

With gas prices soaring, it seems inevitable that coal – the Cinderella of energy resources – is bound to return to the forefront. But how long will it last? asks *Eric Fishnaut*

A comeback for coal

★ With the continued upward price trend of natural gas, coal has returned to the forefront as a workable energy source. Demand for coal is escalating and higher profits are causing producers to ramp up production in order to meet demand. Utilities are continuing a slow move toward cleaner coal-burning facilities, while closing those that are unable to meet environmental regulations. After appearing to be an all-but-abandoned resource, coal is reemerging as the other major fossil fuel.

Coal reserves

Coal is the most abundant of the earth's fossil fuels and its reserves are the most widely distributed. In 2002, estimates of the world's total recoverable reserves of coal were over 1 trillion sort tons. Theoretically, the ratio of coal reserves to production exceeds 200 years. The distribution of coal reserves around the globe varies notably from that of oil and natural gas, with significant reserves found in the US

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and the Former Soviet Union (FSU), but not in the Middle East. The US holds 26% and the FSU 23%, accounting for nearly half of global reserves. Other noteworthy reserves exist in China (12%), Australia (8%), Germany (7%), South Africa (5%) and Poland (2%), (see figure 1).

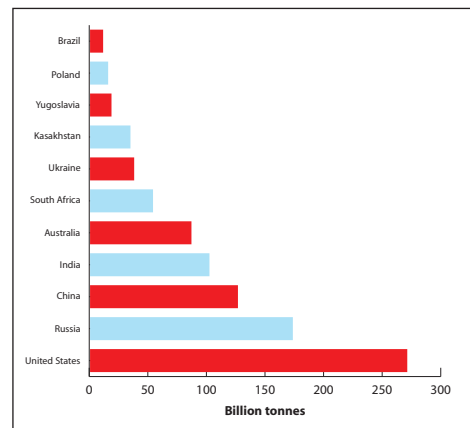
The actual proportion of coal resources that can be mined and recovered economically

from undisturbed deposits varies from less than 40% to more than 90% in some mines. Adverse geological features and mining techniques limit the amount of coal that can be recovered at underground and surface mines.

During 2000, 1.08 billion short tons of coal were consumed in the US (see figure 2). The greatest demand for coal was by electricity-generating plants that burn coal to produce electricity. Over 90% of the total produced more than half of all electricity generated. Each ton of coal consumed at an electric power plant produces about 2,000 kilowatt hours of electricity. A pound of coal supplies enough electricity to light 10 100-watt bulbs for about an hour.

Environmental concerns

As everyone knows, burning coal has been a key environmental issue and is the primary



F1. Major world coal reserves

The majority of global coal reserves, over 92%, are concentrated in 11 countries with the US and China accounting for nearly 50% of reserves
Source: EIA

reason for the use of alternative fuel for power production. Coal accounts for more than a third of US carbon dioxide (CO₂) emissions and nearly 40% of global CO₂ emissions. Advanced technology has been developed and continues to improve, known as integrated gasification combined-cycle power-generating units (IGCC). Of course, cleaner air comes at a cost – IGCC technology is currently some 20%–30% more expensive than traditional systems.

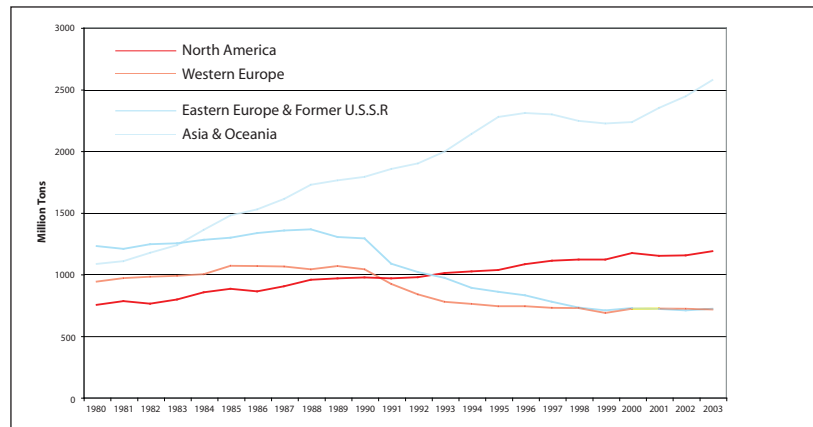
While coal was the major fuel source in the US years ago, its importance declined because petroleum and natural gas were cleaner, more cost-effective and more efficient. However, coal is returning as a primary source for electricity generation because it is now far cheaper than other fossil fuels and it is also more abundant in the US than any other fossil fuel. In 2004, coal usage by the US electric power industry totalled 1.1 billion short tons, 92% of total coal consumption – accounting for more than half of the total electricity produced.

Market economics

During the early 1970s, natural gas was the least expensive fuel used to generate electricity. In 1970 electric utilities paid on the average, about 28 cents per MMBtu of natural gas, 31 cents per MMBtu of coal and 42 cents per MMBtu of petroleum. Since 1976, however, coal has been the least expensive fossil fuel used to generate electricity. In 1999, on a dollars-per-MMBtu basis, natural gas was the most expensive fossil fuel (\$2.59), petroleum was second (\$2.56) and coal was least expensive (\$1.22).

Market traders measure price relativity in real-time with the spark spread (see figure 3). Although these figures show that the cost of generating electricity from coal has increased significantly, it is still lower than the cost of generating electricity from either natural gas or petroleum. The average price for coal delivered to electric utilities was \$24.28 per short ton in 2000, with the spot-market price only slightly higher at \$24.85.

Coal prices rose across the board significantly in 2004 (see figure 4). The average US open market FOB (free on board) mine price increased to \$19.93 per ton, an increase of 11.6% over 2003, a price level not seen since 1993. While US spot coal prices set record levels in 2004, average delivered prices did not increase as steeply due to the fact that coal deliveries to the electric power sector are mostly done



F2. World coal regional consumption

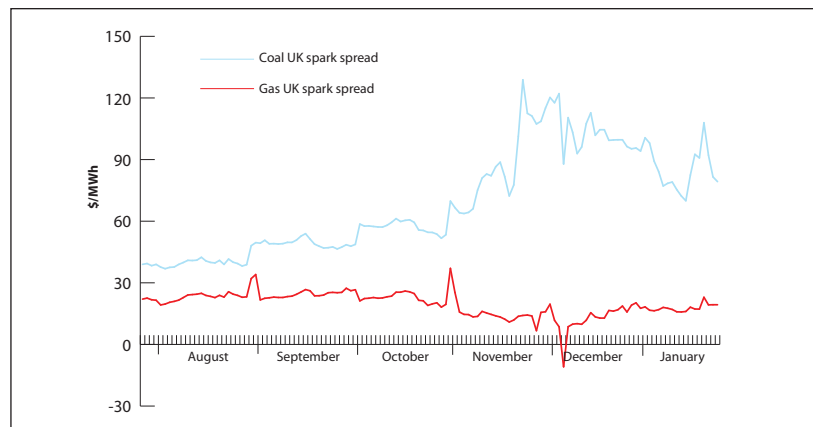
Consumption trends over more than 20 years are up in the US and Asia, while other regions have reduced dependence

Source: EIA

through long-term contracts.

Despite EIA projections that US coal prices in general will rise at the more moderate rate of 5.5% in 2006, spot market coal pricing has been up sharply this year. One key factor currently pushing prices higher is the expectation of continued high prices for sulphur dioxide (SO₂) allowances. Coal prices at electric utilities (a subset of the electric power sector) increased for a fourth consecutive year, to \$27.30 per short ton (1.34 dollars per MMBtu), an increase of 5.7%.

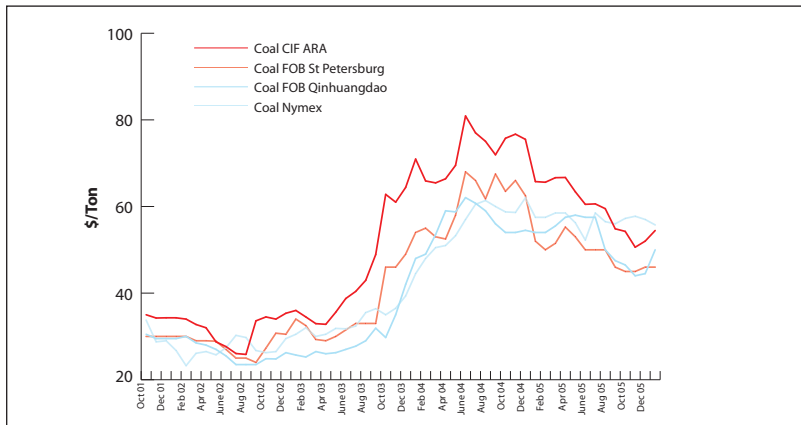
The key is that US coal suppliers are essentially now selling two commodities – Btus and sulphur. Coal with higher Btu will have



F3. Spark spreads - natural gas vs coal

The spark spread shows the cost of electricity as a ratio to the fuel to produce it. Here the spark spread of gas is compared to the 'dark spread' of coal

Source: Argus via GlobalView



F4. Comparison of regional coal prices

Prices for coal delivered at various key points around the globe have stayed in a fairly tight relationship over the past few years

Source: Argus via GlobalView

a higher value, but the higher the sulphur entrained in the coal, the more it must be discounted. In the past, one reported rule of thumb would discount the price by \$0.30 per short ton for each 0.1% of sulphur in the coal. By that approach, a 1.5% sulphur coal would be discounted \$1.50 per short ton below the price of a 1.0% coal of similar Btu.

Now, with the prices of SO₂ emission allowances topping \$1,500 per ton, boiler operators have been demanding discounts of \$15-\$16 per ton for coal carrying an extra 0.5% sulphur. At the same time, the heat content of the coal has become more critical because the amount of sulphur converted to SO₂ emissions is inversely proportional to the Btu value of the coal.

Coal with lower Btu content requires more coal and attendant sulphur to be combusted to produce the heat or power needed. As a result, 11,500-Btu coal with 1.5% sulphur may be at the margin of the market, while 11,000-Btu coal with 1.5% sulphur may have to be discounted below its cost of production.

In the UK, coal reserves are estimated to be up to 230 million tons, while production has been declining, measured at 25 million tons in 2004. Imports reached 36 million tons in that year as demand fell to 60 million tons. In 2004, coal usage by the UK power industry accounted for 75% of total coal consumption and accounted for about 33% of the total electricity produced. In contrast, power generation in China is 80% coal-fired and over 2 billion tons of coal was produced last year.

The UK coal industry has become increasingly exposed to the international coal market since the privatisation of the UK electricity supply industry in 1990. In all sectors, consumers are free to purchase coal from the most economic source available, resulting in prices for UK coal that are closely aligned to the delivered price of imported coal or the perception of the price into the future.

Most UK-produced coal will fall in the high sulphur band between 1.4%-2.2%, with the average around 1.7%-1.8%. While UK coal should compete with imports on price, the main threat to UK coal producers will be on sulphur and other quality issues.

In most scenarios, the projected demand for coal in the UK will likely exceed its production in UK mines, driving imports up along with prices. Only in the very lowest demand scenarios – and then late in the period – does demand fall below the projected national output. However, the situation is different when one takes into account the coal consumers' preference for low-sulphur coals that comply with various emission standards. This means large combustion installations will need coal lower in sulphur than standard UK coal grades, driving demand lower.

Uncertain future

There is uncertainty about power generators' coal demand over the next decade. In a carbon-constrained world where carbon prices are high, nuclear plant lives are extended and renewable fuels boom, coal usage would be squeezed to low levels. In a world where carbon prices are low, gas is expensive, nuclear plants retired early and renewables expansion stalled, coal could even increase its generation.

Coal is inevitably a substantial part of the global energy mix for the foreseeable future, and so will be a major ingredient in energy market economics. The biggest growth in coal generation will likely occur in developing countries such as China, where coal is far more abundant than oil or natural gas.

The coal market is clearly out of its historic isolation. However, although there is great potential for coal to hold a substantial share of the fuel market, that potential may be dramatically susceptible to the market forces of other fuels and government regulation. [ER](#)

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