than even underground centinuous miners. Surface-mined production increased from 24 percent of total output in 1950 to about 60 percent in 1977. Industrywide productivity almost tripled between 1950 and 1969. However, coal-mine employment fell 70 percent between 1950 and 1969, from 415,482 to 124,532.

The crucial factor in mechanizing coal was John L. Lewis. If he had chosen to delay it, the industry would have suffered. But Lewis championed mechanization, and had done so at least since the 1925 publication of his only book, where he wrote:

> The policy of the United Mine Workers of America will inevitably bring about the utmost employment of machinery of which coal mining is physically capable.
>
> Fair wages and American standards of living are inextricably bound up with the progressive substitutions of mechanical for human power. It is no accident that fair wages and machinery will walk hand in hand.[47]

Lewis reiterated his views on mechanization in the early 1950's:

> We decided that question [the UMWA'S position on mechanization] long years ago . . in return for encouraging modernization, the utilization of machinery and power in the mines and modern techniques, the union . . . insists on a clear participation in the advantages of the machine and the improved techniques.[48]

Mechanization was so linked in Lewis' thinking to higher wages and benefits that he simply shrugged off unemployment and other social costs as the price of industrial rationalization. With the UMWA supporting mechanization, big BCOA operators were able to cut their labor costs, secure long-term contracts, and maintain their profitability. Much of the new machinery was financed by using the contracts themselves as collateral, UMWA also loaned money directly to a number of companies to finance capital investment.

UMWA itself began reevaluating Lewis' policy on mechanization in 1973:

> A question which has persisted throughout UMWA history is how closely related are the welfare of the miner and of the coal industry. The coal operators have always argued that what's good for Consolidation Coal Co. is good for every mine worker, and that miners should therefore refrain from asking for too big a share of the profits, During most of his career, John L. Lewis knew better. When he argued for creation of the Welfare Fund, when he argued for better safety laws, when he argued for price controls during wartime wage controls, he repeated his confidence that the coal industry had the wealth to meet the human needs of those who supported it,
>
> But in the 1950's he went against that long-time judgment. Faced with mechanization of the mines, Lewis, in his own words, 'decided it's better to have a half a million men working in the industry at good wages, high standards of living, than it is to have a million men working in the industry in poverty and degradation, '
>
> It was a firm decision, and mechanization with its drastic reduction of the work force was carried out. Unfortunately, no provision was made for the hundreds of thousands of men who were put out of work. There were no benefits, no retraining programs, no new industry brought in. A great many miners were forced to take their families to northern cities

[47] John Lewis, The Miners' *Fight for American Standards,* (Indianapolis, Ind,. Bell Publishing Co., 1925) pp *108-109,*

[48] Justin McCarthy, *A Brief History of the United Mine Workers of America* (Washington, DC. United Mine Workers of America, 1952), pp. 7-8.

like Detroit and Chicago, **where most did not fit in and did** not want to.[49]

Lewis exacted a price from BCOA for supporting mechanization. Hourly wages were increased — albeit modestly–for working miners in each round of bargaining after 1950, The major concession Lewis received was the establishment of the UMWA Welfare and Retirement Fund, which provided pensions and near-comprehensive, first-dollar medical coverage for UMWA members and their families. The Fund was started in 1946, when Lewis persuaded Interior Secretary Julius Krug (who was administering the Nation's mines after they had been seized) of its merit. A modest tonnage royalty was levied, But the operators fought the plan and its funding formula for the next 5 years. Love committed the big operators to support the Fund in 1950, A tonnage royalty was fixed, and it did not rise between 1952 and 1971. Although the Fund was supposed to be distinct from UMWA, Love gave Lewis de facto control of the three-person board of trustees when he accepted Josephine Roche, a longtime Lewis confidante, to serve as the neutral trustee. The Fund did much good work in coalfield health care **in the 1950's and 1960's.** Clinics were organized. **A** chain of hospitals was built. Preventive services were encouraged. Controls over cost and quality of health services were established. But the financial resources of the Fund were always dependent on the level of production of the BCOA companies that paid the royalties. When demand fell in the late 1950's and early 1960's, the Fund — living on an unchanged tonnage royalty —was caught short. **It** had to sell its hospitals and withdraw medical benefits from thousands of miners who had been "mechanized" out of their jobs. When the Fund's records began to show startling increases in respiratory disease among its beneficiaries in the 1960's, Roche and Boyle refused to demand dust controls or an industrywide dust standard. Lewis and Boyle might have negotiated a higher tonnage payment to cover Fund needs, but that risked increasing the pressure on BCOA members who were being battered by low prices and demand stagnation

UMWA finally raised such criticisms of the Fund in 1973:

> **The history of the [bituminous] Funds since their early days is a mixed one. Many persons have been paid, but many men were cut out by arbitrary and unfair rules while the hard coal [anthracite] pension dropped to $30 per month. Medical services were provided for miners and their families, but were** *taken* away **from disabled miners and widows. For almost 20 years the royalty stayed at 40 cents, while up to $90 million of the soft coal Fund's money was kept in non-interest-bearing checking accounts at the union-owned National Bank of Washington.**[50]

The scope of the Fund's work grew increasingly constricted over the years. Under the 1978 contract, medical insurance for working miners was switched to private carriers, leaving the Fund to administer health benefits and pensions only for retired miners.

As labor costs were lowered in the 1950's and 1960's, the industry also externalized production costs. Social costs and externalized costs were rarely assessed in these years. Reclamation standards for surface mines, for example, were not enacted until the late-1960's. Dust controls were not required in underground mines until 1970, when coal workers' pneumonconiosis (CWP) was recognized as a disabling occupational disease by Federal legislation. Federal safety standards were minimal. Industry was not expected to bear the public costs of the unemployment produced by mechanization. Systematic air pollution controls had yet to be enacted; coal suppliers sold relatively "dirty" coal to utilities. Finally, coal field communities generally imposed small tax burdens on local mine operators and coal-reserve owners, fearing that even the slightest additional economic pressure would make local employers uncompetitive. When demand picked up in the late 1960's and early 1970's, the industry was coincidentally expected to begin paying many of these social costs through compliance with environmental

[49] *The Year of the Rank and File: Officers' Report to the United Mine Workers of America 46th Constitutional Convention,* **United** Mine Workers of America, 1973, p. 68

[50] *The Year of the Rank and File,* p. 67.

regulations and health and safety standards. The deficit of community services that had accumulated during the depressed 1950's and 1960's handicapped fast growth in the 1970's, when coal towns struggled to meet the needs of hundreds of new miners.

The Love-Lewis contract of 1950 sought not only to stabilize labor but to impose order on coal suppliers. Surplus miners increased costs of production while surplus operators drove down prices. Both were seen as problems to be solved. Lewis shared the BCOA'S attitude toward the marginal independent suppliers, of whom he said in 1950:

> **The smaller coal operators are just a drag on the industry The constant tendency** in this country is going to be for the concentration of production into fewer and **fewer units more obsolete units will fall by the board and go out of production.** [51]

Lewis used UMWA resources to further the competition-limiting ends of his partnership with BCOA. His organizing drives in the 1950's focused on the small companies exclusively. It appears that the real purpose of the union's campaign of dynamite and sabotage was less to organize these companies than to eliminate them. While battling the non-BCOA operators, Lewis signed "sweetheart" contracts with a number of BCOA members. These secret agreements allowed the favored operator to pay less than union-scale wages or suspend royalty payments to the UMWA's Welfare and Retirement Fund. Coal companies often had difficulty finding money to finance mechanization. Lewis solved this problem for certain BCOA companies by lending them $17 million from the UMWA-owned National Bank of Washington and the Fund.

The small operators fought back against the UMWA-BCOA squeeze. The 1950 contract established a single industrywide wage scale (thus advantaging the most efficient companies), which was an economic handicap to small suppliers. Other contractual provisions devised over the years had the same intent and effect. Small operators brought a number of antitrust suits against UMWA and BCOA in the 1960's. Two succeeded in winning conspiracy verdicts. In *Tennessee Consolidated Coal Company,* the Supreme Court said the "union and large coal operators, through their National Wage Agreement and its Protective Wage Clause, conspired in violation of the Sherman Antitrust Act to drive small operators out of business."[52] Two months later, the Court affirmed a $7.2 million triple damages judgment awarded to South-East Coal Company against UMWA and Consol. The Court agreed with South-East Coal that the two had engaged in a "conspiracy . . designed to force South-East and other small coal producers in eastern Kentucky out of the bituminous coal business."[53] South-East's brief charged that the BCOA "was formed specifically to eliminate smaller operators."[54]

The partnership did little to benefit the union's rank and file. Mechanization threw several hundred thousand miners out of work and cut many off from medical and pension benefits. The annual income of those miners who continued working in the 1950's and 1960's did not keep pace with workers in comparable industries such as steel and motor vehicles. **Increasing** productivity did not lower the frequency of mine fatalities among underground and surface miners. Injury frequency did not improve between 1950 and 1970. Underground mechanization greatly increased noise and dust levels. Unregulated dust conditions produced black lung disease in thousands of miners by the end of the 1960's. Finally, the partnership seems to have required the political disenfranchisement of UMWA's rank and file. The terms and consequences of the partnership probably could not have borne the scrutiny of democratic unionism. The UMWA under Arnold Miller reviewed this touchy subject in this manner:

> Under W. A.'' Tony" **Boyle, who** followed John **L.** Lewis and Thomas Kennedy, the

[51] Lewis quoted In Thomas Bethell, *Conspiracy in Coal,* (Huntington, W Va Appalachian Press, 1971), p. 17

[52] Tennessee Consolidated Coal Company, 72 L R R M. 2312,1970

[53] *South-East Coal Company v Consolidation Coal Company, 75* L.RR.M 2336, 1970.

[54] "UMW and Coal Company Sued, " *Coal Age,* June **1966,** p **52.**

> **UMWA leadership grew more and** more out-of-touch. Boyle maintained the clamp on dissent and the close collaboration with industry of the late Lewis years, but in the three contracts he negotiated he simply could not deliver as Lewis had done. 5%

But the ordinary coal miner had no way of knowing about union loans to operators, sweetheart contracts, and other sleights-of-hand. He could see that Lewis ran the union autocratically, but so great was his trust in John L. that demands for rank-and-file contract ratification or local election of district officers never elicited much support.

The 1950-70 period is often recalled as an era of "labor peace" and "labor stability " True, there were no contract strikes against the BCOA between 19.50 and 1971 (and comparatively few wildcat strikes), but the peace appears to have benefited BCOA and UMWA at the expense of small operators and many coal miners. For non- BCOA companies, market uncertainties and cost pressures —which eliminated 4,779 mines between 1950 and 1973 — and UMWA organizing campaigns, can hardly be remembered as a golden age. For many miners, "labor stability" meant unemployment, dust, disease, and fear.

But the UMWA-BCOA partnership did accomplish what it set out to do. Mechanization and "labor peace" boosted productivity and helped BCOA companies to ride out the hard times. Competition was stabilized by eliminating marginal suppliers and through long-term contracts. It was also regulated by a deliberate, coordinated merger movement that began in 1954 among the major companies. When the dust settled, each of the biggest companies had combined with another major producer. With both labor and operators stabilized, big producers were able to increase profits despite a 20-year price freeze and stagnant demand. In 1955, for example, Consolidation Coal and Eastern Associated reported net profits of $12 million and $2 million, respectively. Profits rose to $20 million and $4 million, respective y, in 1960, and to $33 million and $8 mill ion in 1965, The alliance did one other thing. It created forces within the workplace and labor force that led eventually to the dismantling of the alliance itself. The instability that has characterized the coal industry in the 1970's is part of the process of ending the Lewis-Love partnership.

[55] *The* Year *of the Rank and File*, p 70

The Rebellion: 1969-77

The rebellion of UMWA miners over the terms of the alliance was front-page news in 1969. Beginning with health and safety, the revolt soon expanded to union reform, Fund policies and collective bargaining. Two events — the West Virginia black lung strike (1969) and the 78-victim Farmington mine disaster–propelled coal health nd safety problems directly into the public consciousness. In the process, the structure of labor-management relations began to be u nvei led.

Coal workers' pneumonoconiosis is a progressive, incurable and, in its last stages, fatal disease caused by prolonged exposure to coal-mine dust. (See chapter Vi.) Although medical authorities in England had recognized CWP as occupationally related in 1942, most American doctors refused to agree. The UMWA did not demand or fund extensive research into the disease in the 1950's, even though the new continuous miners were increasing dust. The Fund did, however, try— unsuccessfully — to persuade the American medical establishment that CWP was a distinctive disease of the trade. Expensive dust-control programs and company-paid compensation for respiratory disability would have undercut efforts to lower production costs. By the late 1960's, respiratory disease among working and retired miners was widespread, Slowly, miners began to l ink their disability to the dust they "ate" on the job. For years, coalfield doctors had told them that coal dust was not harmful, and some even said it prevented tuberculosis. West Virginia was especially ripe for a black lung protest as 80 percent of its production came from underground mines and almost one-third of the Nation's miners worked there.

Compensation legislation was passed there in February 1969 after a month-long wildcat strike that idled 42,000 miners, some of whom marched on the West Virginia Capitol carrying coffins. The final version did not incorporate many of the innovative provisions of the original bill, which the Black Lung Association (BLA), an ad hoc group of miners and their allies, had supported.

The West Virginia protest pointed up UMWA's apparent lack of concern for occupational health. The BLA became one base in the political movement by rank-and-file miners over health and safety conditions, To the BLA were added hundreds of disabled and retired workers and their widows who objected to restrictive Fund policies that denied them health and pension benefits.

Mine safety was thrust into the national arena when a Consolidation Coal Co. mine at Farmington, W. Va., blew up in November 1968, killing 78. UMWA president Tony Boyle appeared at the mine and said: "As long as we mine coal, there is always this inherent danger but Cononsolidation Coal was one of the best companies to work with as far as cooperation and safety are concerned. " John Roberts, Consol's public relations director, agreed: "This is something we have to live with. "

Others did not share their fatalism. The disaster prompted Joseph Yablonski, a UMWA official, to challenge Boyle for the presidency. Strong mine-safety legislation was introduced in Congress that addressed the safety and health problems dramatized by Farmington and the black lung uprising. The UMWA's complacency toward the disaster had discredited Boyle and mobilized the reformers.

The Yablonski campaign merged the rebellion over health and safety with growing dissatisfaction over the absence of union democracy. Yablonski urged improved health and safety, democratization, a merit system, mandatory age-65 retirement for officers, a better grievance procedure, a higher Fund royalty, and an end to nepotism, The demand for union democracy was a reaction to Lewis and Boyle's authoritarianism, which had become a prerequisite for maintaining the alliance, Yablonski lost the election, 80,577 to 46,073, on December 9, 1969, Three weeks later, he, his wife, and daughter **were** assassinated by gunmen hired by Boyle and paid from union funds. Because of "flagrant and gross" violations of Federal law, the 1969 election was overturned by a Federal judge and a rerun scheduled for 1972.

During the 1969 Campaign, Federal health and safety legislation was being hammered out in Congress. A reasonably strong bill emerged from the year-long debate. It toughened safety standards, gave the Interior Department broad regulatory and enforcement powers, set dust standards, and provided compensation for black lung victims. The UMWA opposed the strongest legislative measures, as **did the** operators.

UMWA safety activists and union reformers were bolstered by rank-a rid-file disenchantment over the contracts Boyle signed in 1968 and 1971. Boyle touted the 1971 agreement as the $50-a-day package. But the $50 came only in the last year of the 3-year agreement and applied only to a small number of miners, Boyle had finally broken the 20-year freeze on the $0.40-tonnage royalty (raised to $0.80), but most of the new revenue went to cover the cost of the pension increase he had contrived during the 1969 campaign. Other benefits changed little.

As the dissidents escalated their campaign against Boyle, some came to understand the prerequisites of labor peace that Lewis had worked out with Love. Some began to see Boyle's "corruption" more as an exaggerated consequence of the union-industry partnership than as a character flaw. This perspective is reflected in the writings of UMWA officials and staff following Boyle's ouster.

The reformers organized themselves into the Miners for Democracy (MFD) in 1972 and nominated Arnold Miller for president. Miller, a disabled miner from Cabin Creek, W. Va,, had worked with the BLA and other reform elements since 1969. He leaned heavily on the advice and skills of a dozen or so young, liberal nonminers to organize the MFD campaign. The MFD slate defeated the Boyle-led incumbents handily in December 1972. The reform movement effected many changes in Miller's first 5-year term of office. Union programs in safety, political action, internal communications, lobbying, and research were begun or strengthened. New leadership was placed in the Fund. District elections were democratized. The rank and file obtained the right to approve or disapprove negotiated contracts. Organizing—the lifeblood of any union–was stepped up. Major wage and benefit gains were secured in the 1974 contract. Yet the 1973-77 period was also one of tremendous rank-and-file unrest. Strikes and absenteeism increased, As the old partnership between UMWA and BCOA dissolved, "labor peace" was replaced by "labor instability." Miners began demanding the right to strike (which they had in the late-l940's and which Lewis conceded in 1950), Some of the discontent was focused on Miller's handling of UMWA. **It** came from UMWA liberals who thought he was not moving fast enough in many areas and from conservatives or Boyle stalwarts who disliked the changes he was making. Strikes and intra-UMWA turmoil escalated after the 1974 contact,

1974-78: An Overview of Labor-Management Relations

The factors discussed above explain the predisposition of miners and mine management to lock in what Lewis once called "a deadly embrace." But the political and workplace struggles that came to the Appalachian coal fields in the mid-1 970's were qualitatively and quantitatively different from the Lewis-led contract strikes of the 1930's and 1940's. The growing rebelliousness of UMWA miners culminated in the 3½-month-long contract strike in the winter of 1977-78. The roots of this confrontation went back to the MFD victory in December 1972. Freed from what the MFD reformers called "the tragedy and corruption of the Boyle years,"[56] miners found the change in union leadership stirred their long suppressed yearnings for more say not only over UMWA affairs but also over their working conditions and communities. Democratizing the UMWA also politicized hundreds of miners and led them to believe that they could make other social changes.

But neither UMWA nor the workplace lived up to these new expectations. Many miners were frustrated by what they saw as failures of the UMWA leaderhip to fulfill its early promises despite the gains of the 1974 contract. Operators and miners clashed over control of the workplace when companies failed to adjust to the new demands of their employees. The conflict over mine health and safety shifted from the hearing rooms of Washington to the individual mine face as UMWA and local mine safety committees pushed for greater protection.

Management's struggle with its employees has been fought over many issues during these years. Absenteeism and disputes over the grievance procedure, compulsory overtime, and job rights repeatedly disrupted coal production. Miners saw management as trying to take away job protections that they had won through the 1974 contract, Federal law, and local custom. Management saw UMWA job rights as an impediment to steady output, Operators believe Federal health and safety regulations and UMWA work rules enabled miners to encroach on traditional management prerogatives. This, coupled with what they perceive to be increasing Federal regulatory "harassment," impedes profitable mining, the industry says.

The expectations raised by union democracy were applied by miners to their communities as well. High hourly wages were hard to reconcile with the frequently dismal quality of community life in the coal fields. Why, miners asked, did the roads have to be so bad? Why wasn't there decent housing? Why no water and sewer hookups? Why the poor schools? Why were the politicians unable or unwilling to change this situation? The sense of deprivation miners felt in their communities was carried into the pits, where it emerged as hair-triggered combativeness over working conditions.

Wildcat strike activity was relatively constant between 1969 and 1974, accounting for more than 550,000 worker-days-idle annually. But, unauthorized work stoppages and lost time jumped dramatically in 1975-77. Part of the increase is attributable simply to the fact that the work force increased 84 percent between 1969 and 1977. A second explanation is

56 *The Year of the Rank and File*, P 71

that miners were less afraid to assert themselves now that demand seemed to be expanding, labor was in demand, and wages were rising. A third explanation looks to the broad range of unmet rising expectations miners developed in the course of union reform, safety legislation, and political and social changes in the coal fields. Finally, when other channels of communication with mine management and politicians seem to miners to be unproductive, strikes are used as a way for one, often-unrepresented group to get its message across.

A recent study" of wildcat strikes in Appalachian coal mines found–among other things — the following:

1. Some companies had no strikes in 1976; others had as many as 17 strikes per mine. Even within the same company, some mines have many more strikes than others.
2. In a sample of four underground mines, it was found that miners at low-strike mines consistently reported better relations with their section foreman than did miners at high-strike operations.
3. Miners at high-strike mines believed it was necessary for them to strike to get management to talk with them. Many miners believed striking would help resolve disputes in their favor. Miners at high-strike mines reported that management was generally uncooperative with the union and unwilling to settle a dispute when the union had a good case.
4. Ninety percent of the miners believed that one reason for wildcat strikes was the excessive delay in the grievance procedure. Arbitrators were distrusted.
5. Local union officials do not lead strikes. They are led by rank-and-file miners. District presidents do not appear to have the political strength to take any measures against wildcat strikes.
6. The findings suggest that wildcat strikes are related to management practices in dealing with employee matters.
7. Many of the problems of the grievance procedure, which may contribute to strikes, can be reduced if management and the union resolve more of their disputes at the minesite, rather than through recourse to arbitration.

"Jeanne M Brett and Stephen B. Goldberg, p 23 ff.

Wildcat strike activity dropped in 1978. But it is premature to conclude that coalfield peace will reign. The effects of the 4-month contract strike that ended in March left UMWA miners in debt and anxious to work. Thousands have been working on-again, off-again because of poor market conditions and a 10-week strike by railroad workers on the N&W line. Absenteeism declines when the mines are working short weeks, and rises when 6-day weeks and lots of overtime are the rule. Further, miners can't strike if they are not working. A truer indication of the mood of the work force should develop in 1979 and beyond. It would be an error to believe that steady growth in demand for coal will necessarily lead ro good labor-management relations. Growth may, in fact, lead to more militant demands and less concern for cooperating with management.

1974 UMWA Contract

The 1974 BCOA-UMWA negotiations took place in new historical circumstances. The reform UMWA rejected partnership with BCOA. Demand was growing. Profits had risen for 4 straight years as a result of price increases and the 1973 OPEC embargo. Net coal income rose from $128.4 million to $639.5 million — a 398-percent increase — for 24 major companies, the Bureau of Mines reported. Many major coal companies had been absorbed by energy companies or conglomerates, whose greater resources raised UMWA negotiating goals. The union came to the 1974 bargaining table with two basic purposes: 1) to make up ground lost over the previous 20 years, and 2) to work out new terms for future labor-management relations.

BCOA conceded an unprecedented wage and benefit package in 1974. Wages were increased more than ever before, A cost-of-1iving escalator and paid sick leave were granted for the first time. Miners were given the right to withdraw individually from conditions any one of them judged to be an "imminent danger. " Paid vacation days were increased significantly, but a two-track pension plan was introduced. Current retirees received a $75 to $100 monthly raise to $225 to $250, depending on whether they received Fed era l black lung compensation. But the pensions of miners who retired after 1975 were calculated according to a sliding-scale formula based on age at retirement and years of employment Their average pension was $425 a month UMWA negotiators believed this was the first step in phasing in a benefits-accord ing-to-service principle they thought fairer than the flat payment. Newly retired miners liked their higher benefit levels, but much bitterness arose among the 80,000 pensioners locked into the lower, flat rate.

BCOA agreed to continue providing first-dollar medical coverage for working and retired miners and their dependents. Health care and pensions had been administered by a single UMWA Welfare and Retirement Fund until 1974, when it was divided into four separately funded but jointly administered trusts. The two "1950" plans provided health care and pensions to miners who had retired before 1976 and were financed by a tonnage-based royalty. The 1974 plans were funded on a tonnage and hours-worked basis. They provided benefits to working miners and new retirees, Inasmuch as benefits were "tied into production-related financing formulas, no benefits were guaranteed. In the event that future production did not meet the income estimates used by the 1974 contract negotiators, the Funds would be unable to meet their obligations.

This happened in the spring of 1977. Although the 1974 contract had increased Funds' income 62 percent in 2 years, revenues were *still not* adequate to continue services to the more than 800,000 beneficiaries. 5. Overly optimist i c production projections, inflatlon, lack of adequate cost controls, the inability of the UMWA to organize new mines, wildcat strikes, and unexpectedly high growth in the beneficiary population — al l forced the Funds to retrench. Either benefits to miners or payments to health providers had to be cut The Funds chose to cut benefits by instituting deductibles, which ended the tradition of first-dollar coverage established in 1950. Miners had to pay up to $500 per family for medical services. The Funds also ended negotiated retainers with about 50 coalfield clinics i n favor of fee-for-service reimbursement This had the effect of forcing the clinics to cut services Miners throughout the East stopped work for 10 weeks to protest these cutbacks. BCOA refused to refinance the Funds because it felt that wildcat strikes had caused the cash crisis.[59]

BCOA also came to 1974 collective bargaining with a new strategy. The old union-management partnership that had glued the big operators together since 1950 was discarded. The Lewis-Love alliance might be dead, but the operators hoped major wage and benefit concessions would buy labor stability.

The BCOA strategy did not work. The UMWA leadership was not strengthened by the BCOA'S concessions in the 1974 contract. In fact, the plan backfired. If anything, the improvements secured by the union raised the expectations of the membership more than ever. The contract was ratified by 44,754 to 34,741. The two-tier pension plan created animosity and bitterness. The new grievance procedure did not settle workplace disputes expeditiously. Thousands of cases were appealed to arbitrators. Many cases were not decided for more than a year. Unauthorized work stoppages continued to increase in 1975 and 1976 despite contract gains. The number of days lost in wildcat strikes in 1975 and 1976 more than doubled the 1972-73 experience. Many miners felt the 1974 contract should have given them the right to strike over unsettled

[58] "Report of the Health and Retirement Committee, " *Proceedings of the 47th Consecutive Constitutional Convention of the United Mine* Workers *of* America, Sept 23-Oct 2, 1976, (United Mine Workers of America) pp 348 ff

"Although wildcat strikes contributed to the cash shortage, a story in the *Wall Street Journal* (Dec. 3, 1977) correctly pointed out that production lost to such strikes amounted to only 3 percent of projected income, and was not the principal cause of the Funds' financial troubles grievances, a right that Federal court decisions had eliminated in the early 1970's. Rather than solidify Miller's standing with the UMWA, the 1974 contract divided him from part of his constituency. Miller's efforts to discipline wildcat strikers further alienated some of his membership. Some observers see the 1977-78 coal strike as an extension of the rank-and-file dissatisfaction that had been building within the UMWA and against the operators since 1974. UMWA spokesmen, on the other hand, interpret the turbulence of the 1974-78 period more as an acting out of newly discovered strength unleashed by the reform victory than as a reflection on Miller's leadership.

1977-78 Negotiations

BCOA was most concerned in the 1977 negotiations over reasserting management authority over labor at the minesite and curbing wildcat strikes, absenteeism, and certain work rules. Related to this was the matter of productivity, which had fallen steadily since 1969. BCOA negotiators abandoned their 1974 hope that Miller could be transformed into an instrument of labor pacification akin to John L. Lewis. From that reluctant conclusion, the operators were

> ., grasping for something **in 1977-78 negotiations. We realized the UMWA international had lost control of their people. We were grasping for ways to put stabilization into a contract.**[60]

BCOA hoped to effect "labor stability" — a phrase the industry coined — by winning these specific demands in 1977:

1. the unarbitrable right of the employer to discharge an employee for alleged striking;
2. cash penalties against employees for unexcused absences and striking;
3. the employer's unarbitrable right to terminate a new employee during his first 30 days of employment;
4. the employer's right to set up production incentives;
5. the employer's right to schedule production or processing work on Sundays;
6. the employer's right to change shift starting times at his discretion;
7. reduction to 45 days of the 90-day protection period for new employees (w-ho are not allowed to operate face machines or work beyond sight and sound of an experienced employee), and
8. increased restrictions on the mine safety committee.[61]

BCOA also insisted on restructuring UMWA's health and pension system. BCOA demanded that the 1974 health trust (for working miners) be replaced by private medical insurance arranged through individual operators. UMWA was to lose its influence over coalfield medical care by this change. BCOA also insisted that coinsurance be made permanent. Coinsurance would save BCOA members $70 million to $75 million annually. Fund expenditures would go down as well. BCOA would not consider equalizing pension levels or significantly increasing benefits. The union did not demand pension equalization even though the 1976 UMWA Convention resolved that the union's "Bargaining Council . . give high priority in the next national contract negotiations to equalizing pensions."[62]

Finally, the operators did not like the idea that miners felt UMWA was providing their pensions and medical services. Employee loyalty was not created by carrying a "UMWA health card" or receiving a "UMWA pension" each month. Operators saw no advantage to them in the Funds' subsidizing several dozen clinics that everyone casually referred to as "the miners' clinics." By switching to a strict fee-for-service system based on operator-arranged insurance, BCOA hoped to save money and build employee identification.

It is not easy to discern Miller's 1977 negotiating goals and strategy. Certainly, UMWA negotiators believed they were in a

[60] Allen Pack, "President of Cannelton Discusses Coal Issues," *Charleston Gazette,* Apr 12,1978, p 1 C

[61] Memorandum of Summary of Major Improvements and Changes Contained in the Settlement Between the United Mine Workers of American and the Bituminous Coal Operator's Association, " Feb 6, 1978.

[62] Proceedings of the *UMWA's* 47th Constitutional *Convention,* **pp 357-358.**

weaker position than in 1974. Miller entered bargaining after narrowly winning re-election in June 1977 with 40 percent of those voting in a three-way race. UMWA lacked a research department and was not well prepared for bargaining. Perhaps the union's biggest disadvantage was coal's market situation. Utilities had doubled their normal stockpiles. Demand for Appalachian metallurgical coal was weak. Prices for both steam and met coals were generally static and, in some cases, falling. BCOA operators and customers could absorb a long strike, particularly as the long-term effects were appraised as outweighing the short-term losses.

According to newspaper accounts at the time, Miller had two principal goals: winning the right to strike at the local level and restoring first-dollar-coverage health benefits. The UMWA won neither, ultimately. Wildcat strikes had bedeviled Miller for 3 years, so skeptics and others surmised that he planned to trade the right-to-strike for softening of the BCOA'S "labor stability" package. The right-to-strike was not included in any of the three negotiated agreements. Miller sought the restoration of health benefits to precutback levels and their full guarantee over the course of the contract. Apparently, high priority was not given to opposing deductibles, private insurance plans, and clinic cutbacks.

By contrast, the bargaining priorities outlined by the more than 2,000 delegates to the UMWA convention in 1976 were clear and aggressive. Most of all, they did not want to lose any of the ground gained in 1974. That meant no "labor stability" package, no deductibles, and no reduction in benefits. The right to strike had mixed support among the membership. The convention strongly endorsed it for use in "local issues threatening the safety, health, working conditions, job security, and other fundamental contract rights." Convention delegates also endorsed:

1. rank-and-file participation in the negotiating process;
2. across-the-board wage increases;
3. abolition of compulsory overtime;
4. more personal and sick leave days;
5. a 1-cent-per-hour increase for every 0.2 increase in the Consumer Price index;
6. no maximum (cap) to the Cost of Living Adjustment;
7. seniority based on length of service alone (rather than on the company-determined ability to perform the work and seniority); and
8. modifications of the grievance procedure.[63]

Health and safety was another priority. The delegates called for:

1. a full-time, company-paid health and safety committeeman at each mine;
2. a minimum of one UMWA miner trained as an emergency medical technician on every operating section on every shift at each mine;
3. automatic, continuous dust sampling;
4. a UMWA miner employed as a full-time dust weighman "with the authority to enforce dust standards;
5. strengthened language concerning the shutdown powers of the mine safety committee;
6. no arbitration of safety committee decisions;
7. tougher language protecting the right of the individual miner to withdraw from hazardous conditions;
8. a 90-day training period for new miners, and a 30-day time limit on arbitrators' decisions on safety and health disputes.

None of these was included in any of the tentative agreements. Obviously, the union's negotiators were not expected to win this entire shopping list of convention-endorsed objectives. But the scope and quality of the changes envisaged by the rank-and-file delegates suggested they expected a feisty, offensive posture from their negotiators in the 1977 talks. Perhaps the UMWA team lived up to this sentiment in private discussions with the BCOA, but miners found the contracts presented to them in February and early March 1978, did not measure up.

"See "Collective Bargaining Committee Report," *Proceedings of the* 47th *Consecutive Convention.*

UMWA miners were off the job for 109 days in the winter of 1977-78. Two months after their contract expired on December 6, 1977, the union's 39-member bargaining council rejected the first tentative agreement Miller and BCOA had worked out. A month later, miners rejected a second draft, **2-1. As this occurred, newspapers** were filled with administration predictions of impending **power shortages and** strike-caused unemployment of up to 3½ million workers. No power shortages occurred, and only one State— Indiana — seriously enforced mandatory **power cutbacks. The** Bureau of Labor Statistics in the Labor Department was reporting to the White House only 25,500 strike-related layoffs at the height of the strike. " Still, the administration sought and received a temporary back-to-work order under Taft-Hartley procedures invoked on March 6. The prospect of increased Federal intervention in their affairs brought the two sides together, and they hammered together a third agreement. By that time, the Federal judge who had issued the temporary Taft-Hartley order refused to extend it on the grounds that the administration had never proved the existence of a national emergency. On March 24, 56 percent of those miners voting accepted the contract. The third contract softened some of the BCOA'S demands embodied in the earlier drafts. But it fell short of rank-and-file objectives in many areas. Why did miners accept it?

First, many were beginning to suffer economic hardship. The union had no national strike fund, and the lengthy wildcat strikes of 1977 had cut into miners' savings just months before expiration of the 1974 contract. By mid-March there was an inverse relationship between a miner's militance and the number of mouths he or she had to feed. The contract represented income.

Second, there was widespread distress about health and pension benefits. As the strike wore on, fears increased that the entire pension program might collapse. (Benefits had been suspended at the outset of the strike.)

Third, miners were increasingly vocal in expressing their lack of confidence in their own negotiators. Summarized, their argument seemed to be: "We can stop the operators from taking away what we won before, but we can't make our negotiators get what we want. " This belief led to a sense of fatalism about what could be accomplished by continued striking.

Fourth, the ratification process itself weighed in favor of getting a settlement **sooner rather than later. Miners understood that ratification involved at least 10 days. Rejection of the third contract** would mean more delay before negotiations resumed, and then further delay before new terms were agreed on.

All of these factors affected the ratification vote. It is important to understand that in casting his ballot a miner was not necessarily taking the final step in a rational process of assessing the objective advantages and disadvantages of the contract he had been asked to consider.

What explains the protracted inability of the negotiators to agree to a contract that the miners would accept? One answer lies in the ability of each side to endure a long shutdown and the expectation that by doing so the final offer could be a net improvement over any earlier terms. A second is BCOA'S demand for unprecedented changes in the status quo. The magnitude of these changes, together with the barely disguised threat to resort to company-by-company bargaining, was perceived by miners as an all-out attack on their way of life, its culture, and its protections, Third, the perceived cleavage between Miller and his membership encouraged BCOA to demand drastic contract revisions. Had the union side been united, the operators might have compromised sooner. Fourth, had BCOA not insisted on "labor stability" penalties, it is arguable that miners might have accepted BCOA's other demands more quickly as part of a package. However, miners felt the BCOA's stability demands were a reassertion of the operator's wish to do as they pleased with their employees, The stalemate came to focus on the

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"The administration's spurious estimates of unemployment and power shortages were examined by the General Accounting Office in a report to Cong John Dingell, entitled, "improved Energy Contingency Planning is Needed to Manage Future Energy Shortages More Effectively, " Oct 10, 1978

Photo credit: Douglas Yarrow

UMWA coal miners protesting changes in medical benefits in Washington, D. C., during a month-long wildcat strike that shutdown most Appalachian production, 1977

shared perception that "rights" were at stake: the employee's right to job protection, safety, and security; and the operator's right to manage his business according to his best judgment. When each side perceives that its rights are challenged, wars of attrition are common. Fifth, it appears that because of poor market conditions, metallurgical coal producers and some other eastern operators were not terribly hurt by a long strike. Had there been no strike, hundreds of mines would have shut down or laid off workers because of excessive utility stockpiles, static prices, and soft markets.

BCOA was not pleased with the final version, although it had won major changes in the 1974 contract. Miners saw the final product as less punitive than earlier drafts but not as good as the 1974 agreement in many respects, particularly with respect to health benefits.

The 1978 Contract Terms

Discipline

The harsh language of the first two drafts concerning management's right to fine and discipline wildcat strikers was deleted. In its place, however, is a memorandum of understanding that continues decisions made by the Arbitration Review Board (ARB). The ARB decision decided in October 1977, gives employers the right to discharge or selectively discipline employees who advocate, promote, or participate in a wildcat strike. ARB 108 is less punitive than the proposed "labor stability" provisions as employees can appeal grievances through arbitration.

No significant work stoppages have occurred since the 1978 contract went into effect. Some mines report less absenteeism. Are these short-term phenomena, or are they trends that are likely to continue and if so, to what extent are they traceable to the provisions of the new contract?

The second question is the easier. The recent decrease in work stoppages and absenteeism probably cannot be credited solely to the new contract because, with one exception, no new terms bear directly on this issue. The sole exception occurs in the article governing settlement of disputes — the grievance procedure. A small but significant change was written into the first step. A section foremen now has the authority to settle a complaint at the minesite within 24 hours. His decision no longer sets any precedents in the handling of other grievances. Formerly, mine management delayed conceding a point in one matter for fear that it would be binding for the duration of the contract. Although individual miners seem to be getting grievances settled faster than before, redundant disputes over the same points may be occurring. A spot check of different districts in June 1978 produced no definitive information about dispute frequency but did confirm that foremen had more latitude on grievance handling. The officers of the union's largest and most strike-prone district (District 17 in southern West Virginia) reported then a very sharp drop in the number of grievances being referred to union representatives. The layoffs and short weeks that idled thousands of miners in Appalachia in the past year probably discourage grievances being filed and wildcat strikes from happening. If demand perks up in these areas, grievances may rise proportionately.

Whether the reduction in wildcat strikes is a short-term phenomenon is a much more difficult question. Miners are still recovering from a strike that lasted much longer than expected. They have been concerned with retiring large debts and replacing whatever savings they had built up. Like other Americans, they have also been troubled by continuing inflation. Perhaps the best explanation, again, is simply that miners can't strike if they don't work. Almost 20,000 Appalachian miners were laid off in the summer of 1978 because of soft metallurgical-coal markets, productivity-boosting plans, and the strike against the N&W railroad. About half that number were working irregularly in the winter of 1978-79. On the other side, many of BCOA's larger members appear to have made a special effort to resolve grievances as promptly as possible. Some claim that because of the new clause, more grievances are being resolved in the miner's favor. **In any case, ex**perience with the 1978 contract is insufficient to permit drawing many meaningful conclusions about whether it will lead to a sustained reduction in the number and frequency of wildcat strikes and absenteeism.

In the long run, wildcat strikes and absenteeism are unlikely to be brought under lasting control until the union's internal situation stabilizes and the industry adopts a more generally enlightened attitude toward labor relations. It is too soon to know whether either will occur.

Productivity Incentive Plans

The UMWA had traditionally opposed plans to increase production by offering cash bonuses for tonnage over a stated quota. The union argued against bonus plans on two grounds. First, if bonus plans succeeded in significantly increasing a worker's real spendable income, the union would find negotiation increasingly difficult for substantial across-the-board wage gains. The union feared that wages would be shifted from an hourly basis to piece rates, which is considered regressive. Second, UMWA argued that bonus systems encourage risky short-cuts, lack of proper equipment maintenance, and speed up— all leading to more accidents and disease. BCOA made incentive systems a central demand in its negotiating. The post-1 969 decline in productivity might be turned around, the operators thought, if cash bonus plans were adopted. UMWA agreed to this change.

The new contract language provides for a majority vote (among those miners voting) before an operator can adopt a bonus plan.

Once **accepted, it cannot be rescinded by the employees. Each plan would provide monetary incentives** for production or productivity increases. (The contract language does not specify what the cash bonus is pegged to). One of the conditions of the plan is that it "does not lessen safety standards as established by applicable law and regulations. " Some operators and some miners may not interpret safety "standards" as being the same as safety performance (that is, fatality and injury rates and numbers). **It** is possible that accident frequency could rise, but so long as management standards or number of injuries did not change, the bonus system would not be voided. Nothing is included about health standards or experience. The cash bonus system will be popular with many miners, but its adverse impact on workplace health and safety may be significant.

Operators have adopted two different approaches to increasing productivity in recent months. Consolidation Coal has won acceptance at four mines of plans that tie the level of the cash bonus to increased tonnage and number of injuries. It is too early to tell if this approach will raise output without compromising safety. Some union officials are worried that both miners and operators will fail to report injuries in order to preserve the cash bonuses. A second approach taken by another operator seeks to raise productivity by eliminating nearly *2,100* jobs, representing about one-sixth of its work force in West Virginia. A company spokesman said that reduction was not prompted by poor market conditions; rather " it's strictly to improve productivity. " This company hopes to maintain the same level of output after the layoffs, thus increasing productility. "

Aggregate productivity statistics over the next 2 to 3 years will tell relatively little about the effects, if any, of the new incentive clause. Meaningful evaluation will require close monitoring of individual mines where incentive plans are put into effect to determine relationships between these plans and changes in productivity, accident frequency, and dust levels,

[65] *Coal Industry News,* Sept 18, 1978

Health Care

The most dramatic change in the *1974* contract involved the refinancing and control of UMWA's health plan. Under the 1978 agreement, all working miners and recent retirees shifted to company-specific, private insurance plans. A Funds medical plan will exist for pre-1976 retirees only. Coinsurance— up to $200 per year per family–was instituted. All services, including those provided by the clinics, will be reimbursed on a fee-for-service basis. Health benefits are supposedly guaranteed, but uncertainty remains in some areas about what these guarantees mean in practice. The imposition of deductibles for working miners and retirees ends first-dollar coverage, which had been the rule since 1950. Because they apply only to physician care and medication, some health analysts believe miners will be discouraged from buying preventive physician care. The experience of other medical systems—the Stanford University Group Health plan and the Saskatchewan plan — suggests that the introduction of coinsurance reduces demand for physician services. " The entire health-benefits package is now seen by many miners as having been seriously compromised. They were widely dissatisfied with the administration of the Funds, and the current situation is commonly perceived as substantially worse. Strikes over the insurance reimbursement issue have been narrowly averted several times over the last year. The dismantling of the Funds is also an emotional issue that is unlikely to dissipate during the term of the 1978 agreement. For management and union leadership alike, it will remain a difficult problem. Strikes over coalfield health care are likely.

Occupational Health and Safety

None of UMWA's occupational health and safety demands survived the bargaining. The 1974 language continues in force, At each UMWA mine, a health and safety committee is elected (generally three miners), *Committee* members are entitled to special training. They have the right to close sections of the mine

"Anne A Scitovsky and Nelda McCall, "CoInsurance and Demand for Physician Services. Four Years Later, " *Social Security Bulletin,* May 1977 when they find conditions of "imminent danger," If their employer challenges their judgment, Federal or State inspectors may be called in to settle the question, or the issue may be taken through arbitration. The committee's action can be reversed only after the fact. This provision, stronger than most labor agreements, dates back to 1946, when John L. Lewis won it when the mines were under Federal control. If an arbitrator upholds an employer's accusation that a committee member acted "arbitrarily and capriciously, " the miner may be removed from the committee but cannot be fired or otherwise disciplined for his official actions.

These provisions contrast starkly with those generally in effect at non-UMWA mines, where the safety committee, if one exists at all, is often reluctant to enforce standards for fear of jeopardizing its members' jobs.

Workplace Relations

The basic issues that created friction under previous agreements were not resolved and can be expected to cause difficulties in the future.

For example, management retains the right to operate mines 6 days a week (a BCOA proposal to permit operation 7 days a week failed). The compulsory sixth shift is a primary source of discontent among miners at operations where the 6-day week is scheduled. Compulsory shift rotation is another source of widespread discontent. Wildcat strikes have erupted over it. Some miners believe management routinely awards preferred jobs on the basis of favoritism, and that the contract language does not protect a miner's right to be awarded a job on the basis of seniority and ability to perform the work. Some of these conflicts might be resolved if each side were willing to meet and work out a compromise. It is still too early to tell whether this will happen u rider the 1978 agreement.

Education and Training

Education and training have been foreign concepts in the coal industry through much of its history. Both are inextricably tied to im**proving workplace relations. The significance of the changes that have taken place in the industry's** work force over the past decade are difficult to exaggerate. The industry laid off 70 percent of its work force between 1950 and 1970, then turned around and began hiring again in record numbers when demand picked up Today, most miners are in their 20's and 30's The supervisory work force is also overwhelmingly young. In some mines, informal alliances between young foremen and young miners have reportedly occurred in response to perceived intransigence by upper management. Low-level supervisory skills are no longer sufficient, Most industry spokesmen acknowledge the shortage of experienced mine foremen who are able to maintain good rapport with hourly employees. Some companies are trying to upgrade supervisory skills; others hope to get by with what they have. The likely safety and production payoffs of more capable foremen cannot be understated.

The 1978 contract provides for employer-developed orientation programs of not less than 4 days for inexperienced miners and not less than 1 day for experienced workers. The contract specifies that each program should emphasize health and safety. The trainee period — during which a new miner cannot operate mobile equipment or work beyond sight and sound of another miner — was cut from 90 to 45 days.

Education and training for miners can take many forms. A sample list of priority objectives might include:

- Machine-specific training beyond basic requirements of State and Federal law.
- Training in dispute settlement directed at both supervisors and members of the UMWA Mine Committee.
- Training for the Health and Safety Committee to familiarize them with occupational health and safety hazards and Government regulations.
- Interchangeable skills for work crews within the mine. The benefits from such training are obvious. Safe working habits are encouraged. The impact of absenteeism is blunted when a miner can step into

the job of an absent worker without exposing himself and other crew members to hazards arising from unfamiliarity with a machine or work procedure. Recent Federal regulations on miner training are a step in this direction, but critics argue that they are inadequate in many respects.

Wages

Most miners approved the wage package. Unadjusted standard wage rates rose from 1977's $55.68 per day for the top-paid miner to $74.32 per day in the first year. The lowest paid underground miner went from $50.38 to $64.78 per day in the first year. The gap between lowest- and highest-paid miners is $8.64 per day, as it was in the previous contract.

The 1974 agreement initiated a capped cost-of-living escalator pegged to increases in the Consumer Price Index. In the final adjustment period (November 1977), the maximum inflation adjustment was $0.98 per hour. The new contract includes no inflation adjustment mechanism in the first year, and a $0.30 maximum per hour raise in the second and third years. Although the 3-year, hourly wage increase amounts to about 30 percent, the increase in real income is likely to be closer to 3 percent after inflation, deductibles, and higher tax payments are taken into account.

Union-Industry Relations

In the last round of negotiations, some coal operators were encouraged by the Carter administration to break from the BCOA bargaining structure and conclude contracts with UMWA miners on a company or geographical basis. Proponents of this innovation argue that decentralization would reduce the impact of contract strikes because no common contractual expiration date would exist. Some also believe that the more profitable companies could buy "labor stability" through comparatively "fat" packages, leaving less-profitable companies to settle as best they can. Many newer companies — as well as some miners — feel the pension obligations of older BCOA companies limit the size of wage gains that can be negotiated. The other side of the debate argues that regional or company-specific bargaining will create more problems than it promises to solve. They point out that this kind of bargaining historically has destablized this industry. The signing of a number of agreements (each of which embodies a different set of wages and benefits) would create strike conditions because of the differences. **It** is improbable that miners at one mine will work very long for less than miners at an adjacent mine. It is also likely that miners who strike when their contract expires will "picket out" other mines in order to increase economic pressure on their employer. This chain reaction could go on indefinitely as staggered expiration dates are reached. It is debatable whether decentralization would produce a net reduction in time lost to strikes. Had the 31A -month strike actually imperiled the country, solid ground would have been established for a radical restructuring of the UMWA-BCOA structure. But as a national emergency never existed — and is even less likely to in the future– it does not appear to be imperative to change the status quo.

Community Development

Community development problems are beyond the scope of the collective bargaining **process, but they must be addressed more effectively over the term of the 1978 agreement or the basic unrest that has characterized coalfield** life will not abate. The most significant difference in strike activity in the 1970's from earlier periods was that the former sometimes was triggered by nonworkplace social and economic conditions, such as a gasoline rationing plan in West Virginia, controversial school textbooks, unsafe coal-waste impoundments, Federal court decisions, pending Federal black lung legislation, and cutbacks in health benefits. Before the 1970's, strikes were rarely caused by matters other than those arising over working conditions or contract terms. Recent field studies suggest that inadequate, unstable living conditions contribute to absenteeism, wildcat strikes, and lower productivity. The President's Commission on Coal, which began its investigation in September 1978, is exploring the relationship between living conditions and work relations, as well as

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possible strategies for improving the quality of coal field life.

Non-UMWA Labor

Roughly 30 percent of 1977's 230,000 coal workers did not belong to UMWA. Some belong to other unions, such as the International Operating Engineers or PMU. The rest belong to company-approved associations or to no labor organization at all. In the East, most non-UMWA labor is found in small, mostly non-union mines in eastern Kentucky, Virginia, and Tennessee. PMU is based in Illinois. In the West, miners generally are either unorganized or non-UMWA. With a few exceptions, UMWA mines there are underground operations.

Still, UMWA exerts a good deal of indirect influence over non-UMWA operations. In the 1977-78 strike, much non-UMWA production in the East was shut down, too. Wages and benefits in non-UMWA mines are often pegged to UMWA rates. Non-UMWA operators will often offer higher wages than the UMWA scale in order to keep UMWA from organizing its miners, Three UMWA contract provisions appear most objectionable to non-UMWA operators: job security protections, safety and health rights, and benefits for retired miners. If . UMWA succeeds in upgrading its western **surface-mine agreements to prevailing non-UMWA standards, it will probably have better organizing success among western surface miners as nonwage** issues take on increasing importance.

Conclusion

The 1977-78 shutdown was one episode in a long-running coalfield drama; it was not the final act. Labor peace is not unreasonable for a coal operator to expect, but it is unlikely to be achieved by the approach adopted by BCOA in the recent talks. Too much bitter history and too many contemporary conflicts exist to enable threats and penalties to promote stability, let alone peace. Any long-term approach requires recognition that many of the problems have become embedded in the American system of coal mining— its production process, work relations, work environment, communities, and culture. Changing the consequences of this system — absenteeism, strikes, distrust, arbitrariness — means changing the components of the system that produce conflict.

REGULATORY RESTRICTIONS ON MINING

Federally mandated permits and operating methods have become significant factors for the mining industry. The principal requirements arise under the Surface Mining Control and Reclamation Act (SMCRA), the Mine Safety and Health Act, and the Clean Water Act. These are discussed in detail in chapter VII. This section addresses the ways these regulations affect mine operators as well as their potential to affect the supply of coal. The major areas of concern are the increased leadtime required to open a new mine, increased capital and operating expenses, the designation of certain areas as unsuitable for mining, and a sense of "harassment" within the industry.

A longer leadtime for opening new mines could result from the need for additional planning, design work, and permits to comply with Federal regulations. Permits are required under SMCRA, the Clean Water Act, and the Resource Conservation and Recovery Act (RCRA). SMCRA mandates State permit systems in accordance with Federal guidelines that include comprehensive performance standards for surface mining operations and for the surface effects of underground mining. These standards are intended to prevent adverse environmental impacts such as ground and surface water contamination, degradation of land quality, and subsidence. Mine operators must demonstrate, as a prerequisite to obtaining a mining permit, that the land can be restored to a postmining land use equal to or greater than the premining use. The Clean Water Act and RCRA also mandate State permit systems in accordance with Federal guidelines. Under the Clean Water Act, Federal effluent limitations designed to achieve national water quality goals apply to all active mining areas (surface and deep) including secondary recovery facilities and preparation plants. Solid waste disposal standards under RCRA are designed to control open dumping; substantial constraints could be imposed on the disposal of mine wastes if they were declared to be hazardous. Additional design restrictions may be imposed by the requirements of the Mine Safety and Health Act. **In addition, the planning** stage for leases involving federally owned coal or for mines on Federal lands may include the preparation of an environmental impact statement under the National Environmental Policy Act (NE PA) or the Federal leasing program.

Before the implementation of these environmental and health and safety regulations, a mine could be opened in little more time than that required to conduct geologic surveys, assemble the tract, order equipment, and prepare the site, This process typically might have required 5 years. However, permitting and review and other mandated planning have added significantly to this leadtime. Coal operators now estimate that the opening of some new mines could require 8 to 16 years from initial exploration to full production, depending on **the** characteristics of the mine site and the resources of the mining company (see figure 16). However, if many of the required activities proceed simultaneously, and if full compliance with applicable legislation is achieved at the outset, the leadtime should not be increased substantially.

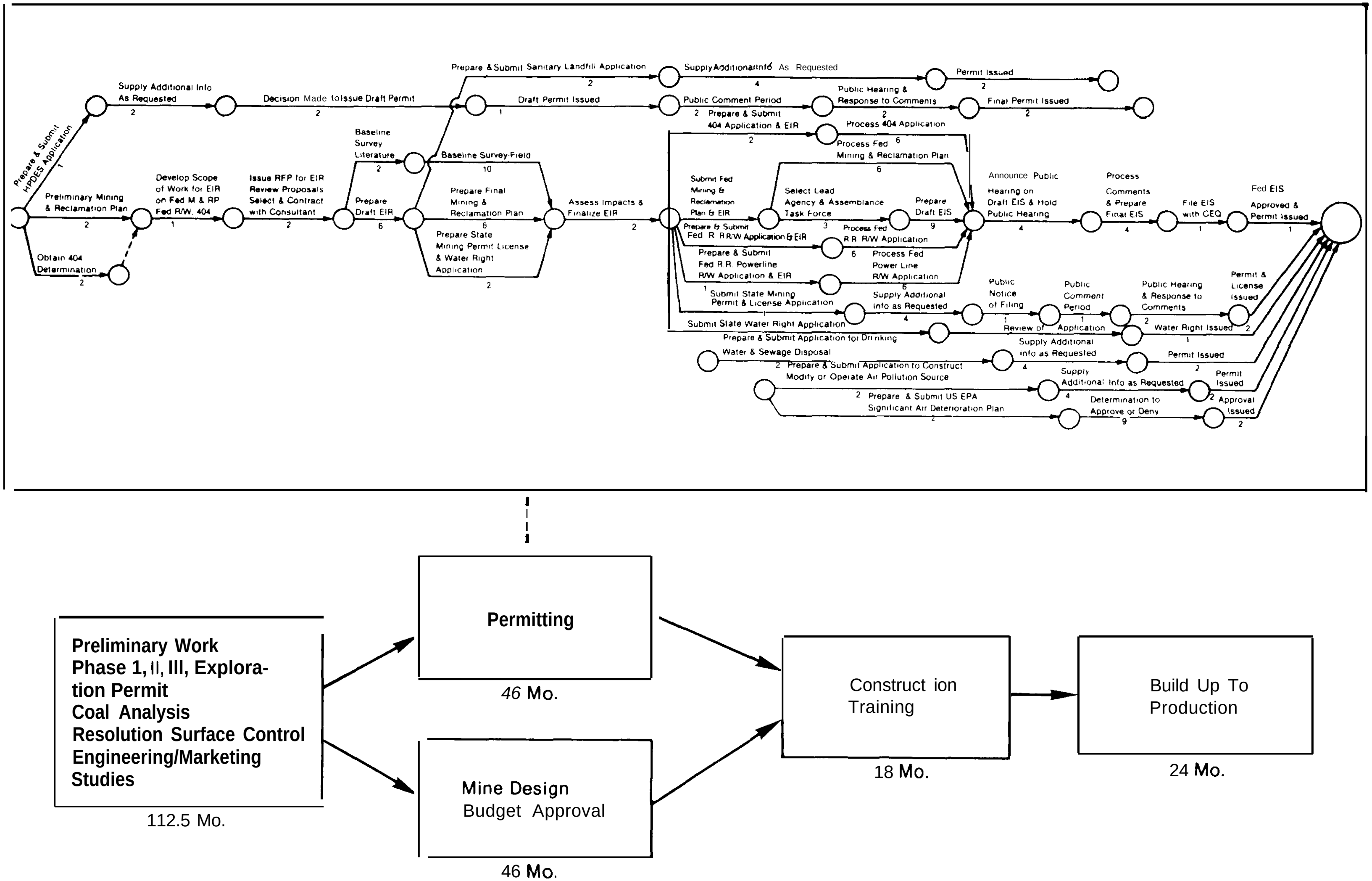
However, if greatly increased leadtimes become the norm, they could constrain coal supplies for the high-growth scenario by the late 1980's, when a rapidly expanding coal industry would need new mines not yet in the planning stage. Supplies should be more than adequate for all scenarios until then. In addition, substantial delays in the opening of new mines could alter the structure of the industry. Because utilities will not contract for coal not needed for many years, coal mine planning would have to begin without an identified market. Larger mining companies can maintain fully permitted nonoperating mines for potential customers, but smaller companies could lose their historic ease of access into the market because the planning and permitting costs would be incurred so far in advance of a return. The flexibility of coal supplies also could be reduced greatly because only those mines that are well into the planning stage could be considered viable suppliers.

Increased capital and operating expenses for surface mines would result primarily from reclamation and other environmental protection requirements For underground mines both environmental and occupational health and safety requirements increase production costs. Before passage of SMCRA, surface mine reclamation costs averaged $3,000 to $5,000 per acre. Depending on seam thickness, this cost translates to a range of about $0.20 to $1.00 per ton. Industry estimates of the increased costs attributable to SMCRA vary widely, depending on the characteristics of the site.

Any cost increases probably will not limit the industry's ability to supply coal, but they will make coal more expensive and could force small, capital-short companies out of business. **In addition, coal operators could have difficulty obtaining reclamation bonds** for areas that are difficult to reclaim because of the stringent, detailed SMCRA requirements for these sites. Federal programs are available to help small companies meet these increased costs, but it is unclear whether they will be adequate.

A third concern raised by regulatory restrictions is the designation of areas as unsuitable for mining. Except for valid existing rights, SMCRA prohibits surface mining on Federal lands valuable for recreation or other purposes (such as national parks, wildlife refuges, wilderness areas, wild and scenic rivers) and on much of the national forest lands. In addition, SMCRA requires the States to institute planning processes for designating areas unsuitable for all or certain types of surface mining. These include areas where reclamation would not be technologically or economically feasible; where mining would be incompatible with existing land use plans; where it would adversely affect important historic, cultural, scientific, and aesthetic values; where it would result in

Figure 16. —Permitting Network for Surface Mines



substantial loss or reduction in long-range productivity of water supplies or food or fiber products; or where it would endanger life or property in areas subject to flooding or unstable geology. Until these State planning processes have been established, it is not clear to what extent they could limit coal supplies.

The final factor related to Government regulations is the sense of **"harassment" engendered within the industry by Federal regulation of what historically had been the industry's prerogatives. This hostility can result from the concerns discussed** above (delays in mine openings, increased costs) or from interference in mining practices by Federal inspectors, and it can occur among mine operators as well as between operators and miners or the public. Mine operators may perceive frequent inspections as harassment, especially if the operators feel that they are making a reasonable effort to comply with the regulations or that the regulations are counterproductive. For example, mine health and safety inspectors may be seen by management as allied with labor or by labor as cohorts of management, resulting in increased tension between these groups. Similarly, SMCRA inspectors may be perceived by mine operators as allied with the "environmentalists " and vice versa. On the other hand, all three groups — mine operators, miners, and environmentalists — may feel that the inspectors are incompetent and do not protect any interests adequately.

An additional source of hostility within the industry is the automatic citation provision of the Mine Safety and Health Act, which requires an inspector to cite every violation regardless of its severity or its potential for immediate correction. Automatic citations and civil penalties are intended to deter noncompliance. However, as with frequent inspections, they may be perceived as harassment by operators who feel they are making a good-faith effort to comply with regulations. On the other hand, miners claim, that Federal inspectors do not always issue the automatic citations because their experience tells them that the specific circumstances do not warrant it. Probably most inspectors use judgment in issuing citations; some are too lenient, others are too literal.

PRODUCTIVITY

Productivity is a measure of the efficiency of an industrial process. It expresses a relationship between a unit of output and the effort that goes into it. In coal mining, productivity is expressed as tonnage mined per worker per shift.

Production is not the same as productivity. Production refers to total output or tonnage; it says nothing about the efficiency of a coal mine or industry. The two concepts are related. Coal production can rise through increasing productivity; that is, by more efficiently using labor, capital, management, technology, and raw resources. But output will also increase without any improvement in productivity when more units of production are employed. Increasingly productive companies usually reflect an ever more efficient use of economic resources. When a company is able to raise its productivity, it should be able to lower its production costs, better compensate its labor, sell more cheaply, and show a better return on investment. Although it is often imperative for an individual company to raise its productivity each year, that imperative may be much less strong for the industry as a whole. Where supply (and capacity to produce) exceeds demand as it does in the coal industry, higher productivity leading to more output may hurt coal suppliers who already have more coal than they can sell.

Mining productivity–output per worker shift—expresses efficiency in terms of labor productivity. Coal (labor) productivity is calculated by dividing total tonnage mined by the number of employees. This formula can be misleading. Actually, productivity reflects the efficiency of how many factors work together to produce a ton of coal. When coal mining was a labor-intensive industry and labor costs accounted for as much as 70 percent of total production costs, this way of measuring efficiency made sense. Then, each miner was paid on a piecework basis — so many cents per ton mined — and mining systems required many workers, little capital, and simple tools. Today, coal mining— both surface and underground systems— is capital intensive, and productivity rises or falls according to how many variables interact, labor being only one. A more useful indicator of mining productivity today might be derived by measuring capital efficiency (in constant dollars), mining system efficiency, individual machine efficiency, or total-factor efficiency.

The decline in coal productivity since 1969 has received much attention. That decline has been dramatized because it reversed a steeply rising productivity curve that had characterized the industry since 1950. I n that year, productivity was calculated at 6.77 tons per worker shift compared with 19.9 tons in 1969. Productivity almost tripled over that 20-year period. But annual *production* never matched the 1950-51 level until the late-l 960's. Rising productivity did not result in increased production. (In fact, more bituminous and anthracite coal was mined in 1920— 655.5 **million tons—at a productivity** level of 4 tons per worker shift than was mined in 1975 —654.6 million tons — at 13'A tons per worker shift.) Productivity improvement in the 1950's and 1960's did, however, allow the biggest coal companies to survive a protracted demand slump. The spectacular rise of coal productivity in these years was the result of mechanization of underground mining, increased surface mining, the absence of environmental controls on surface mining, and inadequate mine safety standards. Productivity improved statistically because 70 percent fewer miners were working in 1969 as were in 1950 while production increased slightly. As the numerator (tonnage) remained relatively constant in these two decades, the denominator (workers) dropped" steadily, resulting in ever higher productivity.

In the 1970's, production went **up,** but **employment** rose at an even faster rate. Consequently, productivity declined. Underground productivity fell from 15.6 tons per worker shift in 1969 to 8.7 tons in 1977. Surface mining productivity dropped from 35.7 tons to about 26 tons. Production rose from about 560 milion tons in 1969 to about 688 million tons in 1977, a 23-percent gain. But employment increased 84 percent from 125,000 in 1969 to almost 230,000 in 1977.

Industrywide productivity data must be used with caution because of numerous inconsistencies and uncertainties in the numerator (tonnage) and denominator (workers) of the productivity formula.

Tonnage, for example, is reported differently by different companies—and even within the same company. Productivity is affected by whether operators report tonnage "as sold" or "as mined. " The latter represents raw coal as it comes directly from the mine face. The former represents both raw coal (sold as is) and cleaned coal. Productivity falls in proportion to the amount of cleaned coal reported because wastage (which has been increasing— see chapter **11) is** subtracted from "as mined" output. Because tonnage data include different definitions of output, productivity statistics may not be measuring efficiency in the same way.

The data also do not distinguish between steam and metallurgical coals. Met coal and steam coal prices were about the same in the 1960's, but met prices have been roughly double steam prices in the 1970's. High prices enabled inefficient met coal mines to operate profitably. The effect of high met prices has been to lower industrywide productivity.

Another data weakness involves the concept of tonnage itself. Coals differ in quality, and tonnage simply measures weight. If, for example, the numerator in the productivity formula were Btu instead of tonnage, underground and eastern productivity would rise relative to surface mine and western productivity.

The raw data may also be misleading because coal companies count their workers differently. Some count only hourly employees; others include office workers. Obviously, the larger the denominator (workers), the lower the

productivity rate. Another weakness involves the definition of a working shift. Actual shift times range from 7'A hours to as much as 12 hours, Generally, surface miners work more overtime than underground miners. The typical surface shift may be longer than the average underground shift. in this fashion, long-shift mines would show higher productivity than short-shift operations, other things being equal. This would tend to show surface-mine productivity higher and underground productivity lower on an aggregate basis,

perhaps the single most serious flaw in the data is that they often grossly combine the performance of vastly different mining systems. Coal mines range from huge investments producing 10 to 15 **million tons annually to tiny "dogholes" punched into a hillside, producing 1,000** tons or less. Shovel size runs from 130 yd^3 **down to a No. 4 hand shovel. Coal is moved by 650** hp jumbo trucks as well as one pony-power railcars. The industry is made up of very different parts, and in analyzing productivity the differences may be more relevant than the similarities.

The most obvious distinction is between surface and underground mining. Surface mines are roughly three times as productive as deep mines. The productivity advantage of surface mining is inherent in its extraction technology and geologic conditions, As more and more surface-mined production comes from the tremendously efficient open-pit mines in the West, surface mining productivity should rise and to a lesser extent, industrywide productivity as well. Although OTA estimates that the 60/40 ratio of strip to deep production is not likely to change over the next 20 years, industrywide productivity would rise considerably if this ratio does increase (as it has since **1950).**

Even within similar mining systems, variations in productivity occur according to seam thickness and accessibility, mining techniques, and equipment size, among other factors. Underground productivity rates range from 31A tons from a thin-seam in southern West Virginia to 30 tons or more in a thick-seam. Similarly, surface productivity ranges from about 20 tons in east Kentucky to 100 tons or more in Wyoming,

A second crucial distinction needs to be drawn between new mines and old mines. The productivity of new underground mines averaged about 18 tons per shift compared with 11 tons for existing deep mines in 1974.[67] Similarly, new strip mines averaged about 70 tons per worker shift — and in some Western operations approached 150 tons— compared with about 36 tons for existing surface mines.[68] Industrywide productivity will increase as new *mines* replace old mines.

To be analytically useful, productivity data must compare like things — mining systems, machines, geologic conditions, etc. Mine-by-mine data that include all the variables involved in productivity are needed. The absence of such data impedes sound policy making.

The productivity decline since 1969 must be seen in light of these data problems; the unique factors causing the productivity increase between 1950 and 1970, and the equally unique factors causing the uneven gains in tonnage and employment since 1970.

The rise in productivity in the 1950-69 period was the result of a combination of conditions that are unlikely to be repeated. Significant advances in underground and surface mining technology maintained output levels while sharply reducing labor needs, (Indeed, the labor cost per ton of coal dropped from 58.5 percent of value in 1950 to 38.3 percent in 1969. '9 Further, the environmental and safety costs of mining were not well regulated by State or Federal law, Productivity rose but at a social cost. The combination of shrinking demand for labor and the cooperative arrangements between UMWA and BCOA kept strike activity to a minimum. Finally, poor market conditions in the 1950's and 1960's weeded out several thousand small, inefficient mines, thus boosting industrywide productivity, Unemployment, black lung, environmental damage, and accidents were the hidden costs of rising product ivity.

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[67] *Coal Task Force Report for Project Independence* (U S Department of the Interior, November 1974), p 29

[68] Ibid

"Joe Baker, "Coal Mine Labor Productivity, " p 8

What happened after 1969 to reduce productivity? The explanation for the decline cannot be pinned to a single cause. A number of demographic, economic, and regulatory developments contributed.

First, innovations **in mining technology topped out both** in reducing labor and in expanding output. Continuous-miner technology has not changed significantly since 1969 and, by that year, almost 96 percent of underground output was mechanically loaded. The only productivity enhancing change in underground mining has been the introduction of longwall systems,[70] which mined about 4 percent of all underground coal in 1977. Although surface mining expanded its share of national production, its technology has not changed significantly in scale or concept.

Second, as coal prices rose to unprecedented levels, hundreds of small, inefficient mines opened, adding many employees but relatively little tonnage to the industry's aggregate.[71] Inflated coal prices enabled these mines to operate profitably despite their relative inefficiency. Conditions and policies that encourage marginal mining will lower aggregate productivity. As long as coal prices remained constant in the 1950's and 1960's, productivity rose steadily, But when prices rose sharply in the 1970's, productivity fell.

Third, clean air legislation and relatively steady metallurgical demand in the 1970's meant coal had to be cleaned, sometimes cleaner than before 1969. More than 100 mill ion tons of waste (the equivalent of 15 percent of 1977's total output) was cleaned from run-of-the-mine output. Although this material is taken from the ground, much of it is not counted in productivity calculations. For a number of reasons, deep-mined coal is more often and more thoroughly cleaned than **surface-mined coal, which further lowers deep-mine productivity. Productivity at individual mines may be substantially affected by this factor.** For example, one underground mine OTA visited was routinely discarding 56 percent of material taken from the mine in order to fulfill coal-quality specifications in its supply contract. Productivity at this mine was about 3 1/2 tons per worker shift. If its production had not had to be cleaned, productivity would have doubled. Throughout the 1970's, the percentage of refuse-to-raw coal has inched upward. This reflects either dirtier raw coal or stricter customer specifications, and possibly both. Assuming that the Environmental Protection Agency (E PA) finally promulgates a 0.2-lb/85-percent sulfur removal limitation, the amount of coal cleaned is likely to increase as the utility market expands. Also, as the more marginal seams are mined, the amount of waste extracted in mining may increase. Both factors retard productivity gains,

Fourth, the labor force has changed dramatically since 1969. Both miners and supervisors are young, often inexperienced and inefficient. Almost half of the experienced 1969 work force retired in the 1970's and 65 percent of today's work force has been hired in the 1970's. The industry has had trouble transferring the practical wisdom of its older miners to this new generation. Absenteeism has also reduced productivity. Few hard data exist on the actual extent of absenteeism or its root causes. One way of offsetting absenteeism is to train miners to have interchangeable skills so that each can do every job on the crew. But few coal companies do this. Nor do many companies employ "utility" workers as the automakers do, whose job it is to substitute for absentee workers. The industry may be able to improve productivity by adopting such changes if permitted by union work rules. Finally, an estimated 5,000 miners were hired after 1974, when the new UMWA contract required helpers on underground face equipment. Helpers safen the operation of mobile equipment by moving high-voltage trailing

[70] Longwalls can mine more coal with fewer miners, but they are expensive and workable only in certain geologic conditions. About two-thirds of the 77 units operating in 1977 were in metallurgical mines, where high product price justified high capital investment.

[71] The biggest single employment category in 1975 was miners in underground and surface mines producing fewer than 25,000 tons annually 46,695 miners in these mines (about 24 percent of all miners) produced only 141 million tons (about 2 percent of all output) Calculated from, *Injury Experience in Coal Mining, 1975*, Informational Report, 1077 (Department of Labor, Mining Safety and Health Administration, 1978), p 77.

cables out of the way, watching roof and rib conditions, helping the machine operator maneuver, and being around in case of trouble. Helpers also receive training in machine operation from experienced miners during their apprenticeship, which allows them — after 120 training days — to operate equipment when the regular operator is not present. The addition of 5,000 helper jobs lowered productivity statistics. But the industry may recoup these statistical losses in the future by having a pool of trained machine operators ready to step in at a moment's notice. Although the productivity decline has its qualitative side (such as inexperience or anti-company attitude), the simple quantitative aspect— more miners— is its real cause.

Fifth, disabling injuries lower productivity to the extent they disrupt production teams and require extra personnel. Disabling injuries have risen since 1969. **In** that year, 8,358 underground injuries and 967 surface injuries were recorded. In 1977, underground disabling injuries had risen 40 percent to 11,724 and surface injuries had gone up 132 percent to 2,246 (see Workplace Safety, table 35). The amount of lost time from disabling injuries is substantial. Average severity of an injury refers to the average number of calendar days lost by an injured worker. In 1977, underground miners experienced 146 permanent partial injuries costing an average of 297 lost days and 11,575 temporary total injuries with an average cost of 73 work days.[72] Surface miners experienced 66 permanent partial injuries with an average loss of 529 days each and 2,211 temporary total injuries with an average loss of 58 days each. Together, underground and surface injuries resulted in the loss of 1,051,489 calendar days in 1977, which meant 751,079 lost production days. That represents 3,391 lost worker years. " In *one* form or another, an equivalent amount of labor had to be hired to substitute for these injured workers to maintain production. This represented extra personnel and extra dollar costs to mine operators, as well as reduced productivity. To put 3,391 lost worker years in a comparative perspective, it represents more than 30 percent of time lost from wildcat strikes in 1977.

Sixth, the 1970's saw extensive legislative and administrative regulation of the coal industry. States began to require surface operators to reclaim land and control landslides and water runoff. This forced the industry to hire more workers and buy new equipment. This added effort was "social [y productive" from a national and public perspective but lowered the economic productivity of the individual operator and the industry. Neither the Federal Office of Surface Mining nor industry associations could supply data on the percentage of the Nation's 64,000 surface miners that were engaged in reclamation work,

A major regulatory initiative that affected underground mining was the 1969 Coal Mine Health and Safety Act. Federal health and safety standards forced operators to devote more personnel and equipment time to ventilation, rockdusting, methane and dust monitoring, roof control, maintenance, and retrofitting machinery with safety features. Safer operating procedures require equipment to be moved in and out of the working place more frequently than before. Had these practices not been adopted, it is reasonable to suppose that coal's safety record would have been substantially worse. Some new personnel were needed to handle the employee-training and administrative aspects of the Act. Other governmental regulations required new safety and environmental personnel. Office workers — professional and clerical –were needed to ob-

[72]Data supplied by MS HA's Data Analysis Center, January 1979 Excludes permanent total injuries

[73] Calculated in the following manner Multiply number of injuries by the average number of days lost to get total number of lost days To find the number of lost work days, subtract two-sevenths of the total number of lost days (representing weekend time) from the total number of lost days Divide this sum by the average number of working days each year– 22o (underground), 230 (surf ace)–to get the number of work-year equivalents lost to disabling injuries. For underground mining, this formula finds 888,337 lost calendar days reduces to 634,539 lost work days, or 2,884 lost worker years For surface mining, there were 163, 152 lost calendar days or 116,.539 lost work days, the equivalent of 507 lost worker years Adding underground and surface lost worker years gives a total of 3,391 lost worker years from mine injuries in 1977 Data for workers in mine construction, preparation plants, etc are not Included

tain permits, develop plans and administer them at the minesite. In 1969, for example, operators reported 2,640 office workers of all kinds at minesites; that figure rose to 7,037 in 1977, an increase of 167 percent. Presumably, all of these management employees do necessary work. But they lower a mine's productivity when they are included as workers in the productivity equation. It has not been possible to determine how many officeworkers are routinely counted in productivity calculations, but anecdotal evidence suggests the number is substantial.

Other factors may contribute to declining productivity. Operators may have trouble getting capital. Delays in replacing mining equipment may reduce output. Underground haulage technology has not kept pace with cutting technology. These systems often break down. In older mines haulage and ground-control problems tend to be more troublesome. Transportation problems from mine to market slow down production when logjams develop. Primitive coal field social conditions and public service deficiencies have been cited in several recent studies as contributing to high absenteeism and hostile labor-management relations, which lower productivity.

What of the Future?

The decline in coal mine productivity has **probably bottomed out. Gradual improvement over the next decade should** occur if many of today's trends continue. Some of these trends are mentioned here. Western surface mining will account for an increasing share of total production. Its productivity ranges from 50 to 150 tons per worker shift. Many of the personnel needed to handle the requirements of Federal environmental and safety regulations are already hired. Major legislative initiatives in both areas requiring many more salaried or hourly employees are not likely. The big hiring surge of young workers has already taken place. They are likely to spend the next 20 years or so in mining as highly skilled, experienced employees. Marginal, inefficient mines will probably close if coal prices stabilize and big companies expand. New big mines with high productivity rates will open; old, smaller mines will close. Finally, it is likely that many operators will try to improve their training programs and labor relations, which should help raise productivity.

However, increasing productivity may be a mixed blessing. Strategies to enhance productivity directly affect the health and safety of coal workers and the quality of community life in the coalfields. Production can be boosted through one of four productivity-enhancing strategies, each of which carries a different set of workplace and social consequences.

These strategies are:

1. Use fewer workers to mine more coal.
2. Speed the pace of work so that each miner produces more tonnage.
3. Invest capital in more efficient equipment to enable each worker to produce more.
4. Make the work process more efficient by redesigning jobs, improving morale and motivation or improving coordination in the production cycle.

The first two approaches can have substantial health, safety, and social costs, depending on how the work force is expected to maintain production levels. If labor-saving equipment is purchased, health and safety may be improved because fewer workers will be exposed to dangerous conditions. However, if the remaining employees are simply expected to work faster or spend less time taking safety precautions, accident frequency or health conditions may worsen. One major West Virginia operator recently announced the layoff of 2,100 workers to improve productivity. This operator who hopes to maintain output with fewer workers consistently shows extremely high disabling-injury rates, and the safety and health consequences of this change may be substantial. Inefficient sections of these mines may close down entirely, or "nonproductive" jobs related to mine housekeeping, rock dusting, and ventilation work may be eliminated.

Speedup strategies (#2) may involve heavy safety and health costs. Recently, a number of mines have adopted cash bonus systems whereby a miner can receive extra income if a tonnage quota is exceeded. One union official in the United Kingdom, where a similar plan was **begun in 1977, reported a 50-percent increase** in fatalities at mines that switched to the incentive plans. The American experience with these plans is too recent to assess. Some U.S. plans tie the cash bonus to both safety (defined as disabling injuries) and productivity. Clearly, this is a commendable approach. But the plans may encourage miners and management to undercount i n juries i n order to preserve the bonus payoff Even plans that tie production to safety ignore possible health costs. If miners work faster at producing coal, they may take less time to maintain workplace conditions that protect their health. As there is no way to measure a worker's immediate respone to increased dust or noise, bonus plans may be encouraging workers to buy short-term extra dollars in return for their long-term health.

Investing capital for greater productivity (# 3) can take two forms. First, a mine operator may upgrade his mining system by replacing existing machines with newer, more efficient models. The costs and benefits of this investment — in productivity, health and safety— are generally well-known. A second form of productivity investment is the purchasing of a new product that has recently been commercialized. The productivity advantages of new technology are usually more easily estimated than any possible health and safety costs. Congress stated clearly that one of the purposes of the 1969 Act was " . . to prevent newly created hazards resulting from new technology in coal mining. " The industry is aware that new technology sometimes may increase productivity at the expense of safety. Joseph Brennan, president of BCOA, noted that "any new mining technology developed to aid in boosting productivity should also incorporate safety as one of its key features."[74] **It** is likely that the safest productivity strategy would be one that removed the most workers from the workplace, but the unemployment implications of this approach would be immense.

Although rising *productivity* brings economic benefits to management and labor, greater *production* is the primary goal of a national energy policy. Increasing coal production is related to— but is not necessarily the same as — raising productivity, Each objective entails a different set of economic and social implications. Price, for example, affects productivity and production differently. High coal prices lower industrywide productivity but raise production; low prices do the reverse. Federal policy has yet to specify the desired blend of production and productivity. Private policy, if the 1978 UMWA-BCOA contract is any indication, appears to have shifted toward productivity enhancement as a way of increasing production. Before decisions are made that commit Federal policy to either direction, major research is needed into the relationships among productivity, safety and market conditions on a mine-by-mine basis, together with a re-evaluation of productivity measurements themselves. Most Federal research personnel do not feel that a radical technological breakthrough— something like in-situ combustion for power generation or a surface-controlled, automated underground mining system — are in the offing. If it were, Federal and local officials would face the social **dislocation of thousands of unemployed miners and possibly the economic devastation of hundreds of coal mining communities akin to that of the 1950's and 1960's.** The state of coal mining technology is such that production can double or triple without any major technological innovations. Specific aspects of the mining cycle can benefit from technological innovation, but viewed as a whole, no compelling or urgent need exists to commercialize new technologies to meet anticipated production goals,

Restructuring the production process and better training and education (#4) may offer the most promise for productivity improvement over the next decade. Little research and experimentation has been done on better ways of organizing work and managing production crews. Similarly, little attention has been given to determining the most effective safety and job training and education programs. Both efficiency and safety are likely to increase in relation to the relevance of their training and the involvement miners feel they have in its practical application.

[74]"Productivlty and the BCOA," *Coal Age, July 1975,* p 97

WATER AVAILABILITY

Water is an essential resource for almost all phases of energy development. The availability of sufficient water to meet energy needs is more than a function of the presence of large quantities of water; it depends on the political acceptability of using the physically available supply, the economic competition from other users, the legal system controlling water rights, environmental factors, and other influences.

Irrigated agriculture is the major consumptive water use in the United States. Most agricultural water is consumed west of the Mississippi. Improved irrigation efficiency can reduce consumptive use of water, with a portion of this savings made available to the energy sector in the West. The Soil Conservation Service (SCS) estimates that in a dry year 195 million acre-feet of water is diverted for irrigation, of which 103 million acre-feet of depletion is charged to irrigated agriculture. Of this, 78 million acre-feet (76 percent) is consumptively used by the growing crop and the remaining 24 million acre-feet is lost to "incidental" causes.

SCS estimates that, by the year 2000, 8-million acre-feet of the water that is presently "lost" each year can be salvaged by improving irrigation efficiency. (A bonus of improved efficiency would be a 48-million acre-feet reduction in withdrawals and a similar reduction in return flows, yielding a substantial improvement in water quality.) Depending on its location, part of this water could become available to energy developers. However, agriculture pays such a low price for water ($l5 to $40/-acre-foot) that little incentive exists for its efficient use.

Besides improving irrigation efficiency, a number of other agriculture water conservation alternatives exist, including:

- crops witching (from water-intensive crops, such as alfalfa, to less intensive crops such as wheat, oats, and barley);
- *improvement* of cultivation procedures;
- removing marginal lands from production; and
- removal of water-using natural vegetation. 75

None of these alternatives is applied universally; some have potentially undesirable side effects. Crop switching depends on available markets and proper farming conditions. Removing marginal lands from production can lead to unemployment and other social problems. Natural vegetation ("phreatophyte") removal can harm wildlife habitat and erode affected lands.

A major policy problem is that incentives to conserve agricultural water have been so low that minimal research and analysis have been done to illuminate the tradeoffs among alternative water use policies. This lack of knowledge, coupled with extreme resistance to any change in water policy, has hampered intelligent reform of water management practices for agriculture.

Meanwhile, without management reform to make water more readily available, the energy industry can afford to pay far more for water than a farmer can. In the Western States, some owners are selling their agricultural land and its associated water rights for coal mining and energy development. If this process of converting agricultural land and water resources to the energy sector continues and accelerates, it may become an important political issue in the West. It seems improbable that State governments will allow wholesale replacement of agriculture by energy. It is clear, however, that the heavy subsidies paid to marginal farmers by selling them water at a small fraction of actual costs is a very expensive policy.

One possible compromise would be to establish a partnership between farmers and the energy sector with the cooperation of the State governments. The energy sector could finance water conservation measures and use the water that is saved. Although cost estimates are unavailable, the cost seems likely to be considerably less than other alternatives being

[75] S Plotkin, et al., "Water and Energy in the Western Coal Lands, " *Water Resources Bulletin,* February 1979

considered, such as the diversion of water from the Oahe reservoir in South Dakota to Gillette, Wyo., at an estimated cost of $700 to $900/per acre-foot, or the changing of technology in electric power from wet-cooling to dry-cooling systems at an estimated minimum equivalent cost of $900 per acre foot.[76]

Inter-basin transfers are often hampered by legal and institutional complaints that have emotional overtones. Congress has the power either to prohibit or require an interstate inter-basin water transfer. As part of the Colorado River Basin Project Act (Public Law 90-537, also known as the Central Arizona Project Act), Congress in *1968* declared a 10-year moratorium on studies on the importation of water into the Colorado River Basin. Many questions remain unsettled on this issue. Water rights remain unadjudicated for many river basins in the West—particularly in the Northwest; the total allocation of water within many basins remains unknown, and conflicts have not been settled for many multiple uses. Questions remain unresolved on the amount of water required for instream purposes; regional goals have not yet been backed by local goals and policies on land use, economic growth, and population growth, making uncertain the prediction of water requirements.

Indian tribes are increasingly exercising their water rights in the West. The present confusion over Indian water rights may be detrimental to the planning of water and related land resources in general, and to energy development in the West in particular. The key to Indian water rights is a 1908 U.S. Supreme Court case that produced what is widely known as the "Winters Doctrine. " The case involved a dispute between Indians of the Fort Belknap Reservation and non-Indian appropriators over waters of the Milk River, a nonnavigable Montana waterway. The Court held that, although it was not explicitly mentioned in the 1888 documents creating the Fort Belknap Reservation, there existed an implied reservation of rights to the use of waters that originate on, traverse, or border on the Indian land, with a priority dating from the time the treaty created the reservation. The Court's language has led to two interpretations of the source of the right. One line of reasoning argues that, with regard to Indian reservations created by treaty (or executive orders), water rights were retained by the Indians at the time of the treaty. Moreover, the document is silent on the question because the Indians did not intend to transfer the water rights. The alternative view holds that the water rights were in fact transferred, but that the Federal Government, under its own powers, "reserved" an amount of water from proximate streams to support an agricultural existence for the Indians. In Arizona v. *California,* the U.S. Supreme Court approved water allocations to various Colorado River Basin Indian reservations. Water quantities demanded and ultimately adjudicated for Indian reservations remain to be determined, Whatever the amounts, the water will come off the top of the available water in the Colorado River Basin, reducing the amounts remaining to the States for allocation to agricultural, energy development, municipal, recreational, and other uses.

Ground water currently supplies about 20 percent of all freshwater used in the United States. The estimated storage capacity of aquifers (underground reservoirs) is nearly 20 times the combined volume of all of the Nation's rivers, ponds, and other surface water. Ground water serves about 80 percent of municipal water systems and supplies 95 percent of rural needs; in all, it serves 50 percent of the Nation's population. Irrigation accounts for more than half of ground water use. **In many parts of the country ground water mining (pumping water from an aquifer faster than the water in the aquifer is replenished) is occurring. The** tendency to use saline water for energy development may add to the overall problem of soil subsidence, salt water intrusion, and the lowering of the water table in many aquifers. In many States, ground water law, like riparian surface water law, is inadequate to allocate the resource among competing users and is unresponsive to the problem of excessive use. The first defect results from vagueness of the rule of allocation ("reasonable use") and the second from failure of the legal system to perceive that the ground water is often a common-pool resource for which there is little in-

[76] Ibid

centive to save an exhaustible supply for use tomorrow. Any user who seeks to save it is subject to having his savings captured by another pumper from the same aquifer.

In virgin or undepleted conditions it is estimated that the average annual surface runoff or yield of the stream systems of the 11 Western States totaled 427 mill ion acre-feet, including 50 million acre-feet of inflow from Canada. Today, owing to the cumulative activities of man, this virgin water supply has been depleted by 83 million acre-feet of consumptive water use annually, leaving 344 million acre-feet or about 81 percent of the virgin yield still unconsumed. Within this western region are large areas such as the Upper Rio Grande and the Gila River Basins, where the total annual surface water supply, for all practical purposes, is completely consumed. In the Colorado River Basin this condition will be reached when the Central Arizona project is completed. The Missouri River and its tributaries in Montana and northern Wyoming appear to have sufficient unused water supplies to meet needs for the foreseeable future. The Platte River tributaries in Wyoming, and particularly in Colorado, are approaching the saturation point in water use.

Present and projected water demands for 1985 and 2000 indicate, on one hand, severe regional water shortages and problems, and on the other hand adequate water availability to meet energy needs on a nationwide basis. According to the 1975 National Assessment of the U.S. Water Resources Council, the Nation's freshwater withdrawals in 1975 from ground and surface water sources for all purposes average about 404 million acre-feet/year (mafy). Of this amount, 125 mafy were consumed through evaporation or incorporation into products, and the remainder was returned to surface water sources for possible reuse in downstream locations. By 2000, total withdrawals are projected to be about 348 mafy, with about 151 mafy being consumed — a 14-percent reduction in withdrawal, but a 20-percent increase in the amount consumed.

The production of energy and the extraction of fuels from which energy is produced constituted 27 percent of the total U.S. water withdrawals and 3 percent of total consumption in 1975. By 2000, mining and energy production (excluding synthetic fuels) will constitute 27 percent of the U.S. withdrawals and 10 percent of total consumption.

The geographic and temporal distribution of the Nation's surface waters is so variable as to pose substantial problems for energy development where billion dollar localities depend on a continuous supply of water. Rainfall varies widely from region to region, from season to season, and from year to year. Similar variations occur in runoff and streamflows. For example, within a normal year, the ratio of maximum flow to minimum flow may be 500 to 1 or greater. Year to year variations in the average flow also are substantial. Even in areas of high precipitation and runoff, a series of dry years may occur, resulting in serious drought problems such as those in the Northwest from 1961 to 1966 and in the Pacific Northwest in 1976 and 1977.

The United States appears to have enough water available to supply its most urgent needs, but there are numerous legal, institutional, and political constraints on its use, and many areas may have severe water shortages unless concrete physical measures — restraints on development, water conservation requirements, construction of additional storage, etc. — are taken. Some critical elements of legal/institutional change include:

- resolving the problems of **Indian** water rights;
- making the price of water commensurate with its cost while recognizing the non-price value to a locale of alternative types of development; and
- developing a cooperative, instead of competitive, relationship between energy and agriculture.

CAPITAL AVAILABILITY

The costs of coal production and conversion facilities have increased rapidly because of hyperinflation in the equipment market and the addition-of environmental protection controls. Coupled with the rapid growth expected, much more capital will be needed. The constraints and uncertainties discussed in other sections will make financing more difficult by increasing overall production costs. Nevertheless, if demand for coal actually develops, financing the new mines probably will not raise insurmountable problems. As discussed previously in the *Industry Profile* section, changes legislated in the industry structure will have an unpredictable effect in this area. Utilities may have more difficulty raising capital for a variety of reasons, which this report has not studied in detail, but most analysts feel the problems will not be insurmountable. If necessary, a number of different incentives could be considered to make all the necessary financing available. These could include tax incentives, loan guarantees, guaranteed purchase prices for products, investment tax credits, and a more uniform application of regulatory policy.

EQUIPMENT

Most **studies of the potential availability of mining equipment to meet expanded coal demands have concluded that** equipment can be supplied as needed. The one exception is the long leadtime for delivery on large draglines used to strip mine Western coal. However, these conclusions were based on the expectation that much of the expansion of production would come from Western coals. If there is a shift toward more production from Eastern underground mines, the dragline delays may not be serious but deliveries of underground equipment could be delayed.

Little information is available on the condition of existing mining capacity and how much upgrading will be required to meet new underground production targets. There are few mining equipment suppliers and most are small; a sudden increase in demand for new equipment would strain their ability to supply the industry's needs and they may have difficulty raising the capital to expand their production to meet the new demand.

TRANSPORTATION

On a national scale, coal development probably will not be constrained by the availability of transportation for the period under study. Minor capacity expansions will be required by 1985, and more significant ones will be needed thereafter. However, transportation facilities can be planned and constructed within the same amount of time as powerplants or large mines, so that with adequate investment and planning, improvements will take place as needed,

Rather than reduce the total level of national coal production and use, transportation bottlenecks that do develop will tend to alter the pattern of mining, shipment, and consumption. Routes and mode choices will be adjusted to alleviate capacity limitations, for example, and mining and power generation will tend to be expanded only where transportation service is adequate.

At the local level, however, availability of the means of transporting coal, or the electric power derived from it, will be significant. The following limiting factors may serve to inhibit coal growth in specific regions.

Rail

Some northeastern and Midwestern railroads are characterized by poor financial performance and deteriorated track conditions. Without either public or private investment in right-of-way improvements, particularly in Appalachia, growth in mining in this region may be inhibited, truck use increased, and mine-mouth power generation expanded.

Western coal-producing areas are served by railroads in somewhat better financial condition, but there rail lines must be extended to serve new mines.

Highway

Investment in Appalachian coal roads has also not kept up with increases in truck traffic. Deteriorated roads, like deteriorated rail lines, may eventually inhibit coal production in affected localities.

Waterway

Barge transportation is ultimately limited by the capacity of channels and locks, which are constructed and maintained by the Army Corps of Engineers. Major extensions and improvements to the waterway system are authorized by Congress; failure to undertake projects as capacity limitations are reached also will affect regional production and market patterns and will tend to divert traffic to railroads.

Slurry Pipelines

Slurry pipelines become an alternative to railroads only where rights-of-way and water rights can be acquired. Slurry pipeline enterprises do not enjoy the power of eminent domain in many States, and opposition by railroads and other landowners can impede development of this type of facility. Also western coal-producing States are characterized by scarcity of water, which may not be made available by local authorities for slurry pipelines.

High-Voltage Transmission

Installation of long-distance transmission lines generally requires Federal approval, which provides an opportunity for opponents to intervene, particularly on environmental grounds. Siting powerplants to take strategic advantage of this means of transporting power may also be difficult, particularly in western coal-producing areas. Regulations to prevent significant deterioration of pristine air quality under the Clean Air Act and local opposition to water use and other environmental impacts serve to inhibit mine-mouth power generation, for which long-distance transmission generally is suited.

REGULATORY RESTRICTIONS ON COMBUSTION

Federal agencies indirectly regulate the siting of large new coal combustion facilites and directly regulate the construction and operation of these facilities as well as the disposal of combustion wastes. The principal constraints are imposed by the Clean Air Act; additional considerations include the Clean Water Act, the National Environmental Policy Act (N EPA), the Resource Conservation and Recovery Act (RCRA), the Endangered Species Act, and regulations governing the use of Federal lands and of navigable waters. The legal framework of most of these provisions is discussed in chapter VII. This section addresses the constraints imposed by these regulations on coal users; the next section discusses the options available for operating within those constraints.

Facility Siting

Facility siting is affected primarily by the Clean Air Act; other considerations may arise under the Clean Water Act, NE PA, the Endangered Species Act, and regulations related to the use of Federal lands.

The Clean Air Act is structured around National Ambient Air Quality Standards (NAAQS) (see table 18), which are implemented through a variety of regulatory programs designed to limit emissions of airborne pollutants from stationary and mobile sources. Programs applicable to stationary sources primarily use control technology requirements and numerical emission limitations to regulate pollution from new and existing facilities, from facilities located in clean and dirty air areas, and from facilities located near scenic areas such as national parks.

Table 18.—National Ambient Air Quality Standards

Pollutant	Averaging time	Primary standard	Secondary standard
Particulate matter	Annual (geometric mean)	75 ug/m³	60 uglm³
	24-hour	260 ug/m³	150 ug/mJ
Sulfur dioxide	3-hour	—	—
	Annual (arithmetic mean)	80 ug/m³	—
	24-hour	365 ug/m³	—
	3-hour	—	1,300 ug/m³
Nitrogen dioxide	Annual (arithmetic mean)	100 ug/m³	100 μg/m³
	24-hour	—	—
	3-hour	—	—

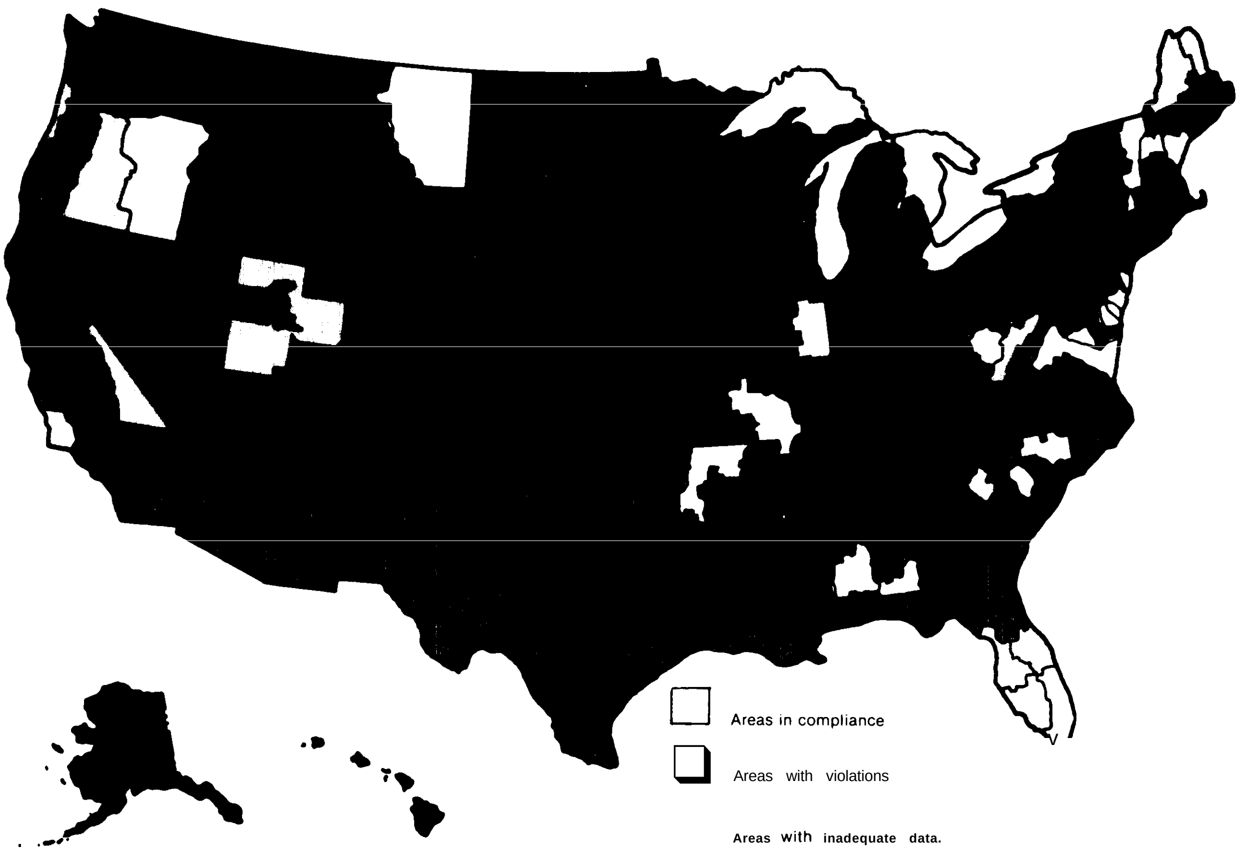
As of 1977, 116 of 247 air quality control regions (AQCRS) reported violations of the primary annual particulate standard while 108 reported violations of the **24-hour standard.** Similarly, 12 AQCRs reported violations of the primary annual SO_2 standard while 37 reported violations of the 24-hour standard. These regions are designated nonattainment areas for these pollutants, as shown in figures **17 and 18. Many of the** AQCRS that are shown as nonattainment areas may only have localized violations with the remainder of the AQCR in compliance. The States are responsible for developing control strategies for areas showing violations that will provide for the attainment of the primary NAAQS as expeditiously as practicable, but not later than December 31, 1982, The State strategy must require significant annual incremental emission reductions from existing stationary sources in areas that show violations, as well as permits for the construction and operation of new or modified sources that would exacerbate existing NAAQS violations.

Nonattainment programs will impose severe constraints not only on increased coal use but on all growth in these areas. As mentioned above, most of the AQCRS have not attained the primary particulate standards, while 15 percent have not met the SO_2 standards. Wherever a new source would exacerbate an existing NAAQS violation, the permit applicant must apply the lowest achievable emission rate (LAER) and must secure from existing sources in the area emission reductions that more than offset the emissions from the proposed facility. The cost of meeting these two requirements is high, and securing the offsetting emission reductions is difficult. Consequently, new sources are more likely to be located in rural areas where the NAAQS have been achieved. In addition, major modifications to existing sources in nonattainment areas probably would be rejected in favor of new sources in clean air areas.

However, the Clean Air Act also includes comprehensive provisions to prevent the significant deterioration (P SD) of air quality in areas where the air is cleaner than the NAAQS require, The PSD increments for Class I areas (usually parks or monuments, or wilderness areas) allow the lowest increase in ambient concentrations over the baseline, and thus the fewest new stationary sources, while the Class III increments allow the greatest increase (see table 19). In no event may a new source located in a clean air area cause the concentration of any pollutant to exceed either the national primary or secondary ambient air quality standard, whichever concentration is lower. At present the PSD regulations apply only to emissions of particulate matter and SO_2. Regulations for NO_2, hydrocarbons, photochemical oxidants, and carbon monoxide are to be promulgated by August 1979.

To obtain a permit to locate a new source in an area subject to the PSD regulations, the applicant must demonstrate that the source will meet all applicable emission limitations under the State implementation plan (SIP) as well as performance standards for new sources and emission standards for hazardous pollutants, and that the source will apply the best available control technology (BACT). BACT is

Figure 17.—AQCRs Status of Compliance With Ambient Air Quality Standards for Suspended Particulate

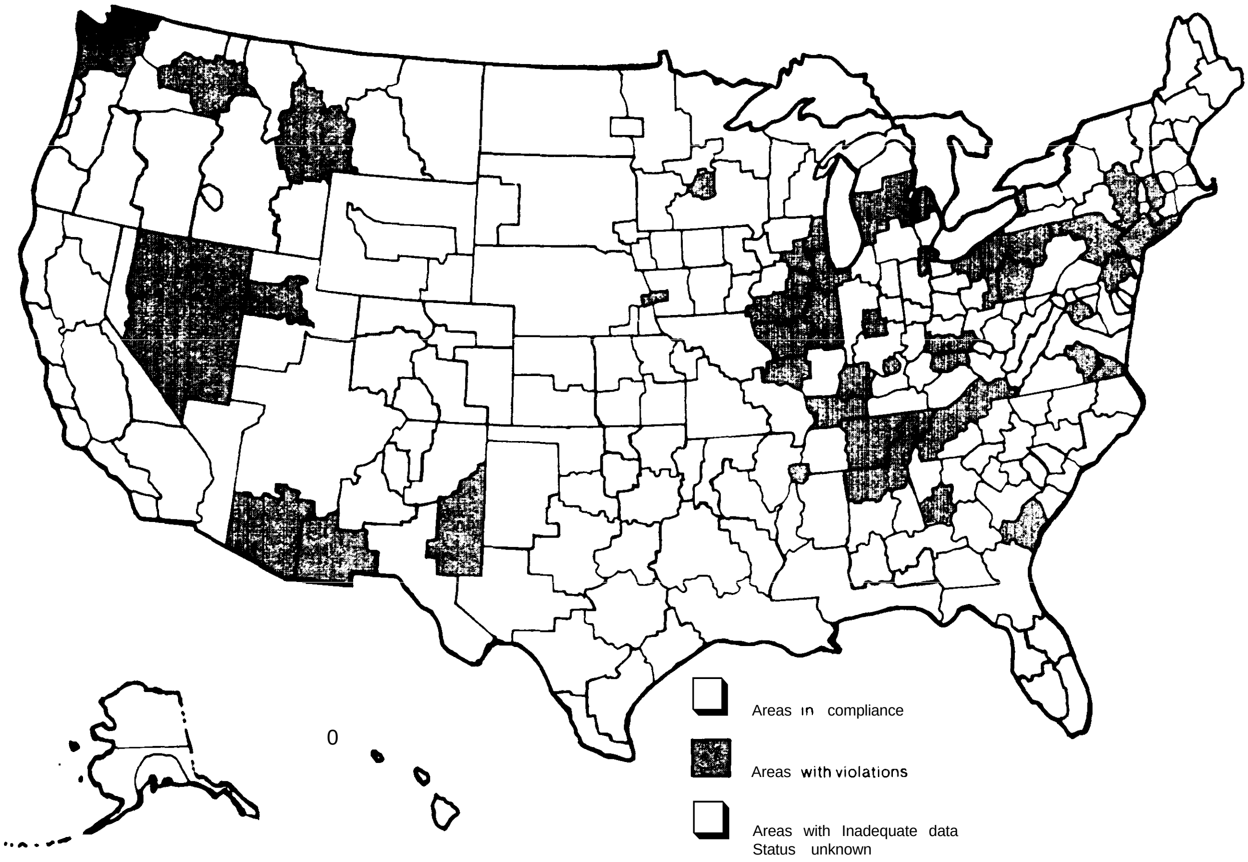


SOURCE U S Environmental Protectlon Agency 1976a

determined on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs. In addition, the applicant must demonstrate, based on air quality monitoring data and modeling techniques, that allowable emissions from the source will not cause or contribute to air pollution in violation of the NAAQS or PSD increments. The permit applicant also must provide an analysis of the source's air-quality-related impacts on visibility, soils, vegetation, and anticipated induced industrial, commercial, and residential growth.

Under the 1977 Clean Air Act amendments, PSD provisions apply to a source in any of 28 categories (including fossil-fuel-fired steam electric generating units of more than 250 million Btu/hr heat input and coal-cleaning plants with thermal dryers) with uncontrolled emissions of 100 tons per year, or to any source with uncontrolled emissions of 250 tons per year. Previous regulations applied only to sources in 19 specified categories. However, under the new regulations, only those sources with controlled emissions of 50 tons/yr or greater or that would affect a Class I area or an area where the increment is known to be violated, will be subject to full PSD review. Sources with controlled emissions of less than 50 tons per year need only demonstrate that they will meet all applicable emission limitations. Each SIP must include a program to assess periodically whether emissions from

Figure 18.—AQCRS Status of Compliance With Ambient Air Quality Standards for Sulfur Dioxide



SOURCE U S Environmental Protection Agency. 1976a

these small, exempt sources, and from any other sources that may be unreviewed because of their date of construction, are endangering PSD increments.

Because the 1977 PSD provisions apply to a wider range of sources, they are expected to increase the costs of facility siting significantly. EPA estimates that 1,600 sources of all types will be subject to the permit requirements each year (as compared to 164 per year under the previous regulations). In addition, there are two situations in which facility siting probably will be constrained, First, PSD permits will not be available for large new sources in areas where the difference between the baseline concentration and the NAAQS already is less than the allowable increment. Second, where there are several sources that are exempt from the PSD requirements because of their size or date of construction, these exempt and unreviewed sources may capture the available increments and foreclose siting for larger new facilities, as mentioned above, States are required to assess periodically the emissions from these exempt and unreviewed sources.

Finally, provisions in the Clean Air Act designed to protect visibility in areas primarily important for scenic values, such as national parks, are expected to affect the siting of coal-fired facilities. EPA's regulations, to be promulgated not later than August 1979, are to require SIP revisions in order to achieve visibility

Table 19.—Ambient Air Increments

Pollutant	Maximum allowable increase ($\mu g/m^3$)
Class I	
Particulate matter .	
Annual geometric mean	5
24-hr maximum	10
Sulfur dioxide	
Annual arithmetic mean	2
24-hr maximum ....=.	5
3-hr maximum	25
ClassII	
Particulate matter	
Annual geometric mean	19
24-hr maximum	37
Sulfur dioxide	
Annual Arithmetic mean	**20**
24-hr maximum	**91**
3-hr maximum	**512**
Class III	
Particulate matter	
Annual geometric mean	37
24-hr maximum	75
Sulfur dioxide	
Annual arithmetic mean	**40**
24-hr maximum	**182**
3-hr maximum	**700**

improvement by retrofitting plants in existence for less than 15 years as well as by adopting a long-term strategy for progress toward a national visibility goal. Proposed fossil-fuel-fired powerplants with a design capacity of more than 750 MW must demonstrate that they will not cause or contribute to the significant impairment of visibility in any of the specified areas. However, until the visibility regulations have been promulgated, it is not possible to determine their impact on the costs of, or site selection for, coal-fired facilities.

Additional, less significant constraints on siting are imposed by the permit requirements of the Clean Water Act, the Army Corps of Engineers, and agencies having jurisdiction over Federal lands, as well as by the general requirements of NEPA, the National Historic Preservation Act(NHPA) the Fish and Wildlife Coordination Act (FWCA), and the Endangered Species Act. The Clean Water Act is structured around the quality of water necessary for a variety of uses, including public water supplies, propagation of fish and wildlife, recreational, agricultural, industrial and other purposes, and navigation. New facilities must obtain a permit under the National Pollution Discharge Elimination System (NPDES). The permit incorporates all applicable effluent limitations and water quality standards promulgated under the Clean Water Act, and an applicant must demonstrate that these limitations and standards will be met. In addition, if the plans for a combustion facility require any structure to be built in navigable waters (such as a cooling-water intake structure or barge unloading facility), a permit must be obtained from the Army Corps of Engineers. Corps regulations stipulate that no such permit may be issued until the applicant demonstrates that all other necessary Federal, State, and local permits, certifications, or other authorizations have been obtained. Finally, if the coal combustion unit or any of its support facilities (such as transmission lines) are to be located on Federal land, a permit must be obtained from the agency having jurisdiction over that land.

Most federally issued permits for coal combustion facilities will trigger the environmental impact statement (E IS) requirements of NE PA. Although the E IS is prepared by the agency issuing the permit, it is based on analyses submitted by the applicant, and the length of time required to prepare the E IS depends on the quality and completeness of those analyses. In addition, before issuing a permit an agency must obtain a certification from the Secretary of the Interior that the facility will not jeopardize the continued existence of an endangered species. Under the FWCA, when a federally permitted project would result in the modification of any water body (for example, reduction of water flow through consumption by cooling towers), the permitting agency must consult with the Fish and Wildlife Service and with the State agency having supervisory authority over fish and wildlife prior to issuing the permit. Issuance of the permit may be enjoined until consultation and coordination has occurred, and serious consideration must be given to recommendations for mitigation of impacts to fish and wildlife. Finally, regulations promulgated under the NHPA require all permitting agencies to determine whether there are historic, archeological, architectural, or cultural resources affected by the proposed action that are listed in the National Register of Historic Places or are eligible for listing. If any of these resources may be affected, the permitting agency must obtain comments from the Advisory Council on Historic Preservation. **In most** cases, however, historic and other sites must only be studied, not necessarily preserved.

Of all these requirements, the Clean Air Act will have the most far-reaching consequences in terms of the number of sites foreclosed to coal combustion facilities. However, the cumulative effect of all provisions, each with extensive interagency and public participation requirements, will be to lengthen significantly the time necessary for site approval. When numerous State and local permits and other requirements are added in, this leadtime can become costly.

Combustion

As with siting, the Clean Air Act imposes the most significant constraints on increased coal combustion. other limitations include the Clean Water Act and the RCRA. The Clean Air Act affects coal combustion through standards of performance for new sources and through the provisions related to nonattainment areas and the prevention of significant deterioration.

Standards of performance for new or substantially modified facilities establish al lowable emission limitations for those facilities and require the achievement of a percentage reduction in emissions from those that would have resulted from the use of untreated fuels. Under the 1977 amendments to the Clean Air Act, these standards must reflect the degree of emission limitation and the percentage reduction achievable through application of the best technological system of continuous emission reduction that has been demonstrated adequately (taking into consideration the cost of achieving the reduction and any health and environmental impacts and energy requirements not related to air quality). That is, New Source Performance Standards (NSPS) must be met through the use of a technological method of control, such as a scrubber or precombustion treatment of the fuel, rather than through alternative fuels such as oil or low-sulfur coal.

The principal coal combustion facilities for which NSPS have been promulgated include steam electric-generating plants of more than 250 million Btu/hr heat input, large industrial boilers, and coal preparation plants (including any facility that prepares coal by breaking, crushing, screening, wet or dry cleaning, and/or thermal drying). The standards for these sources are shown in table 20. EPA plans to announce new standards for large industrial boilers in 1980.

Each SIP must include a procedure for preconstruction review of new sources to ensure that NSPS will be met. In addition, sources that undergo a modification that will increase the kind or amount of pollutants emitted must undergo a similar NSPS review. However, the provisions relating to source modifications do not apply to facilities subject to a coal conversion order under the National Energy Act.

Although NSPS restrictions will eventually apply to most boilers that could emit at least 100 tons of a pollutant per year, it will be several years before these regulations are promulgated. Meanwhile, small boilers are regulated only by State and local authorities and do not require a Federal permit. A utility could be concerned that a number of small units could start up between the time of a powerplant's permit application and the time of permit award and make it impossible for the plant to operate without violating air quality restrictions. For example, six 250-million Btu/hr boilers, each burning 50,000 tons of 3 percent sulfur coal (without control) can release the same amount of SO_2 as a large powerplant burning 2 million tons of the same coal with 85-percent control. Because small coal plants can be ordered as package units with short delivery schedules, this scenario may be plausible. The Clean Air Act requires the States to monitor small sources to prevent them from

Table 20.—New Source Performance Standards

	Pollutant					
	Particulate matter		Sulfur dioxide		Nitrogen dioxide	
Source	Emission limitation	Emission reduction	Emission limitation	Emission reduction	Emission limitation	Emission reduction
Coal-fired steam generator	*0.03* lb/10^6 Btu and 20-percent opacity	99 percent	1.2 lb /10^6 Btu	85 percent	0.60 lb /10^6 Btu	65 percent
Coal Preparation:						
Thermal dryer gases	0.031 *gr/dscf* and 20-percent opacity					
Pneumatic coal-cleaning equipment gases	0.018 gr/dscf and 10-percent opacity					
Other	20-percent opacity					

"using up" available air quality increments, but State enforcement programs may, in some cases, have difficulty complying with these requirements.

EPA's proposed regulations under the 1977 NSPS provisions have become controversial. The principal issue is whether a plant burning low-sulfur coal should be required to achieve the same percentage reduction in potential SO_2 emissions as one burning higher sulfur coal. E PA's proposed regulations for steam electric-generating units set forth a full or uniform control requirement regardless of the sulfur content of the fuel, but with a 3-day-per-month exemption from the percentage reduction to accommodate high-sulfur Midwestern coals. Alternative proposals considered by EPA include a sliding-scale standard under which the required percentage reduction declines proportional to the sulfur content of the coal, and monthly, rather than daily, averaging of the percentage reduction requirement. In addition, the General Accounting Office (GAO) has recommended that EPA continue to allow supplementary controls until mandated studies of SO_2, sulfates, and fine particulates are completed in late 1980.[77]

A variety of considerations will affect the final NSPS regulations. Under most circumstances, the proposed full-control requirement would achieve the greatest reduction in SO_2 emissions, but would increase the amount of scrubber sludge from approximately 12 million metric tons dry basis under the previous NSPS to around 55 million tons in 1985. A full-control requirement would promote the use of locally available, higher sulfur coals, especially in the Midwest, and discourage the use of more expensive low-sulfur coals. Partial scrubbing would reduce flue-gas desulfurization (FGD) costs and permit the bypassing of a portion of the flue gas and thus alleviate the need for plume reheat and associated energy costs. Full scrubbing would delay the construction of new plants causing existing coal- and oil-fired plants to be utilized more than they would have been without the proposed standards, thus causing an increase in emissions from existing plants in the short-term future that would partially offset reductions achieved by new plants.

The provisions of the Clean Air Act related to nonattainment areas and the prevention of significant deterioration (as described above) also affect emissions from existing facilities. The offset policy included in the requirements for nonattainment areas and the availability of PSD increments will put pressure on existing sources to install costly pollution control tech-

"*Sixteen Air and Water Pollution Issues Facing the Nation* (Washington, DC.: General Accounting Office, U.S Comptroller General, October 1978), nology. I n addition, each SIP must include a control strategy for existing sources in order to achieve and maintain the national standards.

The Clean Water Act imposes effluent limitations on quantities, rates, and concentrations of chemical, physical, biological, and other constituents that are discharged from coal combustion facilities. Limitations have been established for total suspended solids, oil and grease, copper, iron, hydrogen-ion concentration (p H), free available chlorine, and materials used for corrosion inhibition including zinc, chromium, and phosphorus. These limitations are implemented primarily through NPDES. As mentioned above, a facility may be issued an NPDES permit for a discharge on the condition that it will meet al l applicable water quality requirements. However, these limitations are not as difficult to achieve as the air quality standard, and the necessary controls do not add significantly to the cost of a coal combustion facility.

Finally, the Federal Government regulates disposal of combustion byproducts–ash and scrubber sludge— under RCRA. The Act establishes guidelines for the identification, transportation, and disposal of hazardous and nonhazardous solid wastes. The extent to which RCRA will constrain increased coal combustion is unclear until all final regulations have been promulgated. However, a preliminary industry analysis indicates that both ash and sludge meet at least one criterion for the "hazardous" designation.[78] If either were listed as hazardous it would have to be disposed of in accordance with a State plan, and the generator of the waste would be subject to extensive record keeping provisions. If both ash and sludge were listed as hazardous, RCRA could prohibit the use of sludge ponds, increase the cost of waste disposal by as much as 84 percent, and foreclose the sale and/or use of the wastes either directly or by making them noncompetitive with raw materials.

COMPLYING WITH THE CLEAN AIR ACT

The three major strategies for complying with the provisions of the Clean A i r Act are appropriate siting, pollution controls, and new combustion technologies. The range of pollution controls and combustion technologies available to minimize emissions from coal conversion are summarized in table **21.**

Theoretically, complying with Federal emission restrictions should not be a problem. EPA is supposed to set the restrictions for new plants on the basis of demonstrated BACT. BACT for control of particulate and NO, emissions is relatively noncontroversial, although more stringent control measures could be enacted in the future. SO_x emission control, however, is a matter of acrimonious dispute. The proposed NSPS for SO_x requires all new coal-fired powerplants begun after September 1978 to use continuous technological controls, For the immediate future, this is in essence a requirement for FGD. This technology is described in chapter **I I 1.** The controversy surrounding its technological adequacy is analyzed here along with alternatives under development. The environmental costs and benefits of applying it are discussed in chapter V.

The FGD Controversy

The recent history of FGD has been one of substantial disagreement between EPA and the utility industry over reliability, secondary effects, and costs and benefits of scrubbers. Most, though not all, of the operating FGD systems have experienced rather severe operating difficulties such as scaling of calcium sulfate on scrubber surfaces, corrosion of operating parts, erosion of stack liners, and acid fallout around the powerplants. Lime/limestone systems, the technologies that have been ordered by most powerplants, produce large quantities of calcium sulfite sludge that, unless specially treated, has poor structural strength (and thus does not provide a stable foundation) and represents a potential water pollution problem. Finally, the forced installation of FGD will cost

78 *The Impact of RCRA (Public Law 94-580) on Utility Solid* Wastes (E lectric Power Research Institute, E PRI FP-878, TPS 78-779, August 1978)

Table 21 .—Applicability and Status of Pollution Control Technologies

Pollutants and control technology	Pollutant reduction efficiency (%)	Applicability: Utility	Applicability: Industrial	Applicability: Residential and commercial	cost
SO_2					
Mechanical beneficiation	20-40	Current	Current	Current	Low
Low-sulfur coal	Varies	Current	Current	Current	Varies[a]
Flue-gas desulfurization (FGD)	85-95	Current	Current (large installations)	Not suitable for small boilers.	High
Fluid bed combustion (FBC)	80-90	1985'	Very near term or current	Not evaluated	Low to moderate
Chemical coal cleaning	40-60	Post-1 980	Post-1 980	Post-1 980	Moderate to high
Solvent-refined coal	70-90	Post-1 980	Post-1 980	Post-1 980	Moderate to high
Coal gasification					
Low BTU	90–95	Post-1 980 (preferable for new units)	Post-1 980 (larger units) or industrial parks.	Probably not applicable except in commercial centers	Moderate to high
High BTU	90-95	Post-1 980	Post-1 980 (highly applicable)	Post-1 980 (highly applicable)	High to very high
Coal liquefaction	90-95	Post-1 985	Post-1 985	Post-1 985	High
Coal-oil slurry	varies	1980	1980	Probably not applicable	Low
Magnetohydrodynamics (MHD)	9 0	Post 1990	Nonapplicable	Not applicable	
FGD combined with mechanical beneficiation	85–95	Current	Current (large installations)	Not suitable for small boilers	Moderate to high
NO_x					
Combustion modification	2 0 - 8 0	Current for some units	Current	Partially applicable	Low
Flue-gas denitrification	6 0 - 9 5	Post-1985	Post-1985	Not suitable for small boilers	High
Particulate					
inertial devices	90	Current	Current		Low
Electrostatic precipitators	9 9	Current	Current		Moderate to high
Fabric filters (bag houses)	9 9	Current	Current		Moderate to high
Scrubbers		Current	Current		

a when western low-sulfur coal is used at the source. the cost is low
b TVA is presently planning for a FBC powerplant which is expected to come on line in 1985
c Strictly speaking this is not a sulfur oxide control technology, but rather a technology to utilize coal in boilers designed for oil with minimal changes in boiler design If a high or medium sulfur coal is used, then the SO_2 emissions will be higher than if oil alone were burned

billions of dollars over what would have been required under the old NSPS, as well as several percentage points in lost electrical conversion efficiency. Industry will acknowledge no significant benefits from such an investment. On the other hand, EPA can point to smoothly running FGD units in Japan as well as a steady improvement in scrubber reliability in this country as counterweights to the industry's reliability arguments. **In addition, EPA can point to the role of SO_2 as a precursor of acid rain, which is** a serious ecological problem in the Northeast. Finally, EPA claims that the issue of sludge disposal is more of an enforcement and cost problem than a technological one; that techniques for stabilizing the sludge have been demonstrated; and that the volume, although extremely large in absolute terms, is not disproportional to the volume of fly ash that the industry has been handling for many years. Environmentalists **who either support EPA's position or who want stricter standards, point to** the possibility, strongly disputed by the industry and by many in the health community, that further controls on SO_2 will lower mortality rates (see Health *Effects,* chapter V).

The level of controversy over these issues has become so intense that it was felt necessary to add a discussion of the technological arguments over the problems of FGD. The health and ecological effects of SO_x are discussed in chapter V, as are the mechanics of disposal and the potential environmental problems associated with the sludge. The various FGD systems are described in chapter **I I 1.**

FGD Status

The first FGD installation was made in England in the 1930's (the Battersea A powerplant, a 228-MW unit using alkaline Thames River water as the scrubbing medium). In 1968 the Union Electric Meremac Unit became the first U.S. commercial installation, using dry limestone injection in the boiler followed by wet scrubbing Between 1968 and 1972, five utilities had installed this type of system, but al l encountered operating difficulties in the form of plugging of boiler tubes, low removal efficiency, and interference with particulate collection efficiency This technology is no longer sold, and the five original systems are either shut down or being converted to other systems. This record, along with operational difficulties with **newer scrubber systems, has created the basis** for years of arguments and controversy between EPA and the utility industry.

As of March 1978 there were 34 operating FGD systems, totaling 11,508 MW, 42 systems under construction (17,741 **MW),** and plans for installation of 56 other units (27,230 **MW), Of the systems installed since 1968, EPA counts 15 (all "demonstration units") as having been terminated. 79 With only a few exceptions, utilities have chosen direct scrubbing with lime or limestone as the scrubbing medium, Most of the new systems have** been retrofitted to existing boilers, although this situation should change within the next few years with the construction of new plants, which must comply with the percentage removal requirements stipulated by the 1977 Clean Air Act amendments.

Although EPA and the utility industry would agree that most of the existing scrubber systems have encountered operational problems, their viewpoints then diverge widely. What follows is a simplified, abbreviated summary of the major EPA and industry arguments about scrubbers. Note, however, that the utility industry is hardly a monolithic structure, and thus the summary "industry argument" should be interpreted accordingly. Some segments of the industry have found scrubbers to be the best alternative for their plants and are trying to make them work well,

The Industry Viewpoint

As electric power demand grows, constraints on capacity growth will demand high levels of reliability for individual units. The industry contends that scrubbers are unreliable and their *use* endangers the system reliability of the powerplants they serve. They take the view that virtually every scrubber that has been installed on a major unit in the United States has had severe operating difficulties and major shutdowns. **I** n many cases, these shutdowns would have forced reductions in boiler capacity except for the utility's ability to bypass the scrubber, New EPA regulations, if approved, will eliminate these bypasses. EPA points to a few smoothly operating scrubber systems, but the industry counters that in every case these systems have unique properties that avoid problems that most plants have to face. In some cases, this "smooth" operation is due to almost continuous maintenance, such as nightly cleaning of the unit, which the industry does not feel is practical or reasonable for the average plant.

Case studies of individual plants illuminate these problems (for more detailed descriptions of actual operating experience at a number of plants from an industry perspective, see appendix V of volume I l). For instance, the Southwest plant (Springfield City Utilities), with 200

[79] "Summary of the Opera bility of FGD Technology" (Washington, D C U S Environmental Protection Agency, Office of Energy, Minerals, and Industry, Sept 14, 1977)

MW of scrubber capacity, started up in April 1977. Operation has been poor; only one of the two scrubbers has been kept in service. The operating scrubber is only 60-percent reliable, with problems such as: (1) mist eliminator plugging, (2) corrosion of dampers, (3) failure of the lining materials in the scrubber duct work and stack, and (4) damage to nozzles and pumps from foreign material in the limestone. Another problem is that, due to a lack of reheating for the cooled gas coming from the scrubber, acid fallout around the plant has occurred. Another plant, the 830-MW Mansfield powerplant (Penn Power), ran well for its first year of operation because of the ability to cut boilers back and thus maintain the scrubbers, but it was reduced to half capacity after failure of the stack liner, a problem that has occurred elsewhere. Operation of this plant has been said to be simplified because its ponded wastes are being discharged to the river rather than recycled. This has been said to reduce scaling problems because the concentration of dissolved solids in the scrubber circuit is kept low.

As noted above, some of the better experiences with scrubbers are felt by the industry to be unique and inapplicable to general experience. For example, Paddy's Run (Louisville Gas & Electric) has received special attention because it operates reliably and is quite effective in SO_2 removal. However, critics point to a number of factors that raise questions about the validity of extrapolating the Paddy's Run design to larger installations (the units are only 35 MW each). The operation is said to be atypical because the plant has a low load factor. Moreover, unlike other installations, the unusually low-chloride content of the coal reduces problems associated with chloride buildup in the scrubber. Finally, the lime employed by the system is a byproduct that is not generally available and appears to have unique properties that provide better operation than standard lime.

Some of the major scrubber problems identified by the industry are:

- Achievement of high SO_2 removal efficiency: Although high SO_2 removal efficiency can be achieved, the problem of achieving high levels without incurring excessive costs becomes very complicated for the high removal levels that may be required by EPA. The major complicating factors include the wide variety of scrubber types and selection of type and amount of absorbent.
- Wet-dry interface deposition: Drops or slugs of slurry become detached, splash back into the gas stream, and stick to surfaces.
- Plugging and scaling of mist eliminators.
- Gas reheat: The requirement to reheat the scrubber gas to increase its buoyancy requires several percent of the total plant output.
- Corrosion/erosion: Especially due to the chloride concentrations in the scrubber liquids. Failure of the stack lining is a common problem, as are plugging, erosion and corrosion of the reheater.

In short, industry feels that a commitment to FGD is premature because the technology creates problems that are substantially more severe than those utilities have historically had to face, the units require maintenance and system debugging of a kind and intensity the industry has heretofore been spared, and the reliability of the units is seen as unacceptably low or unproven.

Beyond technological problems, however, the industry has severe economic problems with scrubbers. They are the most capital-intensive controls it has ever been asked to install — in an industry that is currently undergoing capital shortages. The industry is being asked to increase its power costs by as much as 15 to 20 percent even when no ambient air quality standards or PSD increments are being threatened. Moreover, where control of existing plants is required, the industry is almost forced by the nature of its regulatory system to prefer increases in fuel costs (i.e., switching to low-sulfur coal) to installing capital-intensive equipment. While general rate increases usually involve a lengthy hearing procedure, fuel adjustment clauses in many States allow the utilities to recoup immediately the cost of a fuel switch.

The EPA Viewpoint

EPA justifies its very strong support for FGD systems despite the severe operating problems by the following points:

- The industry, in its description of "problems," is said to ignore the progressive improvements both in debugging existing scrubbers and designing new ones. EPA **concludes that the performance of utility FCD systems has consistently improved over the last 5 years, that many of the problems described in the literature either are essentially solved or are** more in the nature of startup problems requiring differing degrees of "fine-tuning" at each installation. Features of the newer systems (improved mist eliminators and reheaters, a trend toward open scrubber types, high scrubber liquid to gas ratios, improved materials) and newer systems (double alkali, magnesium oxide) should prevent many of the operational problems of the past. EPA asks that the viability of its FGD requirements be judged on the basis of what designers can achieve today and in the future, rather than on the basis of units that were designed several years ago and that were often improperly operated and maintained.
- The Japanese experience with FGD is frequently cited as an indication that FGD in this country could achieve far higher reliability if more optimum designs and more intensive maintenance programs were utilized, Japan has five exemplary coal-fired facilities operating at greater than 90-percent removal efficiencies and 95-percent operabilities. All are greater than 150 MW **in size, and four burn** 2 to 2.5 percent sulfur coal. A recent interagency report on these scrubbers[80] notes their extremely high operability (degree to which the scrubber is used when the boiler is operating) and performance, while also concluding that their operating conditions are not at all dissimilar to those applicable in the United States, In fact, some of the systems were designed and installed by U.S. vendors. EPA can point to the Japanese experience as one where basically the same physical problem existed, but where a completely dissimilar industry attitude (one of commitment to scrubber success), recognition of the need for careful maintenance and chemical expertise in operation, and a conservative attitude towards design, materials, and contractor accountability led to an extremely successful scrubber-based control system.
- Utility industry shortcomings (EPA contends) are a major cause of FGD problems:
  - Utilities' tendency to select the lowest bid regardless of vendor experience or system design.
  - Inexperience in dealing with complex chemical processes, and unwillingness or inability to hire trained operating and maintenance personnel.
- EPA notes that FGD units can build in redundancy, allowing a more intensive maintenance program and compensating for any unexpected failures. This translates a reliability problem into an economic one.

[80] M A Maxwell, et al , *Sulfur Oxides Control Technology in Japan,* report prepared for Henry M Jackson, Chairman, Senate Committee on Energy and Natural Resources, June 1978

Although EPA is concerned about the substantial economic impact of scrubber requirements, EPA's viewpoint is different from that of the industry. EPA is much more likely to consider the public at large rather than utility shareholders as its major "constituents," and thus will not automatically prefer a strategy that will raise operating costs over capital costs as the industry does. Second, EPA must respond to the wording of the 1977 Clean Air Act amendments, which stipulates the use of technological controls for power production.

Interpretation

The substantial improvements **in operating experience of scrubbers** in the United States, the availability of new designs and new and improved systems, and the excellent operability of the scrubbing systems on Japanese coal-fired powerplants represent substantial evidence that FGD is both a perfectible technology and one that U.S. powerplants can install with reasonable confidence that high levels of reliability can be obtained.

The experience at the La Cygne (Kansas City Power & Light) powerplant illustrates the improvement that has occurred with experience in scrubber systems. The scrubber, which is designed to remove 80 percent of the SO, and most of the particulate matter from a very "dirty" coal (5 percent sulfur, 30 percent ash), **was** installed in June 1973 and initially experienced a very low 31-percent reliability. This reliability has been gradually increased over the past several years with experience in proper operation and the appropriate materials to use in critical components. The current reliability is 92 to 93 percent, and the manager of the plant sees no reason why this level should not be maintained or improved in the future.[a] This experience also is being applied to scrubbers now being designed. The significance of this experience is that many of the problems described by the industry are important only in a historical context, or in the context of understanding the problems that can develop if utmost care is not taken in equipment design and maintenance.

The Japanese experience, as EPA claims, appears to indicate that the major FGD problems are avoidable. Although many in the utility industry continue to challenge the applicability of this experience to the U.S. situation, the evidence indicates that the two most visible criticisms — that the Japanese success has been with oil-fired plants, and that their scrubbers run in an open loop mode that is inapplicable to U.S. utilities— are, respectively, no longer true and incorrect. Although the highest sulfur coal used in the Japanese facilities is only the equivalent of a 3 percent sulfur Midwest or Eastern coal, the La Cygne experience indicates that the problems of scrubbing very high-sulfur coal are not insurmountable.

The EPA proposal for an NSPS for SO_x control of utility boilers asks for an 85-percent reduction in SO_2 emissions determined on a 24-hour daily basis for most coals. A reduction in control efficiency to 75-percent removal is allowed for a maximum of 3 days per month. Although all of the existing Japanese coal-fired plants meet these requirements, recently designed U.S plants have not been required to meet them and have not met them. It would be naive to expect that the problems associated with scrubbers will evaporate even when (and if) U.S. powerplants are asked to satisfy the EPA standards. U.S. coal characteristics, utility operating practices, and plant conditions vary enough to ensure that each scrubber will require carefully tuned design and operation to attain satisfactory performance. U.S. utility operators must emphasize conservative design, extremely careful and constant maintenance, use of trained operating and maintenance personnel, and pressure on FGD vendors– just as the Japanese and the successful U.S. operators have. To the extent that utilities do not take these requirements seriously, they invite scrubber breakdowns and consequent loss of system reliability. At the same time, EPA should share the responsibility for ensuring scrubber success by acting in a watchdog capacity over vendor design and installation and utility operations. EPA must take an extremely vigorous position in disseminating its substantial experience; at a minimum, it should sponsor a series of courses or seminars for utility personnel who are responsible for ordering FGD systems, to assist them in selecting systems appropriate to their needs.

In conclusion, existing evidence points to FGD as a viable technology, albeit one with remaining problems. In most situations, scrubbers should be able to obtain sufficiently high levels of both control efficiency and reliability to satisfy EPA and utility requirements. Some doubt remains about satisfying EPA requirements for very high-sulfur coals, and both DOE and the Utility Air Regulatory Group (UARG) have expressed concerns about the need for scrubber bypass capability for plants using these coals.

Given the technological viability of FGD, there remains the critical question of its costs. Present estimates range from $80 to $120/kW out of a total plant cost of about $800/kW. Some utilities report higher FGD capital costs

[a]Personal communication with Mr Cliff McDaniel, Dec 4,1978

will be necessary to achieve adequate reliability, DOE and EPA estimate the cost of the EPA NSPS **proposal by 1990 to be on the order of $22 billion over and above the cost of the previous standard. The accuracy of these and other estimates is very much** in doubt, given the rapidly changing state of the art of scrubber design, the substantial degree of uncertainty as to the degree of scrubber module redundancy that will be needed to maintain the required reliability, the uncertainty as to how risk-averse the utilities will be in their scrubber purchases and operating programs, and the extent to which systems other than lime/limestone are used Nevertheless, the order of magnitude of the estimate is certainly correct, and it demonstrates how much is at stake in the current argument over NSPS. Both DOE and UARG have proposed alternative standards that would reduce costs substantially with small increases in emissions, However, none of the actors in the regulatory process appears to have analyzed the probable air quality effects of any of these alternatives. The existing analyses are based on gross emissions, which are an inadequate measure of benefit. E PA, in turn, has satisfied the requirements of section III of the Clean Air Act by analyzing the "nonair quality health and environmental impact" of the proposed standard, but it has not attempted an analysis **of the actual environmental benefits of the SO_x reductions it proposes to achieve. Thus, neither DOE nor EPA has evaluated the relative costs and benefits of the alternative NSPS options. This raises some interesting questions about the adequacy and** policy orientation of the environmental research programs sponsored by these agencies, as well as their attitude toward the need to attempt to balance costs and benefits.

Other SO_x Control Options

In the immediate future the only significant variant to the use of FGD as the total SO_x control mechanism will be the use of physical desulfurization in conjunction with the scrubber. Any sulfur removed in cleaning counts toward the continuous removal required by the Clean Air Act. Very few coals can undergo sufficient sulfur removal to affect FGD designs significantly. If 30 percent is removed in cleaning, FGD still has to remove 80 percent to meet an 85-percent standard. However, despite its failure to reduce significantly FGD removal requirements, coal cleaning does allow a significant reduction in limestone and sludge handling requirements and an improved operating environment for the scrubber. FGD units are sensitive to the variability of the sulfur in raw coal and the presence of other contaminants that may be partially removed by cleaning. For some new plants, this combination of front- and tail-end cleaning can be economically advantageous. EPA[82] has shown that, under some limited conditions, physically cleaning the coal before scrubbing lowers the total cost of SO_x control.

Current FGD technology may be inappropriate for control of smaller, intermittently operated industrial boilers. Unit capital costs rise sharply with decreasing size, and if a boiler is used only 20 percent of the time, capital costs alone make FGD prohibitively expensive. The emissions standards for industrial boilers have not been promulgated yet. If they are similar to utility limitations, only the largest industrial units will be able to comply; until new coal combustion technologies are developed, smaller units simply will not burn coal. If these facilities and the even smaller residential/ commercial-size equipment are to burn coal cleanly in the short term, it will be possible only by feeding them "clean" coal and accepting a higher level of pollution per ton than from utilities.

The list of options should lengthen considerably in the future. Fluidized bed combustion (FBC) is an efficient method of burning coal while simultaneously controlling SO_x emissions. FBC furnaces can be smaller than conventional ones; this should lower capital costs. The residue of ash and sulfur compound is dry, simplifying disposal. FBC currently is developed to the stage that some industrial-size units are offered commercially. Utility-size units still pose substantial design prob-

[82] *Coal Cleaning With Scrubbing for Sulfur Control* (Washington, D C : U S Environmental Protection Agency, August 1977), E PA-600/9-77-017

lems and may never offer any cost advantages over FGD. Although the technology is expected to be able to meet all new emission limitations, the performance has not been demonstrated on a large scale. If FGD is required as an add-on to FBC, as could theoretically happen, there would be little incentive to undertake FBC. The initial (and possibly sole) application would appear to be in industrial units. If the units now on order work out as expected (and the British experience indicates they will) a very rapid expansion could follow.

Low-Btu gasification is an intriguing near-term development concept for utilities and industry. A combined-cycle facility should prove more efficient than powerplants now in use, and the economics look attractive. Industry should find gasification more convenient than direct coal use.

Solvent-refined coal, chemical coal cleaning, coal gasification (both low- and high-Btu), and coal liquefaction are processes to produce coal-related fuels that are clean enough to meet emission limitations on combustion without the addition of FGD. "Clean" fuels assure that emissions limitations always are being met as long as the boiler is operating, regardless of load level. Those utilities that are least favored in the capital market are relieved of the capital costs burden of limiting emissions. Instead, the capital burden would be on a coal-refining industry that, like the oil-refining industry, can operate at constant load factor over the life of the equipment. Utilities are constrained to follow the load demands of their customers, and therefore have less flexibility even when output is reduced, which increases unit cost for pollution control. "Cleaning" of fuel, therefore, is in some ways more attractive than FGD — but the economics still are questionable. "Clean" fuels also are applicable over a wider range of boiler sizes than FGD. They provide greater flexibility in siting coal-fired units. Existing units are more likely to be adaptable to "clean" fuels than to FGD.

All the processes are currently under development except the Fischer Tropsch coal liquefaction technology, which has been in continuous operation in the Union of South Africa. The costs for U.S. construction and operation of this process, as well as most of the other "clean" coal processes, are the major uncertainty. Thus, none of the processes is expected to begin making much impact until the late-1980's. Chemical cleaning of coal is the only one of the "clean" coal processes that would require other control technologies in tandem since none of these methods removes sufficient sulfur to comply with new NSPS. This deficiency could limit its use.

NO_x Strategies

The control techniques now in use in the United States predominately involve combustion modifications. These techniques appear adequate to meet present standards without excessive economic penalty. Development of low-NO_x burners is underway, and if successful, could reduce NO_x emissions still further (to 85-percent control) at little cost.

The "clean" fuel technologies remove various degrees of nitrogen along with the sulfur. Coal gasification and liquefaction achieve almost complete removal. Chemical cleaning and solvent-refined coal are less effective in nitrogen removal as currently operated.

FBC produces lower NO_x emissions than pulverized coal combustion because of its lower operating temperature and larger coal size. The first factor reduces atmospheric nitrogen reactions and the latter controls fuel bound nitrogen. This may prove to be a major attraction of the technology.

Flue gas denitrification processes are in various stages of development— mostly in Japan– and are designed for oil-fired units. Their commercial availability is not expected for coal-fired units in the United States until after 1985. These processes are considerably more expensive than combustion modifications.

Particulate

Electrostatic precipitators (ESPS) are the major particulate control technology for large industrial and utility boilers. They are likely to remain the technology of choice for utilities burning high- and medium-sulfur coal unless a stringent standard for fine particulates is promulgated. Such a standard is an eventual possibility because fine particulates are suspected of playing a role in health and ecosystem damage that is disproportionate to their weight fraction of the aerosol complex.

Baghouses have recently been installed on a few utility units, They can be efficient collectors of fine particulate (ESPs are not) and they do not suffer performance degradations when low-sulfur coal is used, as do ESPs. Industry has extensive successful experience with baghouses, but this experience is not fully applicable to utility requirements. Thus a testing period is necessary, but there is no reason to believe that baghouses cannot be applied successfully to utility boilers.

Control System/Fuel Compatibility

Coal-burning facilities must be designed as integrated systems. Thus, change in one part can affect others, and the switch of an existing plant to lower sulfur coal can cause a large loss to the efficiency of ESP's. **This particular problem can be alleviated by use of flue-gas conditioning, but other changes in control may call for some extensive modifications. Existing facilities might find a conversion to baghouses from** ESPs virtually impossible because of the increased space and pressure drop requirement.

New plants must consider the effect of the technology selected for control of each pollutant on all the other controls. Thus the use of low-sulfur coal may force the use of hot side precipitators at double the cost of a **cold side** ESP with high-sulfur coal.

PUBLIC CONCERN

Expressions of public concern about energy development are relatively recent. Until the mid-l 960's, active and organized opposition to energy projects arose primarily among property owners over mining or combustion methods that created nuisance-like **conditions. In recent years, however, the increasing knowledge about the effects of energy development, as well as the growing distrust of large institutions of all kinds and the general concern for environmental quality and** for future generations, has led to increasing opposition to energy-related projects, This opposition is not unique in American history; in many ways it echoes late-19th century populist revolts against the railroads and other large industries. **I n general, individuals appear to be increasingly unwilling to suffer personal and environmental risks, especially** when they feel those risks **have been forced on them with few or no counterbalancing benefits,**

Initially, opposition to energy development focused on nuclear power and surface mining, but in recent years the trend has been spreading to coal-fired powerplants, transmission lines, and coal transportation systems. Opposition at first was limited to environmental groups, but recently such diverse groups as agriculture, labor, Indians, and local governments are acting to protect their interests when they perceive them to be threatened. In the past, this opposition has been constructive because it has focused national attention on the problems and has resulted in remedial legislation. For example, mine workers' protests about occupational hazards resulted in mine health and safety legislation and black lung benefits; public protests about the environmental degradation from strip mining brought the Surface Mining Control and Reclamation Act (SMCRA). However, even when concerns have been addressed by legislation, opposition to coal development can continue. For example, many Appalachians continue to oppose increased strip mining as well as mining not covered by SMCRA.

In order to devise more effective ways of addressing public concerns about coal growth, better ways must be devised to involve affected parties in the decisionmaking process. Federal, State, and local agencies that regulate energy development already have included in their regulations extensive interagency consultation and public participation procedures to ensure that all parties to development are identified and their interests heard. Most energy, natural resource, and environmental legislation provides for citizens' suits to ensure that the purposes of the legislation are attained. In many situations these mechanisms have adequately addressed public concerns about coal development. I n others, however, the parties have found that they lack the resources to articulate or substantiate their concerns in public hearings or that their recourse lies with the legislature rather than the courts. In these cases, delaying tactics and civil disobedience have continued long after the conventional mechanisms for resolving disputes have been exhausted.

This section examines several cases **in which** public concerns have not been addressed adequately and discusses some alternate approaches to resolving energy development disputes. **It** should be noted that these cases were chosen because they do not fit the stereotype of zealous environmentalists blocking development to protect scenic areas far from their homes. Rather, these examples reflect disputes that emerged spontaneously among people concerned about their day-to-day quality of life and their long-term economic well-being.

One of the most dramatic examples of the failure of traditional citizen involvement mechanisms to resolve public concerns about coal-related development is the confict over a transmission line in Minnesota and North Dakota. The 470-mile, 400-kV direct current transmission line being constructed by two rural electric cooperatives (United Power Association and Cooperative Power Association) will be the largest of its kind in the country. Any high-voltage line on farmland will modify field work and irrigation patterns, limit future land use, disrupt drainage patterns and sometimes reduce the value of the land. The line's extra-high, direct-current voltage may involve health and environmental problems not previously encountered. Uncertainties about the potential health effects of the line's electrostatic field make the farmers feel their families are being used as guinea pigs.

Much of the conflict surrounding the line stems from the planning process by which the route was selected. The **line was routed under** the 1973 Minnesota powerplant and powerline siting legislation, which authorizes the State Environmental Quality Council (EQC) to determine routes based on recommendations from utilities and citizens. The legislation precluded the use of parks and wildlife areas or highway and railroad rights-of-way, thus forcing the line onto farmland. Alternatives such as smaller decentralized powerplants built near the load center (rather than at the mine mouth) or underground transmission lines were not considered. The cooperatives misinformed EQC about the line's point of entry into Minnesota, limiting EQC's obligation to consider alternative corridors that might have crossed less productive, less populated lands.

Minnesota officials feel they have a siting process that protects individual rights and the environment while assuring timely and responsible energy development. The farmers were included in extensive public hearings during the siting process, and their lawsuits have been heard throughout the State court system. The Governor and church officials tried (separately) to negotiate settlements between the farmers and the cooperatives through mediation. The farmers received compensation for their easements, and the siting legislation has been amended to protect farmland in future route selections. Yet the farmers continued to oppose the line, often using civil disobedience tactics such as standing in front of surveyors' transits. Although they are pleased that farmland will be protected in future routings, that protection will not prevent this line from crossing their land. In addition, they object to the use of heavy-handed tactics and mis-information by the rural electric cooperatives to force acceptance of plans for energy development. To the energy industry such continued resistance seems not only irrational but selfish and irresponsible, given the role of northern Great Plains coal in the administration's energy plan. Thus, where an extensive public participation process was intended to produce consensus, instead the participants have emerged from the process even more firmly entrenched in their individual and opposing positions.

A second example of public concerns that have not been alleviated through the traditional mechanisms is the conflict over the community impacts of Western coal development. Concern about these impacts has risen in western towns such as Craig, Co l.; Rock Spring, Gillette, and Wheat land, Wyo.; Colstrip, Mont ; Farmington, N. Mex.; Moab, Utah; and Page, Ariz, The rapid development occurring in these areas creates conflicts among long-term residents, newcomers, coal operators, and utilities, primarily over changes in quality of life as well as the nature of the growth and the responsibility for its adverse impacts. Long-term residents feel that their sense of community and continuity has been lost; coal miners and plant construction workers often are not included in community activities because they are perceived as transients. Those who will profit are in favor of the rapid growth; lower-income groups that will not share significantly in the community's increased wealth are opposed. Long-term residents and local government officials, who are aware of the historic cycle of booms and busts in the history of the West, are skeptical of rapid temporary growth but do not know how to control it. Coal developers, who could contribute to planned, orderly growth, tend to feel that the solution must come from government.

Although the impacts of rapid development of Western energy resources and the resulting patterns of conflict have received widespread publicity, little **has been** done to resolve them beyond conducting studies and holding public hearings. Rather, the early planning processes

Photo credit: EPA-Documerica

John and Bud Redding with a chunk of the sub-bituminous coal that underlies their land and some 25,000 square miles of Montana and Wyoming

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in more recently developed areas continue to repeat patterns that already have proved inadequate, such as minimal company support (sometimes in the form of company towns that provide housing but little more), ineffective or misdirected government assistance, and a lack of local money. Little effort has been directed toward determining the region's long-term comparative advantages (as opposed to relatively temporary, "boom and bust" growth) or toward accumulating resource tax monies that could be used to promote long-term improvement. Unless means of adequately addressing these concerns are found, active and organized opposition could develop in small western towns slated for coal development.

Opposition to Western coal development already has arisen among ranchers and farmers, who also are concerned about their quality of life and sense of continuity. Many ranchers are working land that has been in their families for three and four generations. They are proud to know that they were not pushed aside or bought out by a corporation. They also resent the extra taxes that have been imposed on their land and their cattle to pay for coal development in neighboring boomtowns. In addition, ranchers are concerned about the uncertainties associated with reclaiming arid and semiarid western land, and especially about potential disturbances to hydrologic systems vital to agriculture. Yet the ranchers are unable to counter effectively the influence exerted by large energy companies. Again, little **has been** done to resolve these conflicts beyond energy companies offering more and more money to buy out ranchers, ranchers expending large amounts of time and money to educate themselves about environmental and energy issues and to prepare for court battles, and local government continuing to increase cattle and property taxes rather than coal severance taxes.

In these and other instances of public opposition to coal and related energy development, the most common mechanisms for attempting to resolve disputes have been public relations campaigns, public meetings and heari rigs, studies, lawsuits, and legislation. However, as is seen in the above examples, none of these has been entirely successful. Public relations campaigns present only one side of a conflict and do not contribute to its resolution. Although public meetings and hearings are designed to present all sides of an **issue, those opposing development generally lack the resources to debate energy companies effectively. Studies can be designed to explore al l facets of development, yet they cannot analyze changes** in quality of life adequately, and they quickly become outdated. Lawsuits are costly and time-consuming and often merely serve to demonstrate to the parties that their relief actually rests with the legislature. Yet seeking new or amended legislation also can be time consuming and usually only affords relief **in future conflicts.** And while lawsuits or new legislation are being considered, uncertainties delay investments and increase economic risks.

Although each of these mechanisms may, to some extent, reach a result that favors what may be termed a common good or the majority view, present-day society increasingly seeks to protect the rights of minorities and increasingly questions the definition of "common" good. Yet an issue or conflict does not lend itself to a simple resolution that simultaneously pleases both the majority and all minorities, and no other traditional mechanisms are able to respond when the minority continues to rebel. This is especially true when the conflict arises over ethical questions such as whether a large corporation should be allowed to exploit energy resources for profit without paying local costs, as well as over questions related to national long-term priorities, such as energy versus agriculture.

However, some of the traditional mechanisms are amenable to modifications that could eliminate or mitigate some future disputes. For example, in the case of the Minnesota powerline, if farmers had been given an opportunity for public participation in the planning stages of the development–rather than at the permitting stage, when the cooperatives already had a vested interest in a particular route— the conflict might have been resolved. Similarly, in the case of the community impacts from Western coal development, tax revenues could be used to ensure that the affected States and localities receive an adequate share of the benefits of development to promote long-term economic improvement.

New methods for preventing or resolving conflicts must be devised. Two recent cases that show promise are greater local control over the manner in which development occurs, as typified by the Navajo experience, and mediation, such as the compromises negotiated during the National Coal Policy project.

The Navajo Nation owns an estimated 20 percent of U.S. strippable coal reserves. The Black Mesa coal mining complex, one of the largest in the world, is located on Navajo-Hopi lands, as are major existing and planned coal-fired powerplants. Yet Navajo per capita income remains at about one-third of the U.S. average, their unemployment rate is about 40 percent, and they are becoming increasingly concerned about the air quality and other environmental effects of coal use. The Navajos have indicated that in the future they will demand more favorable leasing arrangements as well as needed social and environmental benefits such as jobs, management training, and pollution controls as prerequisites to energy development on tribal lands. They already have won the right to impose a possessor interest tax equivalent to a property tax on powerplants and other energy development, as well as a business activities tax. They also are attempting to institute an emissions charge system in order to resolve their concerns about the air quality effects of coal combustion. In effect, the Navajos are ensuring their participation early in the planning stages of energy development as well as ensuring that revenue will be available for needed social and economic benefits.

An even more promising mechanism is mediation of public concerns outside the courts, legislatures, and bureaucracies in which developers and parties-at-interest negotiate a compromise. For example, a group based at the University of Washington has successfully mediated a controversy over the route and size of a major freeway. Recently a foundation-supported nonprofit corporation called RESOLVE was formed to help -settle environmental disputes at the national level. In the energy area, the National Coal Policy project was intended to produce agreements on how coal can be mined and burned without unacceptable externalities. In a series of meetings, leading conservationists and executives from coal-mining and coal-consuming industries agreed in principle but not necessarily in practice on a variety of public concerns. For example, industry accepted the principle that environmentally sensitive areas should be closed to mining; the environmentalists agreed to back off from their insistence that surface miners always must level off high walls. The environmentalists also agreed that their standard delaying tactics in powerplant siting and licensing procedures are counterproductive and concurred in a recommendation for one-step licensing. Industry representatives agreed that the public should be notified in advance of license applications and assented to the principle that qualified public interest groups participating in mine and powerplant hearings should receive public financial support. The two sides also agreed in principle that powerplants should be sited near the area where the bulk of the power would be sold, rather than at the mine mouth or in a remote rural area. Some of these and other agreements may require new or amended legislation, but many could be implemented privately.

The National Coal Policy project has been criticized because it did not include some of the parties at interest and because the participants failed to agree on all the issues. However, its example of conciliatory behavior provides a model for speedier and wiser alleviation of public concerns about energy development. This and other models for constructive public participation in both short- and long-term energy planning must become more common. Yet it must be recognized that some public concerns about coal and related development reflect basic value conflicts rather than objections to specific projects. Where these value conflicts exist, some people wi l l continue to believe their rights are not protected. Thus, in some instances, even when energy companies make every effort to anticipate and address legitimate concerns and to demonstrate that all alternatives have been considered, opposition in the form of lawsuits and civil disobedience will continue.

CONCLUSIONS

Many of the factors affecting coal production discussed in this chapter may limit the pace of coal expansion in the future. Some manifest themselves as temporary impediments to production — e.g., strikes and siting disputes–while others have become ground rules within which the industry must work. A number of these factors enable coal to be produced, but become constraints in certain circumstances. For example, coal cannot be mined without labor, but prolonged strikes by miners can disrupt coal supplies. Rail transport carries the bulk of the Nation's coal each year, but bottlenecks and car shortages slow down the tonnage carried from mine to market.

The most important constraint on coal production has been lack of demand; it is likely to continue to be the most important for at least the next decade despite the rapid growth in demand projected in chapter II. The Clean Air Act has been said to be a major constraint on meeting national goals for coal development, in part because of the requisite emission control equipment. This report does not concur. The now mandatory SO_x controls on new coal-fired powerplants obviously increase the costs of burning coal, but the evidence indicates that the new standards can be met. This evidence, it must be noted, is based on a relatively few plants operating for only a few years. Hence some utilities may experience difficulties with their control equipment, especially if they have not made the necessary commitment of capital and manpower.

Despite the burden of regulations, labor-management unrest, transportation breakdowns, and other constraints, most operators report they can mine as much coal as they can sell.[83] **If coal demand grows faster than the** scenarios outlined in chapter II suggest, supply constraints may become significant. If these constraints do materialize, they are likely to be found among the factors analyzed in this chapter.

No insurmountable supply constraints now exist. However, Federal leasing will have to resume in the 1980's for Western coal production to meet expected demand in the 1990's. Coal transportation systems need upgrading and expansion, as is being planned. Existing data are insufficient to determine whether industry structure has been or will be a constraint on production. I n recent years, poor labor-management relations have cut into coal production. However, as more and more coal is mined in the West and from non-UMWA operations, this factor should become less important nationally. Even during the 3 IA-month UMWA-BCOA strike in the winter of 1977-78, few power shortages occurred and only 25,500 workers were laid off at the height of the shutdown. Further, wildcat strikes slacked off in 1978. Labor-management relations may either be improving or each side may be regrouping.

The highest growth scenario would require almost all supply and demand factors to work out well. No new complex environmental control strategies could be accommodated in all probability. All the major resources required for production and use would have to be available. This situation is plausible, but it probably will not occur without additional Federal policy actions that promote the use of coal.

[83]See testimony of Stonie Barker, Jr., E B. Leisenring, Jr., and Robert H. Quenon (coal operators) before the President's Commission on Coal, Oct 20,1978