The Worlds of Coal--The Perspective from the U.S.A

Richard L. Gordon
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by Richard L. Gordon*

This article examines the increasing importance of coal production in the current energy crisis. The author analyzes the possible expansion of coal production in the United States for both domestic use and foreign export. Attention is also focused on comparisons with the Canadian, British, and Australian programs for coal production. The discussion does not overlook the perceptions of possible importing nations, but rather studies carefully the plans for expansion while observing the trends toward other energy resources.

Since the tenfold rise in world oil prices from 1971 to 1974, expanded use of coal has attracted interest as a means of alleviating the impact of rising energy prices. Even the most casual observer of the American energy scene has noticed the publicity about the desirability of increased reliance on coal. Some have conjectured about encouraging comparable development in other countries. The present article discusses these issues.¹

First, the history of the world coal industry is examined. Then, a survey is made of current conditions in the United States coal industry. This is followed by an examination of the situation in selected foreign countries—particularly in Western Europe. The discussion concludes by examining the interrelationship between coal developments in the United States and those elsewhere.

Until 1914, coal production could be described universally as growing. Throughout the world, coal industries were established and were expanded. After the First World War, considerable differences developed among the divergent coal industries. Clearly, the sixty years after World War I have encountered great turmoil—wars, revolutions, a great depression, and extensive development of alternative fuel supplies. Thus, no summary analysis of coal industry trends can convey fully all the complexities.²

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Nevertheless, one can reasonably divide the coal industries of different countries into three groups—expanders, contractors, and the United States of America. By expanders, I mean countries (or regions) where expansion has been the dominant force at least throughout the post-World War II period. Examples here include the Soviet Union, China, Australia, western Canada, Poland, South Africa, and Czechoslovakia. By contractors, I mean countries where the output trend has been downward at least since the late 1950's. The contractors consist of the Western European coal industries, eastern Canada, and Japan.

This asymmetry in selecting benchmark dates is deliberate. Some contractors, notably Great Britain, started declining as early as 1914. Others, notably France, had expansion programs through the 1945-58 period. Nevertheless, whatever happened before 1958, the contracting countries universally have reduced coal output since then and show little promise of substantially reversing this trend. In any case, the key point is that the expanding industries maintained their expansion over long periods, but the onset of contraction differed considerably among countries.

The United States is placed in a category of its own because its behavior was unique. The American coal industry expanded only modestly in the twenties, suffered a severe decline in the great depression of 1929-39, boomed from 1941 to the late forties, declined sharply from 1948 to 1960, and then began a steady expansion around 1960.

For present purposes, focus can be placed on the United States, Canada, Australia, and the contracting countries. It suffices to note that the Soviet Union and Poland have exported coal steadily to Western Europe, but no one seems to expect any dramatic developments in this realm.

In viewing the American coal industry, primary attention may be placed upon developments since 1948. Briefly, the coal industry has been transformed into the supplier of most of the nation's energy needs outside of highway transportation to a much more specialized industry.

In 1948, about forty-four percent of domestic coal consumption was by the industrial sector, twenty-two percent by the household and commercial sector, seventeen percent by transportation, and sixteen percent by electricity generation. By 1976, the latter's share had risen to two-thirds, transportation use had vanished, household and commercial use had nearly disappeared, and the thirty percent or so devoted to industrial use had been relegated predominantly for making coke, an essential ingredient in manufacturing pig iron.
Over this period, significant amounts of coal also were exported. For a variety of reasons, most notably the tendency of Western Europe to let imports of American coal absorb the bulk of cyclical variations in coal demand and the competition among the United States, Australia, and Canada for the Japanese market, American coal exports have fluctuated considerably. In any case, most exports have been for metallurgical use; the main steam coal market is Canada (more specifically, the coal-fired generating plants of Ontario Hydro).

Throughout the post-World War II period, coal use by electric utilities has risen steadily at a rate averaging better than six percent per year. Coking use has fluctuated without showing much trend, and all other uses have declined. These declines were the dominant influence through the fifties, but by 1960 there were so few sales left to lose that in the shrinking markets the growth in coal consumption by electric utilities became the predominant factor. Thus, the industry began to grow. Until the early seventies, however, this growth was actually slower than that of total energy use, and coal's declining share of energy consumption did not reverse until 1973.

By 1976, even the absolute amount of coal use (measured on a heat content basis) had not attained its prior levels. While production of bituminous and lignite reached record levels by 1976, anthracite output continued to decline. Moreover, the average heat content per ton of bituminous and lignite has declined. The net effect has been that by 1976, the total number of BTU's secured from coal had not surpassed the 1947 level.

Thus, the 1960's were a period in which the coal industry built up momentum for resuming sustained growth and even for increasing its role in the energy market. Subsequently, the prospects have been subjected to conflicting pressures. On the one hand, the emergence of the environmental protection movement has brought recognition of the problems associated with the production, processing, and use of coal.

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* Two factors explain the lower BTU content per ton. First, measured output, which is net of cleaning losses, and cleaning removes waste and raises BTU content, may have become less prevalent because electric utilities have had less stringent cleaning requirements. A second factor has been the shift of the geographic pattern of coal production towards regions that produce lower BTU coals. The highest BTU coals are found in Appalachia; those in Illinois, Indiana, and western Kentucky have lower BTU contents and most coals produced west of the Mississippi have still lower BTU contents. Over most of the post-World War II period, production in Illinois and neighboring states has expanded faster than in Appalachia; in more recent years, there has been substantial growth in production west of the Mississippi.
On the other hand, rising world oil prices, widespread pessimism about the ability to expand domestic oil and gas supplies, and resistance to nuclear power have created interest in promoting coal use.

My overall appraisal of this particular situation indicates first that substantial built-in, difficult-to-reverse commitments exist to promote, if not to make essential, continued expansion of the coal industry through at least 1990. But the growing mass of restrictions on coal production and coal use may produce difficulties in attaining all of the planned expansion. Indeed, some observers—notably the Congressional Research Service and the General Accounting Office—even have predicted that the forecast of a billion tons of coal production by 1985 is overly optimistic, given these barriers to coal expansion. From this it follows that these pessimists consider quite unrealistic President Carter's proposal to raise output goals for 1985 to 1.2 billion tons. My own view is that, should these pessimists be correct, serious problems will arise in offsetting the shortfall.

After 1990, our energy options widen considerably and it is quite difficult to determine what will happen. Anything from accelerated growth of coal to shifts toward other fuels is conceivable, and my best guess is that a combination of a revival of nuclear competition and greater-than-expected oil and gas availability will restrain and possibly reverse the expansion of the coal industry. Whatever happens to coal in general over the entire period, we can expect that a marked shift of production patterns will occur: production will expand most vigorously west of the Mississippi.

I have stated the basis for my views in numerous prior publications, so that a summary statement suffices here. Prognosis about the period until 1990 arises simply from my observation of the situation of the United States electric power industry. No practical alternative exists to extensive increases in coal use by these utilities. Long leadtimes and financing difficulties guarantee that nuclear capacity will be less than that which the utilities have announced. Indeed, utilities continue to announce delays in the construction of nuclear (and coal-fired) plants. Current problems with natural gas supply have created pressures for gas-using utilities in the South Central States to build

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5 See supra note 1.
coal-fired plants. In most cases, it would be prohibitively expensive for these utilities to use other fuels; the utilities conveniently located to use imported oil have converted to such oil or have committed themselves to nuclear power. Those planning to use coal rarely could shift easily to imported oil.

Sulfur oxide emission regulation, as is true of most air pollution rules, is quite complex. No less than four standards exist in federal regulation of pollution control, and the individual states have the authority to be tougher than the federal government permits. Federal standards can be divided into two basic categories—those governing the overall concentration of pollution in the atmosphere (ambient air standards) and those relating to the rate emissions from specific sources. Each category can be subdivided into two components. A set of basic ambient air standards was defined for all major pollutants, and the added provision was made that areas that had cleaner air than required could not have significant degradation. The meaning of this concept proved sufficiently difficult to resolve administratively or judicially so that definitions had to be legislated in 1977. Nondegradation was defined in terms of the maximum allowable increase in permissible emissions. Three different levels of allowable increases were defined, as were rules governing which limits, if any, would apply to particular regions.6 The first set of regulations affecting individual large boilers, such as those in electric power plants, is the New Source Performance Standards issued in 1971 and applicable to all installations planned after the standards were set. Given leadtimes of five years or more between initiation and completion of power plants, these standards affected plants starting operation in 1976. The major compliance options available were to shift to naturally low sulfur coal (largely available in the western United States), or to use cleanup devices, called stack gas scrubbers, in the power plant.

In 1977, a combination of concern that existing standards were insufficiently stringent and of fears of the widespread tendency to use western coals to meet the New Source Performance Standards led to federal legislation requiring the use of the best available control technologies (BACT).7 This concept means that even users of naturally low sulfur coals had to reduce emissions further by some combination

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7 Id. § 109(c).
of pre- and post-combustion treatment. Since the precise definitions of BACT will not be promulgated until early 1978, it will be 1983 at the earliest before facilities governed by these regulations begin to operate. Scrubber use will be the most feasible way to meet BACT rules unless the various alternatives under development prove more successful. However, this effort to discourage use of western coal may be offset by continuation of the cost increase problem of eastern coal.

Considerable problems would arise under the most favorable circumstances in planning, siting, building, and operating plants which meet the applicable regulations. Actual conditions involve a wide variety of other potential threats to implement plans for increasing coal use. Power plant construction has been made difficult by the proliferation of environmental regulations and the unfavorable climate in rate regulation. Electric utilities have been faced with both substantial increases in construction costs and uncertainties about future needs for generating capacity. (Both lower growth in total generation and efforts to spread the usage more evenly among time periods are expected to decrease the need for new capacity.) Public utility commissions are reluctant to grant rate relief of any type and particularly that which the utilities consider essential to permit financing of new capacity.

Further problems may be produced by growing restrictions on coal mining. Mines of all types are being subjected to even more complicated procedures governing their startup and operation. The most recent development of this type was the passage in 1977 of a federal surface mine reclamation act. This law establishes what could be an expensive and time-consuming administrative process to insure compliance with the reclamation requirements in the Act.

A special set of problems is associated with the substantial amount of coal owned by the federal government. Both by administrative decision and by legislation, the process of securing rights to operate under existing leases has become more complex. Except for limited leasing of lands adjacent to previously leased lands to make the total holdings large enough for efficient operation, leasing has been suspended for several years. Some, however, fear that such arguments are based on data that overstates significantly the amount of readily exploitable coal actually leased.

Thus, there are barriers to achieving the ambitious plans for expanding coal use through 1990, as well as significant problems in find-
ing satisfactory alternatives. Some resolution will emerge, if only by default. Considerable uncertainties exist about the true trends in the energy market, the impacts of the different regulations, and the wisdom of the level of controls imposed. Clearly, most of the regulations imposed on coal production and use were inspired by real social problems; what is being debated is whether the controls are excessive, inadequate, or nearly optimal. Thus, we cannot be sure what the best solution will be; however, we can be confident that conflicts will arise and that at present our political leaders often are far too sanguine that they can attain all their objectives. Greater awareness of the potential for conflict is necessary, and policy planning should be better anticipated and should develop measures to alleviate such difficulties.

Over the long run, both the threats to coal and the ability to cope with them should increase given sufficient time. Clearly, failure to cope adequately with existing problems implies continued difficulties. Considerable concern exists that a whole range of new air pollution problems will emerge. Examples include tighter standards on nitrogen oxides, on fine particles in general, and particularly on trace metals that are especially toxic.

Various factors such as the absence of major technical innovations, stricter health and safety laws, worker unrest, and rising unit costs for labor and mining equipment have produced substantial increases in the cost of underground mining—an increase of around ten percent per year (in constant dollars) from 1969 to 1977. Since many of these forces ultimately should cease to alter costs further and since improved mining technologies are being developed, the cost increases may abate and possibly even reverse. Just what these prospects are, however, remains to be seen.

Once again nuclear power may become a significant competitor with coal. The sharp dropoff in orders for nuclear power plants starting in 1975 seems primarily the result of a belief that, because of the prospects for greatly reduced growth, the electric utility industry could not absorb more nuclear capacity than was already on order. (Some utilities have become disenchanted with nuclear energy but many others retained their enthusiasm for it.) As things settle down during the next several years, ordering of nuclear plants may resume. The prospect would be accelerated if it became apparent, as some would argue, that nuclear power is a far more benign energy source than coal.

Conversely, we could develop better ways to mine and to use coal and then discover that our worst fears about nuclear power were
justified. Thus, a wide range of possibilities could arise. Issues still exist about the coal-nuclear market split and also the role of different regions in coal supply. The most that I dare say on the first question is that nuclear power may do much better than one would infer from typical press reports of 1978. It is worth noting that several nuclear energy opponents—notably Barry Commoner and Amory Lovins—have been backing away from support of coal as an alternative. Commoner is pushing the idea that our oil and gas supplies have been understated. Lovins is advocating conservation and a variety of new technologies, such as use of solar energy and biomass.\(^9\)

The environmental threat of coal is beginning to be noticed. If, as seems reasonably likely, this trend continues while fears about nuclear power abate, nuclear power might return to favor.

I am somewhat more confident that a major westward shift of United States coal production can and should occur. Two forces are at work here. Major new coal markets are developing in regions like the South Central States that are served most economically by western mines. Second, as noted, rising cost trends in the eastern United States may, despite the shift to BACT, encourage eastern consumers to continue moves they have made to increase western coal use. Initial increases occurred because it was cheaper to meet New Source Performance Standards with western coal than with scrubbers. The increase may continue because rising costs remove the incentive to use eastern coal, as it becomes more costly to use scrubbers or alternative cleanup technologies, which must be used with western as well as with eastern coals. Despite much propaganda to the contrary, the social and environmental problems associated with western coal seem far more tractable than the health, safety, and social problems arising with eastern underground coals.

Turning to the contracting coal industries, the key moment for all of them was the decline in world oil prices that occurred when the Suez Canal reopened after the settlement of the 1956 British-French-Israeli conflict with Egypt. The belief that Middle East competition for European coal could be overcome only if sufficient effort were exerted had been a powerful influence on coal policy prior to 1958. After 1958, only diehard supporters of the coal industry, like the various heads of Britain’s National Coal Board and its spokesman, the late

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E.F. Schumacher, who later became a cult figure by renouncing his faith in giant economic projects, argued that coal could make a comeback if big efforts were made.\textsuperscript{10}

Western European coal policy became one of easing the contraction of the industry. Expansion plans which had been developed were put aside and contraction schemes were developed. The results are as follows:

<table>
<thead>
<tr>
<th>Country</th>
<th>1957 Coal Production (thousand metric tons)</th>
<th>1976 Coal Production (thousand metric tons)</th>
<th>Percent Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Great Britain</td>
<td>238,883</td>
<td>122,202</td>
<td>48.8</td>
</tr>
<tr>
<td>West Germany</td>
<td>149,446</td>
<td>96,325</td>
<td>35.5</td>
</tr>
<tr>
<td>France</td>
<td>56,795</td>
<td>21,879</td>
<td>61.5</td>
</tr>
<tr>
<td>Belgium</td>
<td>29,086</td>
<td>7,238</td>
<td>75.1</td>
</tr>
<tr>
<td>Netherlands</td>
<td>11,376</td>
<td>0</td>
<td>infinite</td>
</tr>
<tr>
<td>Spain</td>
<td>13,931</td>
<td>10,488</td>
<td>24.7</td>
</tr>
<tr>
<td>Japan</td>
<td>51,731</td>
<td>18,396</td>
<td>64.4</td>
</tr>
</tbody>
</table>

Source: *Energy Statistics* and *Zahlen zur Kohlenwirtschaft*.

Coal production (using the European definition that includes only anthracite and bituminous) has fallen sharply. Nowhere, it may be added, did this decline abate after the massive oil price rises of 1973-74. (In contrast, the German lignite industry steadily has expanded output from 94 million metric tons in 1958 to 135 million metric tons in 1976. When the data are presented in terms of hard coal equivalents, the increase is from 26 to 37 million tons.)\textsuperscript{11}

The problems of the European coal industries are characterized easily in general terms, but current data on the true economic situation are difficult to obtain. The difficulties in interpreting the data can be understood best by seeing what has been done to aid the coal industries. A wide range of programs has been devised to protect the


\textsuperscript{11} These production figures come from various issues of *Energy Statistics* (published by the Statistical Office of the European Communities, Luxembourg) and *Zahlen zur Kohlenwirtschaft* (published by Statistik der Kohlenwirtschaft E.V.).
coal industry. A persistent tendency has existed to restrict import competition—more by quantitative limitations than by tariffs. Further assistance has been provided by pressuring nationalized industries to maintain specified levels of purchases of domestic coal and by subsidizing coal sales—particularly in the coking market. Subsidies have been supplemented because the governments have assumed costs of pensions and other social welfare items. Extensive loan forgiveness has been undertaken, particularly in Britain. Since data on the impacts of all this assistance are hard to locate, any cost and price figures understate the true economic cost of current coal production (and are even worse indicators of what expanded production would cost).

Be that as it may, the available figures suggest that only the reported average costs of British coal look attractive. The National Coal Board reports that its costs averaged £16 (about U.S. $31) per long ton; this would be an average cost of slightly over $1.00 per million BTU's compared to an oil cost of about $2.00 per million BTU's. In contrast, French costs averaged 270 francs (about $54) per metric ton, or almost $2.00 per million BTU's. The cheapest German coals cost 150 DM (about $70) per metric ton, or $2.50 per million BTU's.12

It is hardly surprising, given these statistics, the hidden costs absorbed by the government, and the probability that new capacity will cost far more than the average expense of current capacity, that enthusiasm for coal development is absent. Britain alone appears to be considering extensive coal developments. An existing "Plan for Coal" contemplates extensive investments, but these largely will only keep output from falling as rapidly as would otherwise occur. (More precisely, the plan would maintain output levels from the late seventies to the middle eighties, produce a few years of expansion in the eighties, but would not prevent output declines from resuming afterward.) It has been proposed that a more ambitious expansion plan be adopted that would sustain the expansion at least until 2025.13

Whether even the more modest plan succeeds is doubtful if past experience is any indicator. European coal efforts have had a consistent record of proving considerably more expensive than expected. Similar plights may afflict the Plan for Coal.

12 The British and French costs come from the annual reports of the British National Coal Board and Charbonnages de France; the German prices were reported in Zahlen zur Kohlenwirtschaft, which was also used as the source of factors for converting the figures into a cost per million BTU's, after exchange rates as reported in the New York Times were used to develop the per ton dollar values.

Continental coal industries with their much weaker cost positions are understandably not demonstrating visible enthusiasm for grandiose expansion plans. Moreover, the great European search for a coordinated energy policy remains in exactly the same comatose state as when I analyzed it in my 1970 study of the subject. The same problems preclude action—the various governments fear that any radical reform would involve unwise massive commitments to dubious alternatives such as more vigorous efforts to promote the coal industry. It has seemed preferable to stick with *ad hoc* measures that can be adjusted with the circumstances.

Readers familiar with President Carter's campaign statements that the United States was the only major country without an energy policy and also with European criticisms of the United States for not adopting an energy policy may find this description surprising. The only explanation for President Carter's statements is that he was ill informed about European conditions. The European criticisms of the United States overstate a valid point. While the Europeans are not paragons in making energy policy, they at least have been willing to use high energy prices as a device to encourage reduced consumption and increased production of North Sea oil and gas. The United States used price controls to blunt the impact of higher oil prices on consumers and erected high barriers to domestic energy development, such as the various delays in leasing submerged lands potentially bearing petroleum. The Europeans surely do not expect us to solve in three years issues that the Europeans have left unresolved for at least twenty-five years, but they can argue rightfully that we can do at least as much as they have in facing up to the rise in world oil prices.14

Similarly, the various exhortations to pay more attention to coal that appear from time to time sound depressingly familiar to me. Thus, I remain skeptical that much more than paper programs will develop.

Western Canada and Australia have been expanding output substantially—to date mainly to provide Japan with coking coal. Some prospects exist for developing European markets for Australian coal,

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14 The European inaction on energy is so great that there are no references worth citing on the subject. I regularly receive the annual reports and *Monthly Bulletin* of the European Communities, and its Washington office made available various energy documents. A reasonable description of all this is that, in contrast to some quite well done studies reviewed in my 1970 book, *The Evolution of Energy Policy in Western Europe*, only vacuous general statements have subsequently appeared.
and plans are underway to increase the utilization of Canadian coal in Canada. Not only are the producing provinces seeking to use their own coal, but a project is underway to facilitate the shipment of the coal to Ontario.

Where does all this leave us in terms of development of the coal industries of the Organization for Economic Cooperation and Development (OECD) countries? It would appear that the United States will be quite busy trying to meet its own coal needs, that Australia and Canada will have growing coal industries, and decline will remain endemic in Western Europe. This leaves open the question of whether American coal can serve as a useful energy source for OECD countries in Europe.

Here the prognosis would seem rather unfavorable. It is apparent neither that the prevailing climate in the United States would be conducive to the development of capacity to serve Europe in addition to that needed for domestic use, nor that the rest of the world yet considers American coal to be an attractive energy source. The main exceptions are that the United States, the most attractive source of high grade coking coals, as well as export markets for such coals will grow.

Thus, the tentative conclusion would seem to be that the American industry will expand largely to meet domestic needs. Western Canada and Australia also will enjoy growth. Western European prospects remain uncertain at best. Only Britain seems to be contemplating extensive expansion, and whether these schemes materialize may be doubtful. The market position of European coal is so precarious that even the effect of the OPEC cartel has not yet saved the day. Indeed, OPEC's price actions and the servile way in which Europe reacted to them undoubtedly reflected recognition on both sides that European coal would not represent an effective competitor even to vastly more expensive oil.