



Keynote Address: Coal mining—the future

by R.P. Mohring*

Introduction

Before we look at what the challenges and opportunities for future coal mining will be, it is appropriate to have a look at whether there will be a coal industry in the future.

There is much talk about the damage caused by the burning of fossil fuels and the need to replace coal and oil with more environmentally friendly energy sources. Yes, there is evidence that the current practice in burning of fossil fuel has certain negative environmental effects, however, the adverse effects for global economic development from inappropriate measures to control greenhouse gas emissions would be severe.

Considering a growing global population and a drive to uplift the living standards of the under-developed nations of the world one can only conclude that this is only possible if it is backed by the availability of affordable energy. This can be supplied by coal. Coal is the most abundant fossil fuel resource with reserves at about 200 years at current production levels. It currently supplies some 27% of global primary energy demand and nearly 40% of the fuels required in electricity generation.

Renewable energy sources although providing some 21% of the world's electricity only makes up some 3% of total world primary energy supply and cannot provide the increased quantity of energy required at this stage at the right costs to sustain the growth in population and development needs of the world.

Coal is required to provide energy for an energy-hungry world. It is available in large quantities and occurs in most regions of the world. It is a logical energy source and our challenge is to exploit this energy source safely and convert it in an economic and environmentally acceptable way.

Our efforts must not be directed at condemning the protagonists of renewable and cleaner energy alternatives, but rather at developing coal as the fuel of choice.

Industry trends

There are a number of trends becoming evident in the coal mining industry:

- ▶ Continued growth in coal demand is projected
- ▶ Oil is projected to maintain its dominance as the major source of energy into the future and coal consumption, although projected to grow, is projected to lose market share. Renewables although showing rapid growth is only projected to supply a small proportion of primary energy demand.

The IEA projections suggest three scenarios for coal consumption. However, they are based on three different

levels of economic growth. I contend however, that the same three scenarios exist with the variable not being economic growth but rather levels of acceptability of coal as a clean energy source. Improving the image of the coal industry in all its facets will put us on the high growth path and ensure the future viability of the industry.

The graph also shows the effect of the recent 'clash for gas' phenomenon with the consequent reduced ability of power producers to switch feedstocks when prices vary as is happening now with record oil prices. Major electricity producers will need to re-look at their strategies regarding flexibility of feedstocks.

High oil prices and the linked gas price provides ideal opportunity for growth in the coal sector provided we can meet public expectations in terms of economics and the environment.

Demand will be influenced by:

- ▶ Coal's environmental acceptability
- ▶ Competitiveness as an energy source
- ▶ Competition for markets will remain strong. Four major supply regions will be competing for two key markets
- ▶ Purchasing patterns are changing from long-term contracts to 'spot' purchases. Will this continue in a rising market?
- ▶ The move towards consolidation of producers will continue
- ▶ Liberalization of the electricity market will give electricity producers more flexibility in the choice of fuel source
- ▶ Transportation will present opportunities and threats
- ▶ Exchange rate movements significantly influence profitability and landed cost in local currencies of export coal
- ▶ Coal prices are falling in real terms.

Challenges

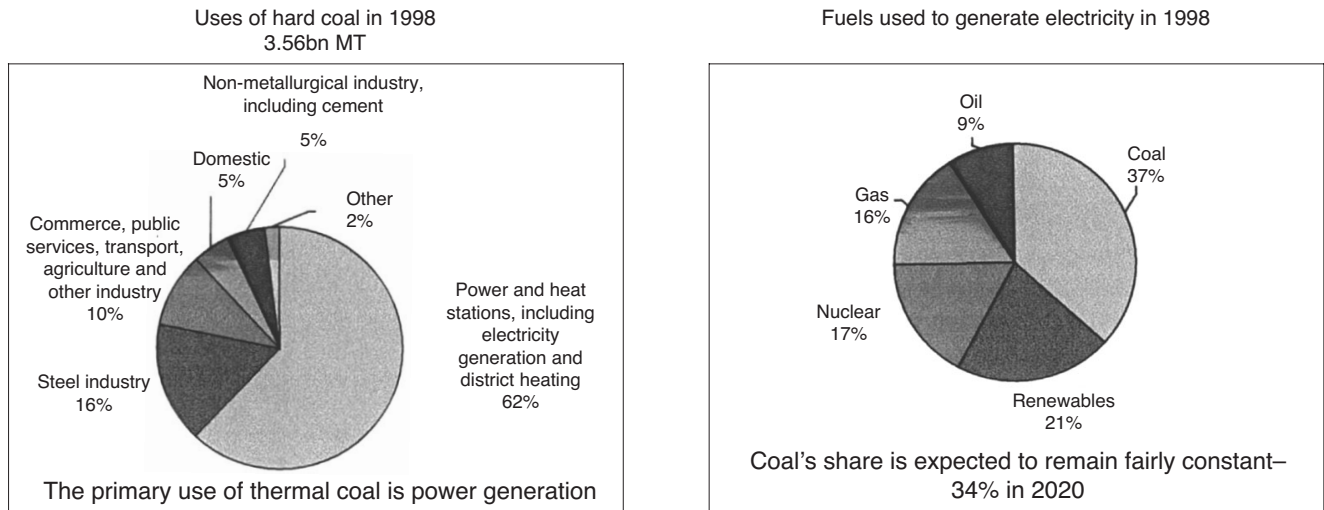
Decreasing real price of coal

For coal to retain its status as a preferred energy source it must be delivered to the customer at an affordable price. Because of the demand by consumers for lower energy prices

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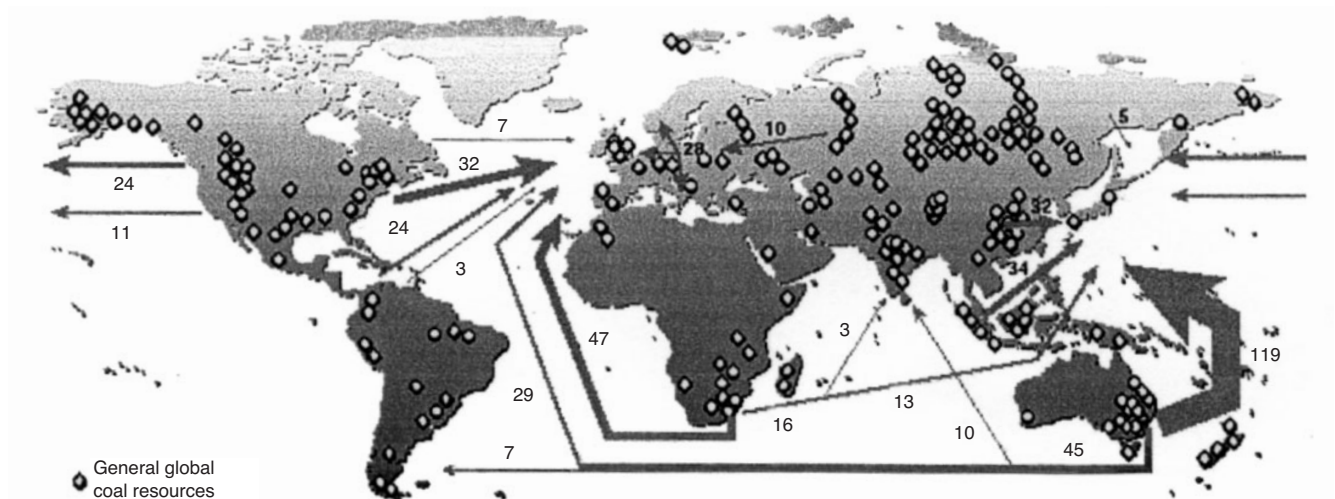
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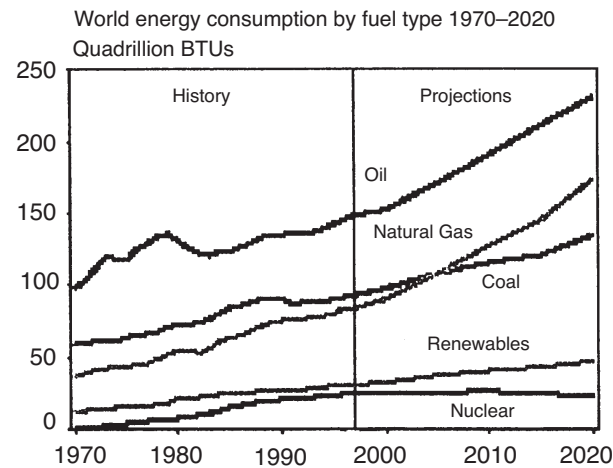
Source: World Coal Institute—Coal Power for Progress
World Coal Institute—Ecoal, 31 September 1999.

Figure 1—Hard coal has many uses and thermal coal remains a major fuel source for the generation of electricity



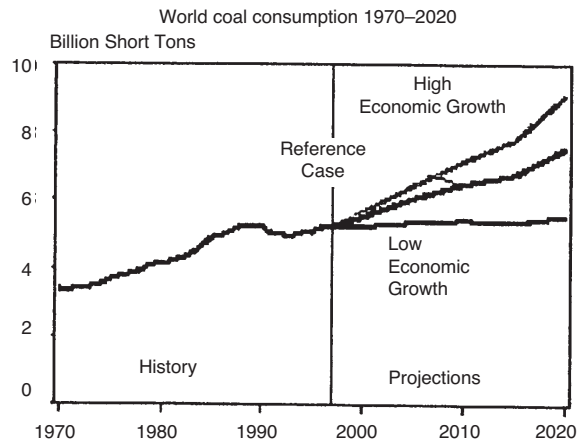
Routes: Figures are 1998 tonnages Source: World Coal Institute—Coal Power for Progress

Figure 2—World coal resources and major trade routes



Source: International Energy Agency/International Energy Outlook 2000

Figure 3—Coal consumption, as a source of primary energy will continue to grow but will lose market share to gas



Even the 'Low' scenario predicts some growth
Source: International Energy Agency/International Energy Outlook 2000
Notes: Reference case = World GDP 2.8% per annum High = Reference + 1.2% Low = Reference - 1.2%

Figure 4—The IEA projections suggest three scenarios for coal consumption

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and increased competition from alternate energy sources thermal coal prices have declined in real terms over the past decade or so.

To combat this decline coal producers must improve productivity to lower their production costs.

Productivity enhancements should be sought throughout the entire coal chain starting with exploration through to the ultimate conversion.

The opportunities along the coal chain would include the following:

Exploration

Coal is a complex product located in a complex environment and the exploration process must produce all information required to make informed decisions with regard to mining, processing, possible blending and uses of the coal.

Mining and mine planning

Labour costs in most countries have increased substantially in the past and generally constitute a high proportion of total costs. Rising labour costs can be tackled through a combination of skills, development and a more logical deployment of labour. The industry needs to move from a manual labour system to a knowledge-based one.

Massive strides have been made in automation, remote control and real time monitoring. This technology exists and is used in many industries, however, I contend that the coal mining industry has been rather slow in introducing them. However, we will be hearing more on developments over the next few days and hopefully the workshop sessions will identify critical areas where we identify new mining techniques which aid re-organization of production cycles which offer the potential of much-needed improvements in productivity of both labour and capital resources.

We cannot persist with situations where highly productive machines are employed in non-continuous operations. A continuous miner is employed for example in a situation where more often than not, it is linked to a non-

continuous coal clearance system or employed in a mining method which dictates that it be continuously moved from one heading to the next.

Mining systems therefore need a total re-think. We have over the past just accepted that in bord-and-pillar mining that the standard chequer-board layout is appropriate and have force fitted new generation high productivity machines into this layout. We need to question this logic and re-look the total system which not only involves the cutting machines, but the coal clearance system, roof support, ventilation and service provision aspects of coal safe coal winning as well.

Safety has rightfully become a major issue in the coal mining industry. Mining comes with inherent dangers and we need to strive for the development of systems, which remove people from areas of potential high risk. Here automation and remote control have a major role to play. To advance this thinking a stage further we need to be looking at ways of economically unlocking the energy in coal seams without having to send anyone underground or below the surface in an open pit.

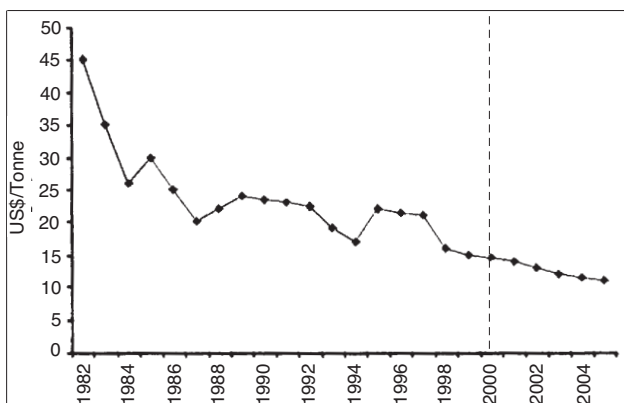
This may be a way off and in the interim we need to manage the risks through thorough evaluation and improved systems and controls.

Coal processing

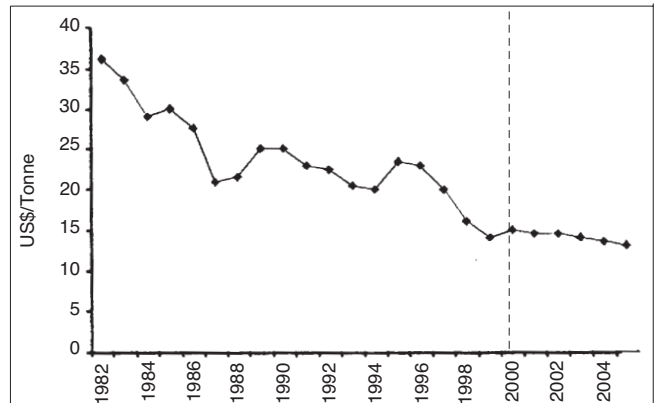
It is predicted that *in situ* coal qualities will deteriorate over time as better reserve blocks are exploited. To counter this trend of decreasing yields, more effective coal processing techniques and control systems will need to be employed.

This topic will be addressed later in the proceedings, suffice to say that coal processing research is needed to explore ways of improving efficiencies in coal preparation in order to ensure maximum utilization of the coal reserve and minimum impact on the environment. Areas of potential benefit are fines recovery, dewatering of fines, discard utilization and optimum plant efficiency through real time control.

South Africa—Price forecast to Europe
in real terms 1982 (basis 6000kcal NAR)



South Africa—Price forecast to the Far East
in real terms 1982 (basis 6700kcal GAD)

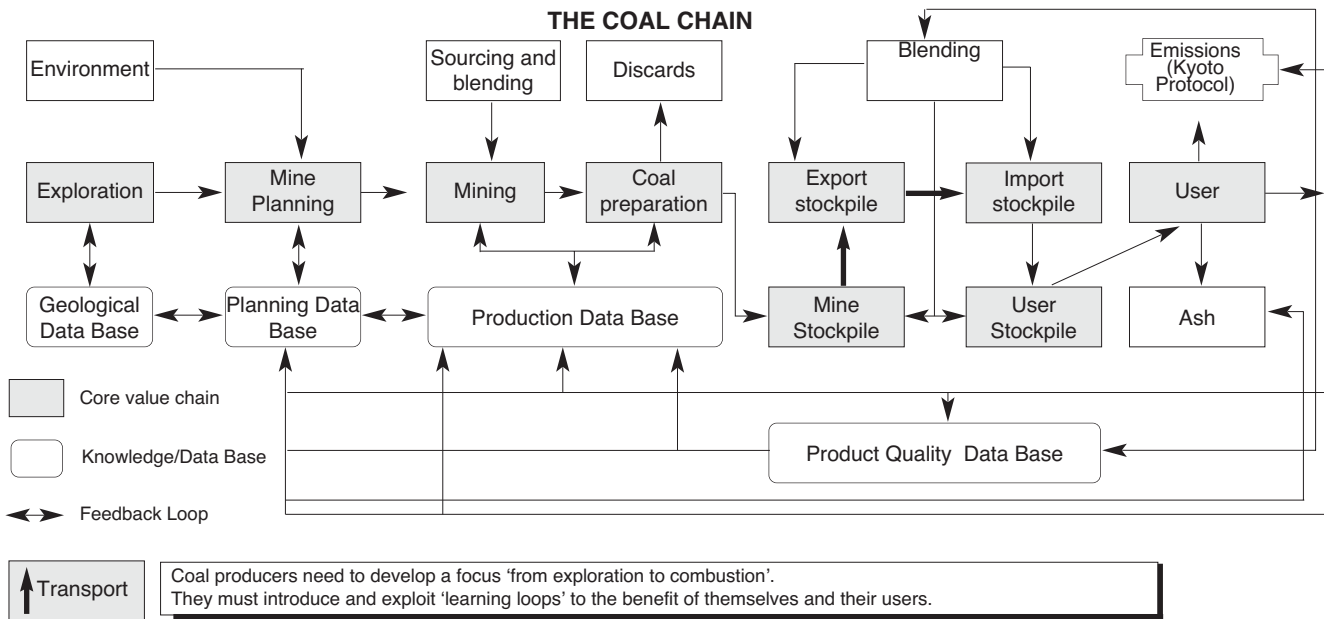


It is common cause that this decline could continue

Source: SACR: Coal Forecast 2000
NAR=Net As Received GAD=Gross Air Dried

Figure 5—The IEA projections have declined in real terms

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Source: SAIMM (South African Institute of Mining and Metallurgy)

Figure 6—The coal business of the future requires an holistic approach which seeks to add value at each stage in the coal chain

Transport and logistics

Getting the coal from the mine to the markets in many instances constitutes a significant proportion of the landed cost. It is therefore interesting to note that this is not a topic being addressed at this conference.

Consider for example the question of 'what is the most cost effective form in which energy can be transported?' This is obviously dependent on many variables such as distance, quantities etc. but a paradigm shift is required if transport costs are to be contained.

The mining industry with the consumer therefore needs to involve the transport industry into the arena of future research into how the costs associated with this supply link can be optimized.

Meeting customer requirements

Efficiencies in coal conversion can be greatly enhanced should suppliers and customers work more closely together to determine precisely each others requirements. This should not only revolve around the traditional quality and price discussion but include areas such as environmental effects of emissions and waste product disposal and other effects of the product on the consumer.

Changing legislative environment

Coal companies are going to be required to operate in a veritable legislative minefield in the future. A major overhaul of the legislative provisions relating to coal mining and its use is happening around the globe. This new legislation is going to make it more difficult and more costly to mine and use coal in the future and industry must ensure its voice is heard in the corridors of power to demonstrate its commitment to addressing some of the sins of the past. It must inform the legislators and the general public of its vital role in providing cost effective and sustainable energy for a rapidly developing world.

Environmental concerns

I will leave the greater debate of global warming to the experts who will be discussing the issue of carbon management and clean coal technologies. It should be noted, however, that the outcome of the international debate on greenhouse gas emission could have a profound effect on the coal mining industry. Should the debate turn totally anti-coal the result would be a sharp drop in demand coupled with a steep increase in the cost of utilizing coal as a fuel source. We as an industry cannot adopt a neutral wait and see attitude but should be urging governments to consider the value of coal in international development, and more importantly we should take up the challenges of utilizing coal in a more environmentally acceptable manner. In this context, technology exists which could substantially reduce (30%–40%) the CO₂ emitted per unit of electricity.

On the mining front all coal mining companies need to adopt the philosophy of sustainable development in their project planning. This will ensure proper environmental planning, public and state support for the industry and eliminate costly remedial actions. Detractors and competitors will be looking for examples of bad environmental practice and these must be avoided at all costs.

Environmental legislation is getting tougher and the impact of this on the industry is going to be longer lead times for project development, additional costs of environmental management and higher closure costs all of which impact on the financial viability of the operation. The effect of these costs can be reduced by ensuring that environmental planning is totally integrated into the operation of the enterprise and that no operational decisions are made without considering the environmental impact thereof.

We have the responsibility to make coal the 'fuel of choice' for an energy-hungry world.

Aids

The HIV/Aids pandemic will seriously affect productivity and

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therefore costs of coal mining in many regions, more especially in sub-Saharan Africa. Statistics relating to the disease are still rather unreliable, however, it is estimated that approximately 25% of mineworkers in South Africa could be infected with the HIV/Aids virus.

Despite the fact that the rate of growth of infected persons is being contained the economic effect on the industry of those already infected is potentially large particularly as a large proportion of the infected population have not yet reached the full blown Aids stage.

It has been estimated that the possible cost to the industry could be up to 33% of payroll costs, made up of

Productivity loss	-	8 % of payroll
Recruitment and training	-	10% of payroll
Benefit funding	-	10% of payroll
Direct medical	-	5 % of payroll.

The severity of the problem is compounded as the peak infection occurs in the 20–35 year's age group. This group is generally at a very productive stage of the carriers.

A number of issues need to be considered by management to effectively reduce the impact of the pandemic.

- The magnitude of the epidemic
- The state of the epidemic
- The rate of growth
- How many losses are expected and when
- Employee distribution of these losses in the company
- The impact on capacity, productivity, absenteeism etc.

- Future health care costs
- Future employee benefit costs
- The need for human resource planning.

An effective HIV surveillance project is required so that the above issues can be addressed. 'What is measured can be managed'. Through timely intervention up to 60% of these costs can be saved.

Conclusions

World energy demand and the abundant worldwide reserves base will ensure that a vibrant coal mining industry can be maintained for many generations to come, however, decreasing international prices in real terms, environmental issues and higher working costs will put ever-increasing pressure on mining and metallurgical engineers to come up with innovative solutions to ensure its acceptability and competitiveness in international markets.

It is not enough to continue making small improvements in our operating techniques to combat the falling prices and inflationary effects on our costs, we need a steep change to take this industry to a new level of productivity and cost effectiveness all the way through the coal chain. This can only come about if our industry combine their collective talents and find solutions to the myriad of challenges facing us. The ICCR and programmes like the *Coaltech 2020* and similar have been set up for this purpose and I believe radical changes can come about if the correct level of lateral thinking is applied to the process. ♦

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