

## Coal – is it really as plentiful as we think?

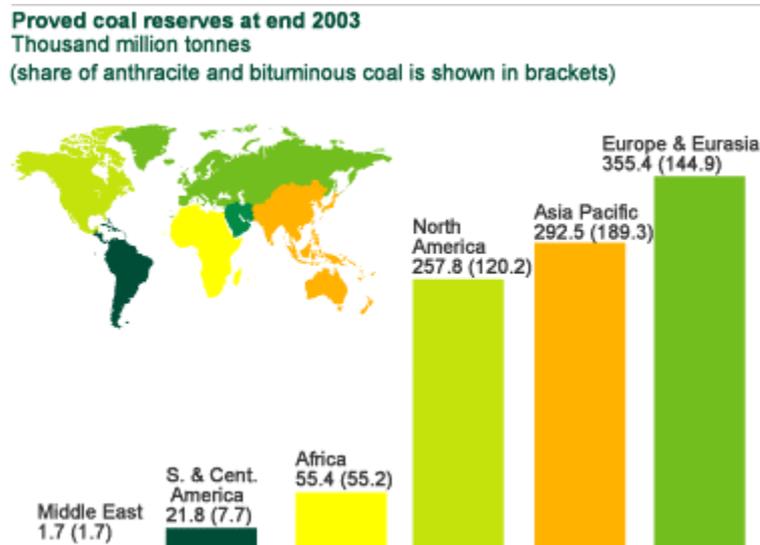
### Introduction

The world is entering a period of change in the energy industry. Man's ability to harness electricity has set our civilisation apart from past successful civilisations. Our capability to continue the trend for affordable energy will be severely tested in the coming decade, as evidenced by recent price rises in coal and gas. The common view of thermal coal is that it is plentiful resource, cheap to produce and buy whilst being easy to move and store. Is this true and, if so, will it remain so the future?

This paper looks at coal supply factors for supply of thermal coal into Europe, on the basis that this represents the most significant challenge in view of the completeness and maturity of the legislation controlling the market.

### Coal Resources

It is true that coal is a common energy resource – total proven world reserves of thermal coal are estimated to total almost one trillion tonnes and are anticipated to last over 200 years at current rates of consumption. By contrast, it is estimated that by reserve to production ratio for oil and gas is 40 years and 60 years respectively (*World Energy Council*).



Source: BP Statistical review 2004

The traditional attributes of coal are considered to be that it is relatively easy to mine (especially in an opencast situation), it is plentiful, it is easy to transport and, uniquely, it can be stored safely in relatively large quantities. With a diverse range of suppliers, it is an energy source that is reliable, safe to use and, above all, cheap.

Fundamental to this concept is the idea that coal's availability will ensure it remains cheap. This has made coal a favoured fuel for electricity production for many years and only the CO<sub>2</sub> caps being introduced in Europe from 1 January 2005 for electricity producers are presenting its first real challenge as a desired fuel supply. However, there are several issues that suggest the commonly held believe that coal will remain cheap forever that complicate this picture. These suggest that coal is not quite as reliable as the conventional figures indicate and that companies that rely strategically on such sources may wish to consider sensible alternative plans to avoid potential higher fuel input costs.

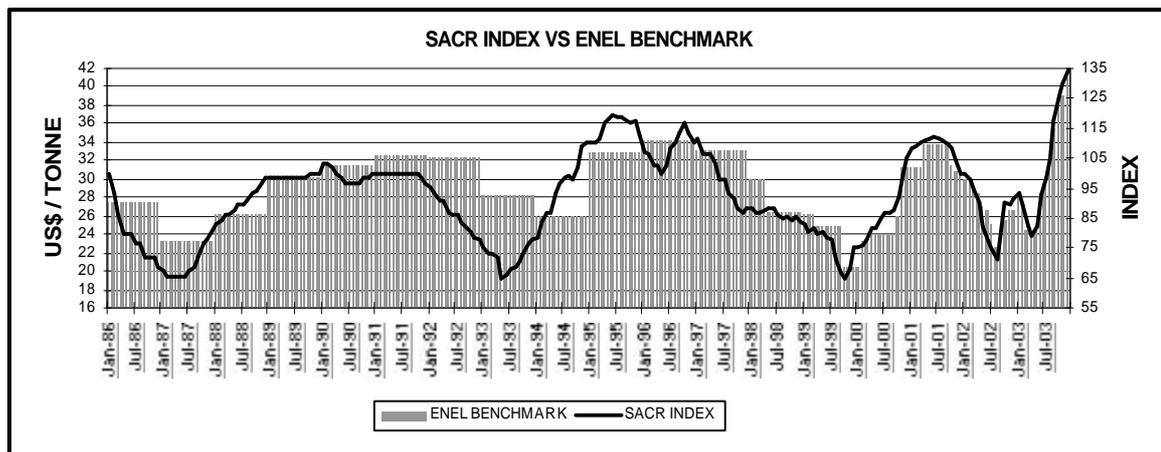
## The issues

A series of issues are hidden in the figures commonly quoted, summarised as;

- The mineable reserve estimate for coal, as quoted in publications like the BP Statistical Review, is meaningless unless an economic cut-off is applied to the 'proven' resources that indicate how much coal can be produced viably.
- The amount of coal exported and available to non-producing consuming countries is dependent on the economics of coal mined and the internal demand in producing countries. These factors are not built into the mineable reserves commonly quoted.
- The future price of coal will be capped by the effect of emissions on the price of the generated electricity using the fuel source.

## Historical coal prices

Export thermal coal prices have traditionally fluctuated in a range from lows of below US\$ 20 per tonne to highs of over US\$36 per tonne. Until the unprecedented price increases of the past twelve months occurred, coal has traded consistently in a relatively tight price zone



Source: Barlow Jonker (Pty) Ltd

**FIGURE 1 – Export coal prices from South Africa to Europe**

The fluctuations in price are caused by the ability of suppliers to react relatively speedily to market trends, increasing production when prices rise, causing oversupply, and declining production when prices are low.

If we look at the fluctuations in coal prices and assume, for the moment, that the past is a good indicator of the future, it would be prudent to consider that coal deposits for export purposes must be mined at a total cost of less than US\$22 per tonne. This would ensure operations remain profitable during all but the most severe downturns in price. For coal used internally in the country of produce, the figure would be lower, at least by the loading, transport and port charges. These would typically amount to US\$6 to US \$10 per tonne, suggesting that coal for local power station use should be produced at a cost below US\$15 or 16 per tonne.

Of course, there are coal producers that exceed these costs of production, but few can survive on a long-term basis. The point of this somewhat crude calculation is to show that the total world's total coal reserves estimates that are commonly quoted are almost certainly erroneous in that there is no provision made for the economic feasibility of the production.

### **Is demand relevant?**

There are differing views on future coal demand. The IEA, in the 2004 International Energy Outlook, forecasts coal usage in western Europe to decline by the rate of indigenous production by about 19% (on a heat basis) by 2025 and by 8% in the eastern Europe but this is not a universal opinion. In its exhaustive study, European Energy and Transport - Trends to 2030, the EU Commission forecast that coal use will dip to about 103 Million tonnes of oil equivalent by 2010 but increase to 133.2 and 195.9 Mtoe by 2020 and 2030. This is as a result of coal replacing aging nuclear capacity after 2010 and renewables fail to make targets.

The reality is that no-one really knows the real effect of major legislation such as the EU Large Combustion Plant Directive and the impact of the carbon trading scheme and the real cost of CO<sub>2</sub>. The message appears to be - don't rely on a natural demand decline to ensure sufficient coal supplies.

### **Where will European coal come from?**

This exercise is somewhat academic in that many of the coal deposits considered proven have not had the detailed analysis performed that would enable them to be considered economic under all conditions of the typical export price cycle, where US\$20 is a reasonable base. This is because to complete a detailed study of a deposit to arrive at a reliable production cost figure is an expensive and lengthy process that is usually only undertaken when a realistic likelihood of mining exists.

However, if we look at some individual country reserves in the total proven reserves quoted, supply issues seem to exist.

Coal supply to Europe from traditional suppliers faces several challenges:

*South Africa* lacks easy replacement of mineable reserves, prompting companies to investigate expensive extraction methods for old coal pillars. Whilst large power station coal deposits exist, the mineability of many of these is questioned after Majuba Colliery, the deepest mine, closed early upon encountering serious mining complications as a result of dolerite intrusions that were largely undetected during the original exploration process.

Coal exports could start to fall from 2010 and be significantly less, possibly by 50%, than current volumes by 2020, depending on export revenues.

*Colombia* faces security problems and, possibly a steady decline in coal qualities. The political situation has not hampered coal development in the past, but mining companies are very risk averse and it is not unfeasible that disruptive events would prompt a regular assessment of the desirability of doing business there. Infrastructure requirements are large and need important decisions by producers. Increasing import coal demand in the US will have an important bearing on coal availability for Europe.

*Poland* is likely to see exports drop rapidly as industry restructuring gains momentum and many experts see thermal coal export levels declining from the current 18 million tonnes per annum to 7 -10 mtpa. The current high export prices have delayed some closures but it appears inevitable that Poland will decline as a producer and may even become a net coal importer in the next decade.

*Russia* is hampered by poor port and rail infrastructure that will require considerable investment. It will remain a large producer but coal is the chosen fuel source to drive the economy. Like in *China* and *Indonesia* the internal requirements of the country will probably take precedent over exports and all three are committed to indigenously-produced coal forming the backbone of the country's energy supply. However, it is likely that they will maintain their coal exports to Europe.

EU production of hard coal, nearly all of which is thermal in nature, still stands at over 70 mtpa but will decline sharply over the next decade to a level that will depend mainly on the commitment of UK and Germany governments to maintain domestic producers as a strategic safeguard to dwindling international energy supplies. Both are likely to halve production, perhaps more, by 2015.

*Australia* remains a country with potential for significant export coal expansion. However, coal deposits yet to be exploited are further from ports than current deposits and are subject to high capital and operational costs as transport issues and port capacities become problematic.

The table below depicts the potential shortfall that may develop in Europe, considering major suppliers only, and reflects the possibility of coal shortfalls compared to current supply levels if a series of circumstances combine. These include increased demand for Colombian coal in the USA, South Africa's inability to exploit more marginal reserves and Russia failing to develop infrastructure sufficient to fill any shortfall. The table illustrates not so much the absolute nature of the potential problem, but that a significant shortfall may occur if demand is consistent and supply is economically constrained.

Country	2003	2013 Possible	Difference	2013 Doomsday	Difference
<b>European production:</b>					
UK	27	20	-7	6	-21
Germany	28	20	-8	15	-13
France	2	0	-2	0	-2
Spain	13	0	-13	0	-13
<b>Sub Total</b>	<b>70</b>	<b>40</b>	<b>-30</b>	<b>21</b>	<b>-49</b>
<b>Exports to Europe:</b>					
Colombia	27	40	+13	25	-2
South Africa	48	52	+4	40	-8
Poland	16	7	-9	3	-13
Russia	26	35	+9	20	-6
<b>Sub Total</b>	<b>117</b>	<b>134</b>	<b>+17</b>	<b>88</b>	<b>-29</b>
<b>Total</b>	<b>187</b>	<b>174</b>	<b>-13</b>	<b>109</b>	<b>-78</b>

(Figures rounded to nearest millions)

It can be seen that the coal balance may be maintained if Colombia and Russia are able to significantly increase production and export to Europe. The 2013 Doomsday scenario represents a worse-case outlook but shows the dramatic effect of the likely reduction in EU coal production and the possibility that demand, in absolute terms, will remain reasonably consistent.

There are new sources of coal, but they are limited to countries that have undeveloped industries and infrastructures. *Nigeria* could be a possible supplier to Europe. *Botswana* has extensive reserves that could supplement South Africa's energy needs if investment can be found and infrastructure developed. *Mongolia* has the capability to supplement the voracity of China for energy. However, new sources are limited and lack the desirability of the Indonesian or Colombian deposits in terms of market suitability and investment attraction.

### So what does it mean to us in the future?

It is not our intention to predict a dire and imminent coal shortage (although the current price levels may suggest otherwise!) but we wish to point out that perhaps the days of most producing countries increasing rates of coal production in a seemingly never-ending spiral may be ending. Coal buyers would be wise to think longer term and avoid over-reliance on the concept that cheap coal is a fixture.