

THE SOUTH AFRICAN COAL INDUSTRY

By **Xavier M Prevost**, Chief Mineral Economist, Minerals Bureau, Department of Minerals and Energy, South Africa

The growth of coal mining in South Africa as a dominant source of energy has a long history. Coal production began in 1870 to supply energy to the Kimberly diamond fields; this coal was exploited from the Molteno-Indwe coalfield in the Eastern Cape. As a result of the discovery of the Witwatersrand gold deposits at the end of the 19th century, coalfields in the central basin were put into production. In South Africa, a country richly endowed with minerals, mining has always been its "core" business, and from the very beginning coal has been the main source of cheap energy for mining. As subsidiary industries developed, they also became coal users directly, utilising steam coal-fired boilers or indirectly, using coal-generated electricity.

A reason why coal has always been preferred to other energy sources is its cheap pithead price and the relative proximity of mines to users. The political isolation suffered by the country during apartheid intensified this dependence. Not only was coal cheap, but also, with small reserves of liquid fuels and natural gas, the only energy option. The main reason why the strong and successful synthetic fuels industry began was to generate transport fuels urgently needed by the country in its isolation years.

The future of coal in South Africa will be affected by technological, economic, political and environmental factors.

TECHNOLOGICAL FACTORS

Coal production and sales are a function of three elements, mining method, preparation and transportation. In general the total cost is derived from all three, in similar proportion. In certain mines the deposit's location, structural complexity and run-of-mine quality impose constraints that make one or other of these elements more expensive than the others. When possible, new collieries opt for opencast mining, the

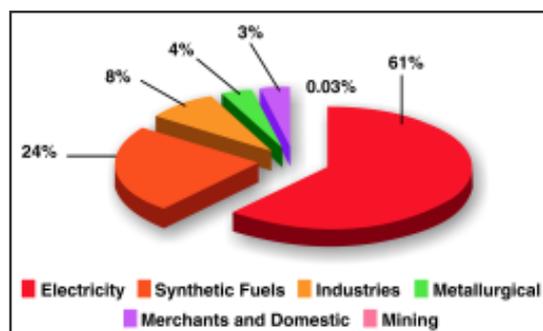


Coal – the dominant source of energy in South Africa.

reason being better reserve recovery, lower mining costs and labour, although capital investment in mine equipment is higher. The latest preferred underground method is long-wall mining, using continuous miners. Also other very ingenious methods are being used to recover reserves of thin high grade or heavily disturbed coal seams.

Technological innovation is fostering the optimal use of the South Africa's remaining coal reserves, but after more than a century of relative intense coal mining, little remains of the previously abundant good quality thick seams. With the exception of some prime coal blocks kept by the big mining companies for future development, the remainder is of low grade, difficult to mine or/and smaller blocks of reserves. Technologically, it is still possible to mine coal for at least 40 to 50 years, but low cost mega-mines are something of the past. As the mines become smaller and more complex to operate, mine costs will increase, productivity will decrease, but coal production volumes will be sustained.

One of the areas of mayor technological development is in methods of treatment of coal, i.e., using its physical and chemical characteristics and removing rock and mineral matter from it. South African producers, which are dealing with particularly low grade, high ash coals were, some years back, already compelled to use coal preparation methods extensively as the only way to make the coal products' quality suitable to enter the international coal markets. The price paid was very large "stockpiles" of discards, currently exceeding the one billion ton mark. Only in 2003, coal waste generated in the washing process reached 63 million tons, almost as large as the volume of coal exported in the same year.



Coal sales by user 2003.



A power station coal stock pile.

ECONOMIC FACTORS

The South African coal industry is very sensitive to international coal prices. Almost 30% of the yearly saleable production is exported. It produces about 55% of the total revenue accrued by the industry. The remaining 70% sold locally obtains relatively lower prices. Therefore most mines subsidise their operations with their export production and would not be able to operate at their present profit levels without the income derived from exports.

Export steam coal producers suffered a serious setback as coal prices began sliding steadily from a high of US\$45.87/t in May 1995 to US\$26.65/t in July 1999, a decrease of 58% in barely four years. As South African exports are composed of 96% steam coal, local companies' plans for expansion were put on hold and some small producers had to close their mines.

South Africa's export price has since shown an upward trend from May last year and has now increased above the US\$52/t mark, an unpredicted and unprecedented 126% increase, between mid-2003 and 2004. All indications seem to suggest that, until at least June or July this year, the price will continue to strengthen, albeit not as dramatically as experienced the previous year.

It is believed that demand from the European continent has been the main driving force behind the increasing price trend. A lack of availability of steam coal from European producers, coupled with depleting stock piles, has resulted in

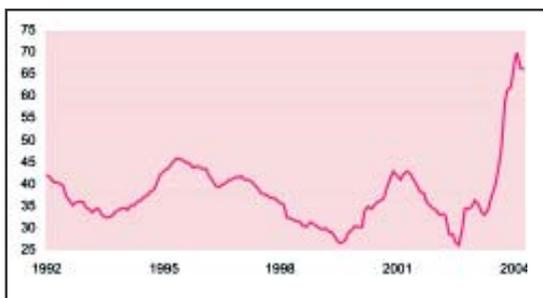
demand from the continent skyrocketing. This has been relatively good news for South Africa as the country's main coal export destination is in fact Europe. South Africa, the largest exporter of coal to Europe, shipped some 74% of the country's total exports in 2002, and 80% in 2003. Last year's exports from the Richards Bay Coal Terminal (RBCT) exceeded their 68 million ton target.

However, despite the increasing demand and higher price, the current rand/dollar exchange rate has resulted in South African coal producers actually experiencing cut-backs in their profits. It is unlikely that the high demand for steam coal will translate in higher revenue for the local coal industry, unless the rand/dollar exchange rate becomes weaker.

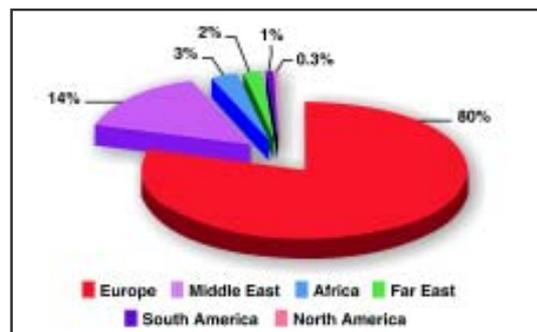
This could effectively mean that more South African coal mines are downsized or even closed if their profit margins don't increase.

Although an export price increase benefits, to a degree, everybody in the industry, the non-RBCT shareholders in need of exporting some of their production require access to the coal terminal. This was only recently made possible by the RBCT shareholders' allocation of two million tons to the small producers for the 2004-2005 year. This allocation will be increased by one million tons yearly, until 2006.

Finally, it is expected that, when completed, the long-awaited phase five RBCT expansion, also called the South Dunes Coal Terminal (SDCT), will increase coal exports to 86



Coal marker price 1992 - April 2004 (Spot CIF Price, NW Europe, \$/t basis 6,000 kCal/kg NAR).



Coal exports by region 2003.

million tons, with economic empowerment companies accounting for a minimum of 50% of the 10 million ton capacity of the new terminal.

POLITICAL FACTORS

As a consequence of the new Mineral and Petroleum Resources Development Act (MPRDA), with a carefully designed formula for promotion and assistance from public and private sectors, the structure of the industry is about to change. The changes will comprise the optimisation of the recovery of the best remaining reserves, e.g. those within the boundaries of the Central Coal Basin (Witbank, Highveld and Ermelo Coalfields), where most of the coal-related infrastructure is located, and the opening of a number of new small collieries that will provide products for the local as well export markets. All this will happen in the backdrop of the introduction and implementation of clean coal technologies, which will prevent coal importers' sanctions, especially the European Community, South Africa's main export clients.

ENVIRONMENTAL FACTORS

One aspect that could create a difficult situation for the local producers is the move toward tougher environmental legislation, spearheaded by the Kyoto Convention. The European Community (EC) is one of the regions where, as a consequence, "carbon taxes" could be introduced. This surcharges levied on coal imported for power generation is based on the premise that coal-fired electricity stations produce the largest CO₂ emissions. The EC aims to replace its coal-based boilers with natural gas or combined-cycle substitutes. This change could drastically reduce South Africa's exports to this market.

Local bituminous coal, although relatively low in sulphur is, prior to beneficiation, high in ash. Some of the new environmental laws target ash's trace elements or small quantities of high contaminants, such as mercury, cadmium and others. Processed coal with relatively low ash could still be banned from EC countries if its content of trace elements is proven to be too high.

To contest the environmental laws and make coal still acceptable as an energy source, it is necessary to improve its image. One of the best ways is to remove the pollutants at the mine or plant stage, or later as it is being used. A new set of procedures, referred to as clean coal technologies (CCTs), mainly developed in Europe and other countries such as Australia and the USA, have been introduced to South Africa (see page ...). Although the CCTs have been utilised in the EC with great success, their implementation requires investments and a new frame of mind for coal producers and users alike. Coal, considered in South Africa as a cheap commodity, might not longer be so. CCTs, to make coal usage environmentally friendly, introduced a set of techniques designed to remove pollutants. This will make coal usage more acceptable, but will increase its cost per unit of energy released. This increase must be carefully controlled so that prices are not comparable to those of coal main competitor, natural gas. If so, the latter will quickly replace coal as the main energy feedstock.



The Arnot power station near Middelburg.

One other source of pollution and also of land sterilisation, are the large coal discard dumps so common in the Mpumalanga Province. It is estimated that more than one billion tons of discards exist in the country. The use of discards is foreseen, as the implementation of CCTs becomes a reality. Fluidised bed combustion boilers (FBC), now being investigated by Eskom, use discards as feedstock. Also several companies are looking at the implementation of briquetting fines or duff, a product of mining and beneficiation, with good quality, but difficult to market.

CONCLUSIONS

The next twenty years will be critical for the South African coal industry. The industry will have to make economical and political changes, or else it will steadily reduce production and lose its international markets to other, better prepared countries.

The future of coal in South Africa cannot be seen in isolation anymore. Coal, as a global commodity will have an impact on coal in the local market. The new oil crisis has had an influence on present coal prices. The spectrum of the Kyoto Conference of Parties and its threat to coal usage is slowly disappearing as more and more countries join the ranks of those believing in clean coal, rather than gas or nuclear. The European Community, where a few years ago the emphasis was on carbon taxes and total replacement of steam coal by natural gas, is changing its tune. Millions are spent in CCT research. The IEA Agreement on Clean Coal Science (CCS) is channelling the resources of many countries worldwide into this area of study. Here in South Africa most of the coal research departments are, directly or indirectly, involved in CCTs. With the acceptance of South Africa as member of the IEA CCS Agreement, the country has access to all the Agreement resources and projects and research scientists in this area will co-operate with their colleagues overseas, to the benefit of the local industry. Coal no longer needs to be a threat to environment and given the right technology, it will survive as the main energy carrier.

The most urgent problem is to make it environmentally friendly, and to find enough coal resources to last beyond the year 2020. [\[1\]](#)