



# Presidential Address— The South African coal industry: current position and future challenges

by R.P. Mohring\*

## Synopsis

*The South African Coal Industry had its beginnings in the Eastern Cape in 1859 when coal was mined to satisfy the fledgling settlements in the Eastern Cape.*

*The growth in the industry was relatively slow up to the early 1970s when, firstly, the export business was expanded coupled with a major increase in the quantity of coal converted to liquid fuels and utilized for power generation. To meet this increased demand the industry developed many new operations employing the latest mining technology and systems.*

*Coal production in South Africa reached 204 million tons in 1996 and revenue from exports reached R8 billion making it the second-largest foreign exchange earner after gold.*

*In his address Rick P. Mohring describes the role coal plays in the international energy scene and outlines South Africa's position as a producer and consumer of coal, and the challenges facing the industry. A wide range of steam-coals are produced to satisfy both the local market (power generation, coal conversion and the metallurgical industry) and the export steam-coal market.*

*South Africa is in a unique position regarding the export market as it is still a relatively low-cost producer and is geographically well-placed to play in both the European and Far East markets.*

*There are, however, a number of challenges facing the industry. To retain our competitiveness in the international market, ways of minimizing the cost pressures caused by high-cost inflation, increased environmental protection obligations and a decreasing quality resource base need to be sought.*

*Locally the coal mining industry has a major role to play in Eskom's goal of reducing the real cost of electricity by 15% in the next three years.*

*Safety and health, productivity and the adaptation of the latest technology are issues being addressed by the industry to maintain its dominant position within the South African economy.*

## Introduction

The dramatic progress achieved by the South African coal industry over the last 25 years has made the industry a modern day success story. From its modest beginnings in 1859 outside Molteno in the Eastern Cape its growth was rather pedestrian until the early 1970s when the industry started to rapidly bring about huge increase in production. These increases have taken the industry from being a relatively insignificant producer by international standards to become the world's fifth-largest hard coal producer. During this period coal exports have

risen dramatically to a point where South Africa now commands third place in international steam coal trade, with a dramatic impact on the country's foreign exchange earnings.

In KwaZulu-Natal, coal was first mined in about 1865 at Talana Hill outside Dundee and was supplied to the Pietermaritzburg and Durban areas. The fledgling industry in the Transvaal, started by the Voortrekkers for their own use, was soon given a boost by the energy that was needed to work the newly discovered diamond and Witwatersrand gold deposits.

By the mid 1960s the industry, whose output had reached some 50 million tons a year, represented an unexciting proposition financially, characterized by selling prices fixed by the State coupled with rising working costs. South Africa did however benefit from an abundant supply of cheap domestic energy.

## The coal boom

From the mid-1970s to the mid-1980s production surged ahead at an average 10% per annum, climbing to 176,7 million tons in 1986.

## History of SA coal production since 1900 showing rise of exports

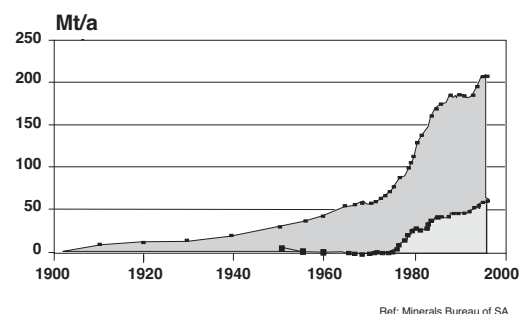


Figure 1—History of South African coal production

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The following decade saw a slowdown in growth to 1,5% per annum, with more than 208 million tons per being produced in 1996.

Three very different markets, all taking off at the same time, were responsible for this increase.

Firstly, the expansion of the export market started with the signing of a 30 million ton, 13 year, contract with Japanese steel mills coupled with the government decision to build a 550 km rail line from the Witbank/Middelburg coalfields to the port of Richards Bay. The creation of a deep-water harbour at Richards Bay and the construction of a high capacity coal terminal, owned by the coal producers, helped to overcome the significant freight disadvantage previously suffered by South Africa's coal producers. This enabled the industry to aggressively market its coal in both Europe and the Far East.

Internationally, demand for coal was given a boost by two oil shocks. In 1973, the Organization of Petroleum Exporting Countries (OPEC) raised the oil price by about 70%, embargoed the supply of oil to the United States and cut back on

production. This manipulation of the oil market made most industrialized nations realize how dependent they were on oil producers, many of which were in politically unstable regions such as the Middle East. Coal, on the other hand, had a better geographical spread and reserves were more abundant.

Despite a further oil shock in 1979 the world is still heavily reliant on oil, with 3 312 million tons of oil equivalent (t.o.e.) being consumed in 1996. This represents 40% of world energy supply. Coal makes up some 27% of world supply (Figure 2).

The second growth factor was the decision to build two huge domestic synfuel plants, following the oil shocks of 1973 and 1979, in order to reduce the country's dependence on imported oil. Following the construction of new plants at Sasolburg and Secunda, Sasol's consumption of coal for conversion to liquid fuels and other associated products increased from 12 million tons in 1981 to 40 million tons in 1989.

During the same period, consumption of electricity grew to such an extent that coal supplied to Eskom, the national electricity generator, increased from 20 million tons per annum in 1969 to 80 million tons in 1996.

As a result of these developments, coal is today second only to gold in terms of South Africa's foreign exchange earnings, and is the country's major energy supplier. But where to from here?

### World energy supply 1996

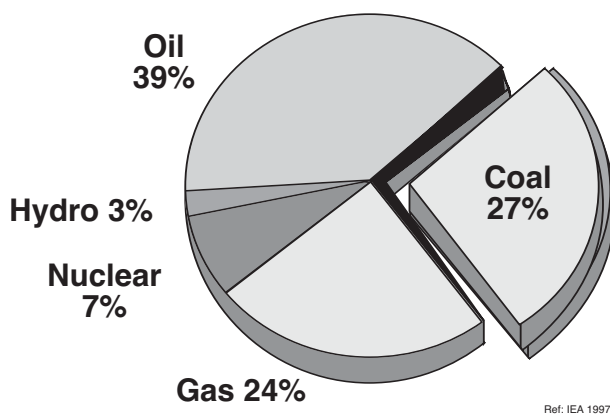


Figure 2—Coal's position in world energy supply

### Eskom coal consumption

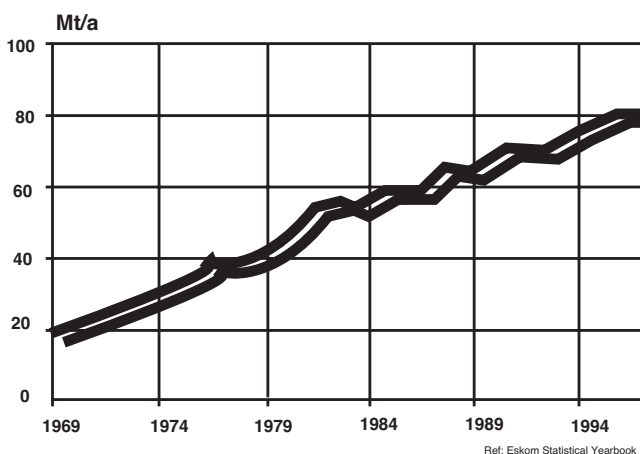


Figure 3—Eskom coal consumption

## Current position and future challenges

### World energy scene

Coal holds a fairly dominant position in the world energy scene contributing some 27% to the total world energy supply.

Electricity generation accounts for 60% of total demand for steam coal and consequently developments in the electricity sector drive developments in the coal industry, creating both threats and opportunities. There are four key factors impacting on electricity producers which affect the attractiveness of coal relative to other fuel sources and therefore the attractiveness of the coal industry.

- ▶ Deregulation—as countries deregulate their electricity sectors private producers look for the most cost effective fuel source.
- ▶ Environmental concerns—the cost of complying with increasingly stringent emission laws directly affect the choice of fuel.
- ▶ Technology—new technological developments allow producers to burn a greater range of fuel types in their boilers.
- ▶ Substitution—the impact of deregulation and emission controls, coupled with new combustion technology greatly increases the threat of substitution.

### World coal demand

Current world hard coal production now totals some 3,35 billion tons annually. Demand for seaborne-traded thermal coal which has grown consistently since the mid-1970s (see Figures 4 and 5), is anticipated to grow by 5,2% per annum over the next eight years with South Africa supplying just over 20% of this requirement.

### Seaborne thermal demand 1978—1997

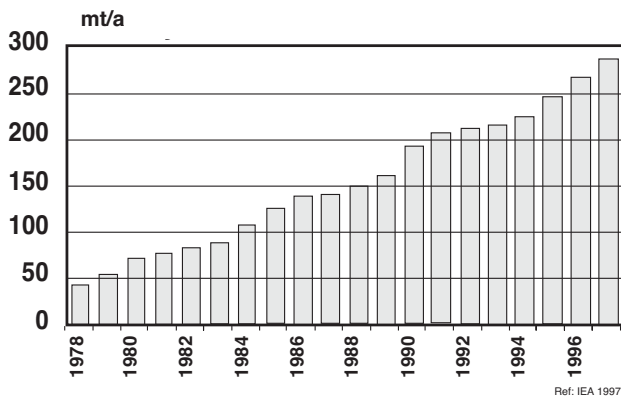


Figure 4—Seaborne thermal coal demand 1978—1997

### Seaborne thermal coal demand forecast

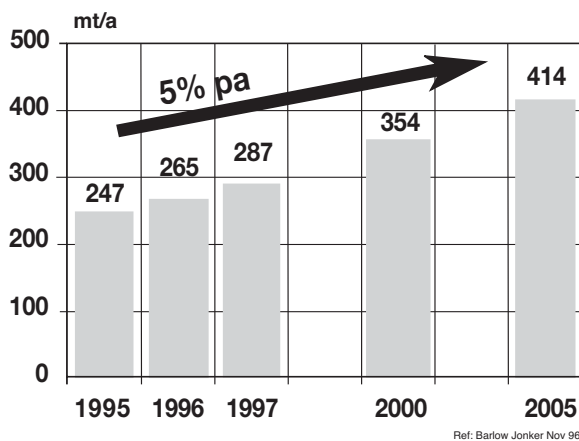


Figure 5—Seaborne thermal coal demand forecast to 2005

#### Energy supply

A significant proportion of the rapidly expanding world energy demand is anticipated to be generated by coal in spite of competition from other sources.

The known reserves of gas and oil are anticipated to be exhausted in some 60 years (this same statement, however, was made 25 years ago). Renewables, although increasing fairly rapidly, are not expected to make a major impact on total world energy supply. This is mainly because of the small total energy output of these systems, along with high relative installation costs.

The threat of substitution by gas is considered relatively low for existing generating capacity but depending on the region, moderately high for new capacity.

Gas's threat increases as emission standards are tightened and coal's relative cost position changes due to emission-based taxes and costs associated with emission controls.

The greatest threat for gas substitution is in Europe where environmental concerns regarding the Greenhouse Effect and Global Warming are high and an extensive gas pipeline

### World energy resources known reserves vs demand

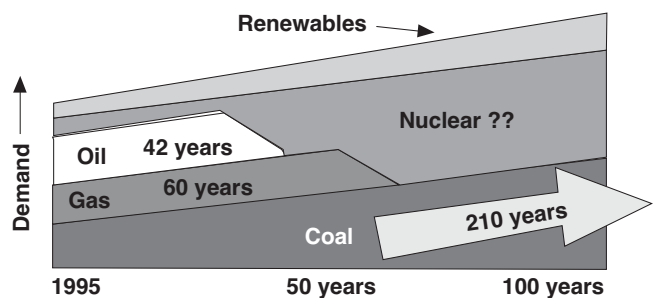


Figure 6—World energy resources

network is in place increasing the availability of gas and reducing the relative transport costs. With a few exceptions Asia on the other hand have placed more emphasis on meeting their growing energy needs than on reducing emissions and have a poor gas infrastructure reducing the substitution threat in this region substantially.

However, coal with its abundant reserves, widespread geographic occurrence and relative cost competitiveness is in a good position to play a major role in meeting the growing energy demand.

The bulk of the world energy supply in the long term appears at this that it will have to be met through coal and nuclear sources. The nuclear power industry, however, is still going through very turbulent times and nuclear power is being rejected as an alternative energy source by environmentalists and politicians in many parts of the world. The problems of disposing of toxic waste are still unresolved while construction of new facilities and their eventual decommissioning have proved to be a lengthy and expensive process. Research into the safe utilisation and waste disposal continue and growth in this sector is anticipated to increase.

#### South African production

South Africa now ranks as the fifth-largest hard coal producer in the world as indicated in Table I.

Latest figures for 1996 show South African production at 208,1 million tons per annum broken down as follows:-

Bituminous	205,5 million tons
Metallurgical	2,6 million tons

Table I

#### Top world hard coal producers

Country	Saleable production 1996 (ref: World Energy Council)
China	1300
USA	562
Former Soviet Union (CIS)	313
India	283
South Africa	208
Australia	200
Others	486
Total	3 352

### SA Coal usage by industry 1996

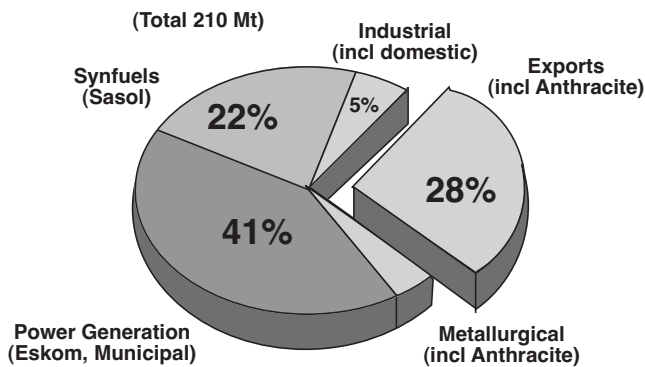


Figure 7—South African coal sales by industry 1996

In 1996, export sales totalled 61,7 million tons, mainly to Europe and the Far East, with 149,9 million tons being consumed locally:

Power generation	87,2 million tons
Synfuels	45,6 million tons
Industry	11,3 million tons
Metallurgical industry	5,8 million tons.

As South African coal seams are relatively shallow, the major portion of coal is mined by opencast or bord-and-pillar underground mining methods.

### Challenges facing the industry

#### Productivity

Underground production is mainly bord-and-pillar with continuous miners (37% of tonnage produced), conventional drill and blast (11%) and wall mining (7%). Some 91,8 million tons or 45% was mined by either opencast strip mining or by truck and shovel.

Although most South African mines are large by world standards and enjoy significant economies of scale, substantial productivity improvements are required in order to maintain our competitiveness in world markets. In order to achieve this, further mechanization and better capital utilization are urgently needed.

Most coal mines are highly mechanised, but capital utilization is low. By work restructuring and more effective shift rostering, capital utilization can be improved.

Further improvements in technology are required to increase output by 'de-bottlenecking' the production process, whilst maintaining legal compliance in areas such as roof support, coal clearance and environmental protection.

#### Competitiveness

The export market accounts for some 65% of the industry's total income per annum. Current trends are seeing export steam coal prices experiencing a real decrease of approximately 1% per annum in rand terms. Therefore, to maintain margins-cost of sales must decrease below the ruling inflation rate. To compound this challenge, many of the large opencast mines have cost structures where 40% of the costs are directly US dollar dependent, with any significant decrease in the local exchange rate having a direct impact on production costs.

Productivity and efficiency increases are therefore essential to maintain the profitability of the industry and to encourage the investment in replacement and growth capacity.

#### Maximising reserve utilization

Generally speaking, the lower grade coals are used in the electricity generating and coal conversion industries with higher grade coals being exported.

On a heat basis, the quality of coal used in the local power industry would range from 16 to 24MJ/kg, with export coal generally being about 28,0MJ/kg. To attain the higher heat values required by the export market, local coals need to be beneficiated. The typical yield across South Africa's coal export plants is 60 - 65%, therefore discarding 35 - 40% of plant feed.

It is predicted that coal qualities will deteriorate over time as the better reserve blocks are exploited. To counter the trend of decreasing yields, more effective coal processing techniques and control systems will need to be employed. In addition, the upgrading of the fine and ultra-fine fractions, which are generally discarded, will need to be instituted.

Many coal processing plants are upgrading and/or installing spirals to upgrade the -0,5mm +150µm material. Various methods of upgrading the ultra-fines, including column flotation, are presently being investigated. A secondary problem to overcome is the drying of the high moisture product produced when the ultra-fine fraction is upgraded.

### Health and safety

#### Occupational safety

The new Mine Health and Safety Act which came into operation in January has brought many challenges to the mining industry. Occupational safety has to focus specifically on the management of safety and the pro-active prevention of accidents. To meet the challenges, the industry is required to introduce a number of safety management, accident investigation and reporting systems.

The Act places extensive requirements on mines to investigate all accidents and to compile an accident investigation report. At present, industry does not have a uniform accident investigation technique at its mines. The challenge for the industry is to adopt an accident investigation technique that will enable it to investigate accidents and compile balanced reports which will reflect the direct and indirect causes of accidents whilst at the same time ensuring that consistent information is gathered and disseminated throughout the industry.

Recent accidents in the industry have focused attention on health and safety training. Employees must be trained in hazard awareness, which involves the ability to recognize and anticipate hazards during the course of work, and take steps to avoid those hazards. New and innovative ways have to be sought to teach hazard awareness. The emphasis has shifted to coaching and on-the-job training. Although such training is informal, it must be formalized in training programmes.

#### Occupational health

One of the saddest legacies of apartheid in the mining industry is the lack of data on occupational diseases affecting coal mineworkers. Coal mining companies find themselves in the difficult position of having to put in place occupational health



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systems without sufficient data to make decisions on how to manage particular occupational diseases.

The Mine Health and Safety Act requires that occupational medicine is linked to occupational hygiene. Therefore, occupational hygiene hazards must be identified and assessed. Exposure to hazards in the workplace must be linked to the outcome of occupational disease. At the same time, occupational disease must be detected, managed and prevented. This involves setting up an occupational health management system that is linked to a safety management system. The industry must now embark on such a process.

### Environment

It is recognised that mining by its very nature disrupts the natural environment; however, it has major economic and societal benefits to the country. The industry must in all aspects of its operations adopt a philosophy of sustainable development and commit itself to achieving a balance between the impacts of mining and the protection of the environment. Should this not be done, draconian legislation could be enacted to force compliance with strict and one-sided environmental protection requirements.

South Africa is in the process of developing new environmental legislation in consultation with the industry which will have a profound impact on the mining industry.

Extensive consultation with a wide variety of stakeholders formed an important part in the drafting of the White Paper on Environmental Management and the draft Water Act. These Acts will have a major influence on new and existing mines and are expected to lead to the mandatory compilation, with public participation, of full Impact Assessments. Water will

become more costly in future and mines will have to be more innovative in all their water management endeavours.

It is also expected that the Department of Environmental Affairs will play a much more profound role in the future.

For mining companies, South Africa's re-integration into the world family of nations, has brought new challenges. Sustainability, world treaties and transparency are some of the new buzz words. Everyone will want to show that they are responsible citizens. Even where no legislation exists, mines will have to operate and be developed with the full consent of the local community, and even the world public at large.

The cost impact of environmental regulations is set to fundamentally change the economics of new projects. To stay profitable in these times will require extensive 'green' sense from all disciplines of the mining industry.

### Conclusion

World energy demand and the abundant world-wide reserve base will ensure that a vibrant coal mining industry can be maintained for many generations to come.

The South African coal industry is in a good position to participate in this growth—but decreasing international prices in real terms, lower yields and higher working costs will put ever-increasing pressure on mining and metallurgical engineers to come up with innovative solutions to ensure its continued competitiveness in international markets.

For the industry to remain a preferred haven for investors' capital, reserve utilization must be improved whilst ensuring that a healthy, safe working environment is maintained for all persons employed in the industry. ♦

