



Summer 1981

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### Recommended Citation

J. G. Polach, *Coal-Bridge to the Future, and Future Coal Prospects: Country & Regional Assessments, Carroll L. Wilson, Project Director, and Robert P. Greene and J. Michael Gallagher, Editors*, 21 NAT. RES. J. 675 (1981).

Available at: <https://digitalrepository.unm.edu/nrj/vol21/iss3/18>

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# COAL—BRIDGE TO THE FUTURE

Report of the World Coal Study, WOCOL/VOL. 1.

CARROLL L. WILSON, Project Director

Cambridge: Ballinger. 1980. Pp. xxv, 247.

## FUTURE COAL PROSPECTS: COUNTRY & REGIONAL ASSESSMENTS

WOCOL/VOL. 2.

ROBERT P. GREENE and J. MICHAEL GALLAGHER, Editors

Cambridge: Ballinger. 1980. Pp. xv, 577.

The role of coal in the world energy balance has been a subject of analyses and policy deliberations for decades. However, the ensuing conclusions and recommendations have greatly varied, even when considered over a relatively short period. As recently as the early seventies the best energy policy option, recommended particularly to the countries of Western Europe, was to give up indigenous coal and replace it with imported oil.<sup>1</sup> Adequate availability of cheap oil was here to stay, they were told, for many decades to come.

Yet, in a short span of a few years coal has become a preferred energy policy alternative. As we are now assured, ample coal resources provide the world with a long-term solution to a predicted, increasingly critical, scarcity of liquid hydrocarbons. At issue remain the conditions under which coal could supply adequate competitive energy required to sustain the development of modern economies and their growth during the next two decades to replace oil as the world dominant fuel.

To answer this question, a system of private study groups was organized in sixteen countries. In addition, the International Institute for Applied Systems Analysis (IIASA) is also listed among the participating organizations, but the role and specific contribution of the IIASA is nowhere identified.<sup>2</sup>

The entire World Coal Study project was headed by Professor Carroll L. Wilson of MIT and linked directly to the Workshop on Alter-

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1. R. Gordon, *The Evolution of Energy Policy in Western Europe*, in *THE RELUCTANT RETREAT FROM COAL* (1970).

2. It seems, however, that IIASA could not fully support the WOCOL conclusions and projections. At about the same time when WOCOL volume 1 appeared, IIASA published the German text of its study of world energy. According to IIASA, the full development of coal as a substitute for oil can be expected only after 2000. Correspondingly, in IIASA projections the highest coal supply predicted for the year 2000 is about 5.3 billion mtce; i.e., more than one billion less than in WOCOL projections. See W. HAEFELE, *ENERGY IN A FINITE WORLD* 8-10 (1981).

native Energy, with the results presented in these two volumes. In principle, the conclusions and analyses presented in the first volume are based on the assessments in the second volume, although this relationship is not always quite clear.

The first volume is divided into two parts: "The Need for Coal" and "Building the Bridge." Part one begins with a brief review, chiefly authored by Professor Wilson, of the world energy situation and its expected evolution to the year 2000. Examining in this context individual primary energy resources, he finds their potential for expansion rather bleak, with the exception of coal. Only the resource base of coal could be developed almost immediately and output increased to such a degree that coal could meet at least one half of the future increase in OECD energy demand over the next two decades. In other words, if timely developed, coal could become the bridge to the safe haven of ample energy supply expected to be forthcoming from new resources in the 21st century.

The projections of coal requirements in the next two decades are developed under two scenarios, one based on a moderate increase in coal demand, the second on a high rate of increase. The latter approach forecasts an overall annual growth rate of 4.0 to 4.5 percent, and corresponds to world coal production on the order of 6 to 7 billion metric tons of coal equivalent (mtce, equaling 27.7 million BTUs) by the year 2000, i.e., about 4 billion mtce above the world coal output in 1977. In WOCOL projections this increase then is equally, if somewhat arbitrarily, divided between the OECD and the rest of the world. As a result, coal demand in OECD is projected to increase more than three times, from about 990 million mtce in 1977 to 3 billion mtce in 2000. On the other hand, coal demand in the rest of the world, including countries with planned economies (CPEs) and LDCs, is projected to grow at a relatively slow rate, increasing from 1.5 billion mtce to 3.5 billion mtce during the same period.

The new pattern in world regional imbalances between demand for coal and supply obviously will affect international coal trade. According to WOCOL, world coal exports are to grow from about 200 million tons in 1977 to 600-700 million, and possibly even 980 million tons, by 2000. The major part of this trade will be in steam coal. Imports of OECD countries, notably those of West Europe and Japan, will account for about 70 percent of world coal trade. Major suppliers are to be the United States, Australia, and Canada from OECD, plus South Africa, Poland, and possibly the USSR and China; but only the United States and Australia are considered capable to export 200 million tons annually during this century.

The projected growth in coal demand and international trade will require massive investment not only in coal productive capacity but also in supporting infrastructure, notably inland transportation, ports, and ships. According to WOCOL projections, capital investment to be made during the next two decades in the new mining capacity, inland transportation, port facilities, and ships would amount to \$200 billion (in 1978 dollars) in twelve WOCOL-OECD countries only. Wilson analyzes the coal investment problems in greater detail, and with help of an interesting "supply chain" model, in a chapter in the second part of volume one. It is on the basis of this analysis that he concluded that the availability of capital should not be a restraining factor, at least not in WOCOL-OECD countries, in carrying out the necessary investment projects.

As to capital investment which may be required in other countries (non-WOCOL, OECD, WOCOL-non-OECD, CPEs and LDCs), it is suggested that such investment would be on the same order, and in LDCs possibly somewhat larger, than in the twelve WOCOL OECD countries.

In eight chapters of the second part of the first volume, the basic tenets on which Wilson's summary rests are corroborated in greater detail. These chapters, figuratively speaking, the building blocks of *The Bridge*, are authored by teams of various project associates, MIT staff, and consultants. The subject matters they examine include: world energy and coal prospects; structure of coal market and prices; environmental and health issues; coal reserves and production; maritime transportation and ports; coal technologies; and capital investment in coal. Readers will find these analyses instructive as to the factors which may affect projected future demand and supply of coal. The paper on maritime transportation deserves particular attention. It illustrates the significance of economies of scale in ocean shipping for international competitiveness of coal from different geographic regions.

In Appendix to this volume are reprinted the summary worksheets of projections for coal and energy, as established for twelve WOCOL countries in the second volume. Why similar worksheets for India are not included is not explained.

The first part of the second volume, extending over 500 pages, contains assessments of coal prospects in the sixteen WOCOL countries. The second part, of about 60 pages, covers the rest of the world. Although the editors obviously tried to impose a certain degree of uniformity on the methodology and scope of the assessments, they vary considerably even among the WOCOL countries. The paper on

China is rather rudimentary.<sup>3</sup> Also, in contrast to volume one, it is not always clear who is the author and bears responsibility for the respective assessment and quantitative information. This applies not only to China and Poland, but also to France, or India.

Furthermore, there is a baffling imbalance in the significance assigned to individual assessments. One hardly can understand why the assessments of coal prospects in Italy, though excellently written, should occupy 78 pages compared to 44 pages reserved for Australia, or 42 pages left to the United States. In effect one wonders why, in the study of coal prospects in the world, Finland, Sweden, Denmark, and the Netherlands, with no coal production, should occupy another 73 pages when the assessment of South Africa's coal prospects is discussed peremptorily in a one-page chapter of 25 lines. Even less space is devoted in another one-page chapter to coal prospects in the USSR. Strangely enough, Indonesia with coal output of less than 200,000 mtce is included in WOCOL countries, while Vietnam which exports about 1 million tons of coal, and North Korea whose production is more than 40 million mtce annually are not even mentioned.

In effect, the non-WOCOL assessments and their quantitative base give rise to a number of questions. Thus, for instance, the significance of coal in non-WOCOL OECD which includes, among others, Austria, Belgium, Spain, Luxembourg, as well as Greece, Turkey, etc., is dismissed because "None of the countries has a coal mining industry of large significance, and consequently little coal consumption has developed outside the iron and steel industry" (p. 517).

This may be true about Luxembourg, but hardly about any other country in that group. Moreover, quantitative information presented in T.17.2, on which the assessment of future prospects is based, suffers from considerable error. To illustrate: no production of coal in Austria is shown in this Table, while production in Greece is given at 23 million mtce, and that in Turkey at about 13 million mtce. This makes (erroneously) Greece the largest coal producer in that group, and Turkey's output higher than that of Belgium. But even on a ton-per-ton basis, most of the information in T.17.2 could hardly be reconciled with the established statistical sources.<sup>4</sup>

Quantitative information given for Latin America suffers from the same defect when compared, for instance, to the UN Statistical Series

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3. In effect, a survey of world energy resources prepared by the U.S. Geological Survey in 1913 is more instructive about China's coal potential, as is also *Chinese Coal Industry: Prospects over the Next Decade* (Jan. 1979) (unclassified CIA research paper).

4. See, e.g., U.N., ECE, *Annual Bulletin of Coal Statistics for Europe*, or U.N. STATISTICAL PAPERS, Series J, *World Energy Supplies*. Strangely enough, neither of these two sources prepared on the basis of official reports of individual countries is ever mentioned in WOCOL.

J, *World Energy Supplies*. Besides that, the base year for projections in this chapter, as well as in that on East and South Asia, is 1975 rather than 1977 which was used in other parts of WOCOL. Furthermore, a WOCOL projected expansion of coal production in Latin America from the given 12.7 million mtce in 1975 to 146.9 million mtce in the year 2000, to be plausible, would need an analysis much more detailed particularly with respect to capital investment needed to support such expansion, than is offered in this chapter or elsewhere in the study.

In spite of these objections, there are parts in this volume which deserve careful reading. The assessments of coal prospects in the major WOCOL coal-producing countries, the United States, Australia, India, Canada, the UK, and Germany, are excellent. They offer readers a deep insight into the conditions under which these countries could become the main factors in restoring coal to the dominant position among fuels in the world economies.

There is no index to either volume.

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