

The importance of coal*

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Introduction

While coal can be used as a chemical feedstock instead of oil for the production of the petrochemical-based commodities that are so important to our modern way of life, the impact that coal is going to make on the world-energy scene is without doubt its more important role in the short- to medium-term.

After inflation, energy is probably today's most talked-about and controversial economic issue. It is a plentiful supply of energy that has permitted each of us to live a life of convenience that is matched only by the most fortunate of the aristocracy in history. Our present consumption of energy, if measured in terms of human output, is equivalent to a personal army of 300 slaves working day and night for every one of us. Never before in the history of mankind have so many people lived in such luxury, thanks almost entirely to a vast legacy of oil and gas.

Energy Options

The message regarding the future availability of oil and natural gas is clear. Supplies are showing signs of running out. Production is expected to reach a peak in 1990 and thereafter show a fairly rapid decline. Political instability in the countries of the Middle East, where most of the world reserves are located, could lead to an erratic supply situation with adverse effects on the economies of Western nations.

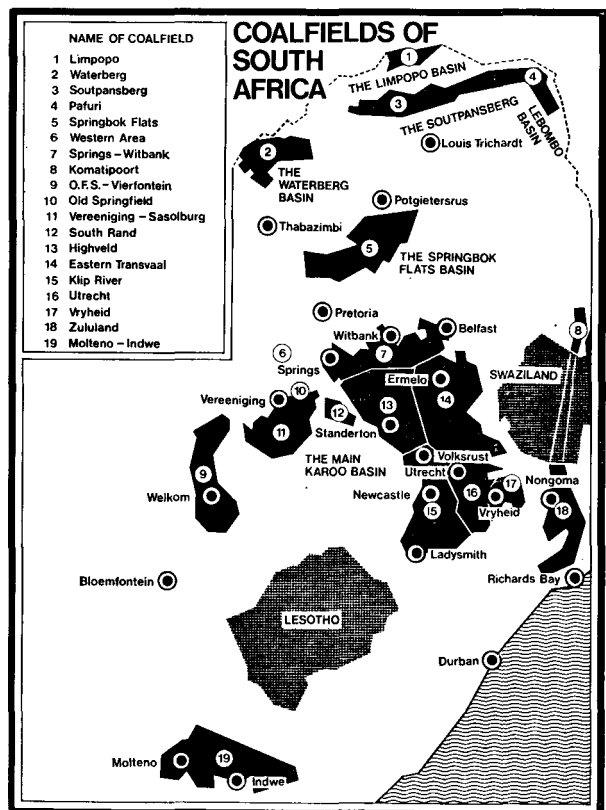
These circumstances are forcing nations to examine alternative sources of energy. Solar, tidal, wind, geothermal, and wave energy are all receiving increased attention. However, much development is necessary, and it is evident that the capital cost required to harvest this free energy is extremely high.

Resources of uranium energy are not much greater than those of oil and gas, and it is unlikely that nuclear energy can make up for the oil deficit. Fast-breeder reactors and fusion are bright stars on the horizon of the twenty-first century, but are unlikely to satisfy mankind's more-immediate needs. Twenty-five years ago the decision was taken to build the experimental fast reactor at Dounreay, which has worked very successfully, but the first prototype reactor is not yet working. The enormity of the technical problems associated with nuclear fusion can be gauged by the fact that the hydrogen-boron reaction requires temperatures of three billion degrees centigrade, and the deuterium-tritium reaction, on which much current research is focused, takes place at 100 million degrees.

Coal's International Role

Coal was the driving force behind the Industrial Revolution, but in recent decades it has become the Cinderella energy, overshadowed by the world's preoccupation with oil. An important benefit of the energy crisis has therefore been the re-appraisal of the role of coal in the world's economy as an energy source and as a chemical feedstock. Projections by the Workshop on Alternative Energy Strategies show that coal can meet future energy demands because of vast reserves. Also, coal technology is proven. We know how to mine it, handle it, transport it, and clean it.

An appreciation of the world's usable reserves of fossil energy could serve to highlight future global dependence on coal. It has been estimated that 93 per cent of the world's usable reserves of fossil energy is in solid form, 4 per cent in the form of liquid (oil), and 3 per cent in the form of gas. The global coal reserve of 7600 billion tons, when related to the present annual consumption of 3 billion tons rising to 5 billion tons in 1990, can only give great confidence in the longevity of coal. By comparison, in terms of coal equivalent, oil and gas together, with reserves of some 160 billion tons



With acknowledgement to Coal Mines in the Republic of South Africa (Minerals Bureau, Directory no. 2/79, May 1979)

*Opening address given at the colloquium on 'Mining methods and economics for improved coal extraction, and coal processing and preparation', held at Witbank on 3rd and 4th October, 1979. A summary of the proceedings is given on pp. 489-492, and a list of the papers presented on p. 495.

and a consumption of 6,5 billion tons, which in spite of high prices is expected to reach 12 billion tons a year by 1990, is certainly a matter of international concern.

It is not difficult to predict that the next twenty to thirty years will be vital for coal, and coal will be vital to the world. Energy resources will be augmented by coal during the last quarter of this century, not only in terms of tonnages but also in terms of energy equivalent, as sophisticated technology increases the amount of useful energy derived from coal. The steel industry, another important market for coal, will undoubtedly continue to use more coal as it grows from its present base of 700 million tons per annum. We can also anticipate a very considerable growth in the production of aromatic chemicals from coal, which will be used as the feedstock for polyesters, nylon, and the family of styrene rubbers and resins.

Considerable coal-energy orientated research is in progress on a world-wide basis. The production of synthetic natural gas from coal, which is a much more efficient means of delivering energy to the consumer than the conversion of coal to electricity, must take on added importance. In the U.S.A., the emphasis in development work has recently shifted from synthetic natural gas to liquifaction. Pyrolysis makes it possible to produce oil, gas, and char at high thermal efficiencies with an inherent flexibility that permits variation in the proportions of the products. These, and many exciting new developments in the conversion of coal to other forms of energy are in the pipeline.

A Role for South African Coal

Resources

The total resources of coal in the Republic amount to 120 thousand million tons. This assessment considers only those seams with a minimum thickness of 1,2 metres to a maximum depth of 400 metres. With present technology, a possible 60 per cent of these resources is considered to be recoverable. It has been estimated that, up to the year 2000, exports will deplete the high-grade resources by 3,8 per cent, while internal consumption will deplete the low-grade resources by some 6 per cent.

South Africa ranks sixteenth in the world in energy consumption, and consumes more than half the total energy on the continent of Africa. In contrast to many other countries, South Africa experienced an oil crisis rather than an energy crisis, since 76 per cent of our energy is derived from coal. Our energy is derived as follows: 23 per cent from electricity, 21 per cent direct from coal, 32 per cent from coke and gas, and 24 per cent from oil.

Coal in the Local Context

By the end of this year, Escom's installed generating capacity of close to 16 000 MW will demand more than 40 million tons of coal per annum. By the turn of the century, this consumption is likely to reach 110 million tons to meet the predicted annual generating capacity of more than 50 000 MW. It is of interest to note that the demand for electricity in South Africa with its 30 million

people is more than half that generated in China for its population of 1000 million.

The spectacular Sasol II and III projects are based on the Bosjesspruit Colliery, which, when completed, will produce 27 million tons of coal a year. By 1984, the coal consumed by the three Sasol plants will represent more than one-third of South Africa's present annual production of coal. Apart from their importance as producers of fuel for the transport sector, the byproducts of these unique undertakings include industrial gas, which is supplied to the Vaal Triangle and Witwatersrand areas, thereby replacing petroleum fuels. The thriving petrochemical industries centered around Sasol I produce explosives, fertilizers, plastics, waxes, and base products for synthetic rubber. The production of polyvinyl chloride from the coal plant at Sasolburg is another impressive industrial project. This production of acetylene, chlorine, vinyl chloride monomer, and polyvinyl chloride in five linked plants is impressive by any standards, and of considerable strategic importance to the Republic.

South Africa, with 90 million tons of coal sales per annum rising to some 210 million tons by the year 2000, ranks as the seventh-largest coal-producing country in the world and the fifth-largest coal exporter. The International Energy Agency regards South Africa as the most promising source of coal supplies outside the major countries belonging to the Organisation for Economic Co-operation and Development. The rapidly increasing rate of exports to Common Market countries will soon place South Africa ahead of Poland as their largest single supplier.

The Role of Exports

The total coal exports of South Africa, which comprised 15 million tons valued at R313 million during 1978, are set for fairly rapid growth. The planned extra capacity at Richards Bay will allow exports of 30 million tons in 1983 and 44 million tons in 1986. The total provisional exports authorized by the State amount to 1200 million tons of industrial coal over a 30-year period, which will deplete our reserves by some 5 per cent.

The likelihood that alternative sources of energy will replace coal-based energy during the twenty-first century justifies this export policy. Furthermore, much-needed capital for expansion is being generated that will provide employment opportunities for thousands of workers. In the future, when coal assumes its true role as a feed stock for the chemical industry, sufficient resources for hundreds of years of exploitation will still be available, in spite of this export policy.

These exciting local coal-based developments, as well as the export opportunities, which by 1986 will place coal firmly behind gold as the top earner of foreign exchange, are dependent upon a vast accumulation of expertise in the extraction and beneficiation of coal.

Manpower

It is generally accepted in the minerals industry that manpower is the overall single largest investment. Universally accepted is the fact that the right man for the right job is not just born but is created by meticulous